

RECORD OF THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

April 1982

THE GRADUATE SCHOOL



1982-1983 ISSUE



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THE GRADUATE SCHOOL

Announcements for the Session 1982-1983

GRADUATE SCHOOL SERIES, No. 102

THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
CHAPEL HILL, NC 27514

THE UNIVERSITY OF NORTH CAROLINA

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History of the University

The University of North Carolina is comprised of all the public institutions of higher education in North Carolina that confer degrees at the baccalaureate level or higher. The University was authorized by the State Constitution in 1776, and it was chartered in 1789 by the General Assembly.

The University of North Carolina opened its doors to students at Chapel Hill in 1795. Thereafter, beginning in the latter part of the nineteenth century, the General Assembly of North Carolina has established and supported fifteen other public senior institutions in keeping with Article IX, Section 8, of the Constitution of North Carolina which provides that the "General Assembly shall maintain a public system of higher education, comprising The University of North Carolina and such other institutions of higher education as the General Assembly may deem wise."

By 1969 The University of North Carolina included six constituent institutions, governed by a single Board of Trustees. This multicampus University had its beginnings in legislation enacted in 1931 that defined The University of North Carolina to include The University of North Carolina at Chapel Hill, North Carolina State University at Raleigh, and

The University of North Carolina at Greensboro. In the 1960s three additional campuses were added: The University of North Carolina at Charlotte, The University of North Carolina at Asheville, and The University of North Carolina at Wilmington.

Beginning in 1877, the General Assembly of North Carolina established or acquired ten additional separately governed state-supported senior institutions of higher education. They are: Appalachian State University, East Carolina University, Elizabeth City State University, Fayetteville State University, North Carolina Agricultural and Technical State University, North Carolina Central University, North Carolina School of the Arts, Pembroke State University, Western Carolina University, and Winston-Salem State University. Then, in 1971, the General Assembly redefined The University of North Carolina, and under the terms of that legislation all sixteen public senior institutions became constituent institutions of The University of North Carolina.

The constitutionally authorized Board of Trustees of the six-campus University of North Carolina was designated the Board of Governors and this body is by law The University of North Carolina. The Board of Governors consists of thirty-two members elected by the General Assembly, and it is charged with "the general determination, control, supervision, management, and governance of all affairs of the constituent institutions." The chief executive officer of the University is the President.

Each constituent institution of the University has its own faculty and student body. The chief administrative officer of each institution is the chancellor, and the chancellors are responsible to the President.

Each constituent institution also has a board of trustees composed of thirteen members: eight elected by the Board of Governors, four appointed by the Governor, and the elected president of the student body *ex officio*. (The School of the Arts has two additional *ex officio* trustees.) The principal powers of these institutional boards are exercised under a delegation of authority from the Board of Governors.

CALENDAR OF EVENTS

1982-1983

Summer Session, 1982

First Term

May 24, Monday	Registration
May 25, Tuesday	Classes begin.
May 26, Wednesday	Last day for late registration.
May 31, Monday	Holiday.
June 1, Tuesday	Last day to <i>drop</i> a course for credit on student's financial account.
June 11, Friday	Last day for submitting an application for a degree and an application for admission to candidacy for the master's degree and last day for submitting an application for doctoral degree for August graduation.
June 14, Monday	Last day to withdraw for credit on student's financial account.
June 18, Friday	Last day to <i>drop</i> a course.
June 25, Friday	Last class day.
June 26, Saturday	Reading Day.
June 28-29, Monday-Tuesday	Final course examinations.

Second Term

July 6, Tuesday	Registration.
July 7, Wednesday	Classes begin.
July 8, Thursday	Last day for late registration.
July 10, Saturday	Written examinations for master's candidates for the August graduation may not be taken after this date.
July 13, Tuesday	Last day to <i>drop</i> a course for credit on student's financial account.
July 27, Tuesday	Last day to withdraw for credit on student's financial account.
July 30, Friday	Last day to <i>drop</i> a course.
August 6, Friday	Last class day.
August 6, Friday	Final signed copies of doctoral dissertations and master's theses for candidates for the August graduation must be filed in the Graduate School by this date.
August 7, Saturday	Reading Day.
August 9 and 10, Monday and Tuesday	Final course examinations.

Fall Semester, 1982

August 18-20, Wednesday-Friday	Registration.
August 23, Monday	Classes begin.
August 27, Friday	Last day for late registration.
September 6, Monday	Holiday.
September 7, Tuesday	Last day to <i>drop</i> a course for credit on student's financial account.

September 24, Friday	Last day for submitting an application for a degree and an application for admission to candidacy for the master's degree and last day for submitting an application for doctoral degree for December graduation.
October 6, Wednesday	Fall Recess begins at 5 P.M.
October 11, Monday	Classes resume at 8 A.M.
October 12, Tuesday	University Day.
October 22, Friday	Last day to withdraw for credit on student's financial account.
October 25-29, Monday-Friday	Pre-registration for Spring Semester.
November 13, Saturday	Written examinations for master's candidates for December graduation may not be taken after this date.
November 19, Friday	Last day to <i>drop</i> a course.
November 24, Wednesday	Thanksgiving recess begins at 1 P.M.
November 29, Monday	Classes resume at 8 A.M.
December 3, Friday	Last class day.
December 6, Monday	Reading Day.
December 7-16 Tuesday-Saturday Monday-Thursday	Final course examinations.
December 10, Friday	Final signed copies of doctoral dissertations and master's theses for candidates for the December graduation must be filed in the Graduate School by this date.

Spring Semester, 1983

January 10-11, Monday-Tuesday	Registration.
January 12, Wednesday	Classes begin.
January 18, Tuesday	Last day for late registration.
January 25, Tuesday	Last day to <i>drop</i> a course for credit on student's financial account.
January 28, Friday	Last day for submitting an application for a degree and an application for admission to candidacy for the master's degree and last day for submitting an application for doctoral degree for May Commencement.
March 4, Friday	Spring recess begins at 5 P.M.
March 14, Monday	Classes resume at 8 A.M.
March 15, Tuesday	Last day to withdraw for credit on student's financial account.
March 26, Saturday	Written examinations for master's candidates for May Commencement may not be taken after this date.
April 4, Monday	Holiday.
April 6-12, Wednesday-Tuesday	Pre-registration for Summer and Fall Semesters.
April 14, Thursday	Last day to <i>drop</i> a course.
April 22, Friday	Final signed copies of all doctoral dissertations and master's theses must be filed in the Graduate School by this date.
April 28, Thursday	Last class day.
April 29, Friday	Reading Day.
May 2-11 Monday-Saturday Monday-Wednesday	Final course examinations.
May 15, Sunday	Commencement.

Special Deadlines for Admission Applications

July 1, 1982	Last day for submitting a completed application for admission to the Fall Semester.
November 2, 1982	Last day for submitting a completed application for admission to the Spring Semester.
January 21, 1983	Last day for submitting a completed application to qualify for fellowship consideration for the Fall Semester.
May 2, 1983	Last day for accepting applications from foreign students for the Fall Semester.
May 13, 1983	Last day for submitting a completed application for admission to the First Term Summer Session.
June 21, 1983	Last day for submitting a completed application for admission to the Second Term Summer Session.

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To Graduate Students and Prospective Graduate Students

The University of North Carolina at Chapel Hill is one of the leading graduate research universities in the United States. It is one of the most comprehensive in the nation and provides a breadth of study and experience which is matched by few institutions. There are fifty-eight doctoral-level programs and seventy master's-level programs currently active in the Graduate School.

This catalogue provides the basic information you will need to learn about these programs. It includes our admission standards and requirements, tuition and other costs, sources of financial aid including fellowships, graduate degree requirements, and information concerning research institutes and centers as well as brief program and course descriptions. In addition, you will find under each program description a listing of all graduate faculty in that area together with their specific research interests.

The University of North Carolina at Chapel Hill is committed to equality of educational opportunity and does not discriminate against applicants, students or employees. Moreover, The University of North Carolina at Chapel Hill is open to people of all races; we actively seek to promote student diversity at the University by recruiting and enrolling a larger number of black students.

In addition to the resources represented by an outstanding faculty, an outstanding research library (fifteenth in the nation, first in the southeast), and other outstanding facilities, the University has about it a warm and collegial human spirit which many find to be unusually conducive to personal growth and scholarship.

As you consider your future, we hope you will consider this institution, and that you will apply here and find an opportunity to visit the campus.

The Graduate School

THE GRADUATE FACULTY

Included here is the name, terminal degree, and academic appointment of each *full* member of the Graduate Faculty, spring 1982. More extensive data about each faculty member is provided in the Undergraduate Bulletin.

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- WILLIAM JAY YOUNT, M.D., *Professor of Medicine and Professor of Bacteriology*
- DENNIS JOHN ZABOROWSKI, M.F.A., *Associate Professor of Art*
- RICHARD HAROLD ZAFFRON, Ph.D., *Assistant Professor of Philosophy*
- WILLIAM N. ZELMAN, Ph.D., *Assistant Professor of Health Administration in the School of Public Health*
- MICHAEL WILLIAM ZENGE, M.M., *Professor of Music*
- PAUL ZIFF, Ph.D., *William Rand Kenan, Jr., Professor of Philosophy*
- ROBERT WALTER ZMUD, Ph.D., *Associate Professor of Business Administration*
- CHARLES G. ZUG III, Ph.D., *Associate Professor of English*

GENERAL INFORMATION

History

The University of North Carolina at Chapel Hill was the first state university to admit students. It was chartered in 1789 and formally opened in 1795; from early in its history, it has encouraged research and creative activity.

As early as 1853-54 the catalogue of the University carried an announcement of graduate course work. In 1876, after the institution had been closed for the period 1871-75, the catalogue announced the requirements for the master's degree, and the next issue carried an announcement of regulations governing the degrees of Master of Arts, Master of Science, and Doctor of Philosophy. Several graduate degrees were awarded before the turn of the century, the first degree of Doctor of Philosophy being conferred in 1883, but it was not until 1903 that a separate Graduate School with a dean was established.

In 1920, from an earlier advisory committee, the Administrative Board of the Graduate School was organized. In 1922, the graduate faculty voted, first, to vest in the Administrative Board legislative powers in matters that affected graduate education; second, to authorize the Administrative Board to admit members to the teaching faculty of the Graduate School; and, third, to vest in the Administrative Board the responsibility for authorizing curricula and courses carrying graduate credit. At the present, the Board consists of twenty-one members appointed by the Chancellor upon nomination by the Dean, after an advisory vote by the graduate faculty.

All master's degrees offered by the University and the degrees of Doctor of Philosophy, Doctor of Education, and Doctor of Public Health are conferred by the Graduate School.

Organization

Work toward advanced degrees in The University of North Carolina at Chapel Hill proceeds under policies and regulations established by the graduate faculty. The immediate direction of the Graduate School is in the charge of the Administrative Board, of which the Dean is Chairman, consisting of twenty-one members of the faculty who represent the following seven divisions:

The Division of the Humanities

- The Department of Classics
- The Curriculum of Comparative Literature
- The Department of English
- The Curriculum in Folklore

The Department of Germanic Languages
The Curriculum in Linguistics
The Department of Philosophy
The Department of Religion
The Department of Romance Languages
The Department of Slavic Languages
The Department of Speech Communication

The Division of Fine Arts

The Department of Art
The Department of Dramatic Art
The Department of Radio, Television, and Motion Pictures
The Department of Music

The Division of Biological Sciences

The Department of Anatomy
The Department of Bacteriology and Immunology
The Department of Biochemistry and Nutrition
The Department of Botany
The Curriculum in Ecology
The Curriculum in Genetics
The Curriculum in Neurobiology
The Department of Pathology
The Department of Pharmacology
The Department of Physiology
The Curriculum in Toxicology
The Department of Zoology

The Division of Social Sciences

The Department of Anthropology
The Department of City and Regional Planning
The Department of Economics
The Department of Geography
The Department of History
The Department of Physical Education
The Department of Political Science
The Department of Psychology
The Curriculum in Recreation Administration
The Department of Sociology

The Division of Physical Sciences and Mathematics

The Curriculum in Biomedical Engineering and Mathematics

The Department of Chemistry
 The Department of Computer Science
 The Department of Geology
 The Curriculum in Marine Sciences
 The Department of Mathematics
 The Curriculum in Operations Research and Systems Analysis
 The Department of Physics and Astronomy
 The Department of Statistics

The Division of Professional Schools I

The Graduate School of Business Administration
 The School of Education
 The School of Journalism
 The School of Library Science

The Division of Professional Schools II

The School of Dentistry
 The Department of Medical Allied Health Professions, School
 of Medicine
 The School of Nursing
 The School of Pharmacy
 The School of Public Health
 The School of Social Work

The Summer Session

One of the first summer schools in America was established at The University of North Carolina at Chapel Hill in 1877. Eighteen sessions were held during the next thirty years. The Summer Session has operated annually since 1907 and has come to be an integral part of the academic organization of the University.

Curricula and courses that are offered during the Summer Session are comparable to those of the fall and spring semesters. With few exceptions, students may make progress toward fulfilling requirements for all graduate degrees offered by the University.

The Summer Session is divided into two terms of approximately five and one-half weeks each. The summer program is planned to meet the needs of graduate students who are fulfilling degree requirements in this institution, visiting graduate students who desire to take courses for transfer to other institutions, teachers and administrators who desire to meet state certification requirements, and other students who have special educational objectives.

Graduate students who wish to be admitted or readmitted in the Summer Session to a degree program should write to the Dean of the Graduate School. The requirements for admission in the Summer Session to a degree program are the same as those in the regular academic year. Those who desire a copy of the Summer Session catalogue, or other information, and those wanting to enroll in the summer as *visiting* students should write to the Director of the Summer Session, The University of North Carolina at Chapel Hill, 102 Peabody Hall 037-A, Chapel Hill, N.C., 27514.

Visiting Scholars

Registration as a Visiting Scholar at The University of North Carolina at Chapel Hill entitles the registrant to certain privileges of the University at Chapel Hill and its facilities for the duration of the visitor's stay in the University.

Eligibility for registration as a Visiting Scholar is limited to those who (1) are *not* on the University payroll as employees in any capacity and (2) are visiting the University under the sponsorship of an academic department or school for the furtherance of scholarly interests. Visiting Scholars may include faculty members on leave from other institutions of higher learning, post-doctoral fellows, or others who hold the terminal degree in their fields and are invited to visit by a department or school.

Persons interested in applying for Visiting Scholar status should communicate with the appropriate department or school within the University. Further details concerning University privileges to Visiting Scholars are available from the Office of the Registrar, 02 South Building 005-A.

The University Year

Two semesters of approximately 17 weeks each and a summer session consisting of two five and a half week terms constitute the University year. The requirements for admission to graduate programs and for graduate degrees in the summer session are the same as those in the regular academic year. For the schedule of events of particular interest to graduate students, one should consult the Calendar of Events printed at the front of this catalogue.

ADMISSION, FELLOWSHIPS AND FINANCIAL AID

Admission

Application for admission should be made on forms provided by the Graduate School. Inquiries concerning admission and requests for appli-

cation forms should be directed to:

The Graduate School
The University of North Carolina at Chapel Hill
200 Bynum Hall 008A
Chapel Hill, N.C., 27514
(919) 966-2611

It is advisable to apply for fall admission by February 1, but applications submitted as late as July 1 will be considered for admission if space is available. Only when the application and all supporting materials are received by February 1 can an individual be considered for a Graduate School fellowship. (Departmental awards may continue to be available thereafter.) Applications for admission in the spring semester must be received by October 15, but earlier submission of applications is advisable.

Admission to the Graduate School of The University of North Carolina at Chapel Hill is necessarily a selective process. Only applicants with academic records of high quality should seek admission. Admission to the Graduate School does not imply financial assistance of any kind. The award of financial assistance is a separate decision. The prospective student must hold the bachelor's degree from an accredited college or university in this country or its equivalent in a foreign institution—based on a four-year curriculum. The student's record should be a strong one overall with an average grade of B or better in the major subject area. Meeting this requirement does not insure that an applicant will be admitted.

It is customarily expected that the prospective student will have completed an undergraduate major in the subject of graduate interest. This expectation does not extend to schools and departments that represent disciplines not commonly offered at the college level or to others for which a high level of aptitude and academic achievement in general may constitute the basis for admission. Students who are taking, or have taken, graduate work elsewhere must be in good standing at that institution to be eligible for admission to this Graduate School.

The Administrative Board of the Graduate School has empowered the Dean to grant admission on a provisional basis to applicants who apply in the middle of the senior year of college, contingent on completion of the bachelor's degree prior to enrollment.

Many departments require specific tests or materials of all applicants, and the Graduate School requires that all applicants with less than a B average in the last two years of undergraduate work take the GRE aptitude test. The Graduate School also strongly recommends that the GRE be taken if the applicant is applying for financial support. The test should be taken no later than October to insure that scores will be submitted in time to process the application for fall admission. Applicants whose native language is not English are required to submit acceptable scores on the

Test of English as a Foreign Language (TOEFL) in addition to the usual requirements.

Diversity among student backgrounds and points of view is desired. To that end, admissions committees also consider an applicant's accomplishments and personal qualities that are brought to their attention by the applicant or by his or her references. A careful evaluation of accomplishment and promise is at the heart of the process.

Other matters relating to admission, including details on the appropriate test or tests, are discussed in the instructions accompanying the application forms, and in the sections of this catalogue pertaining to schools and departments. Your attention is called to these descriptions which contain information necessary to successful completion of admission requirements.

Admission to the Graduate School entitles one to begin a program of studies that leads to a graduate degree. Admission to the Graduate School is distinct, however, from admission to candidacy for such a degree. Until admitted to candidacy for a degree, the student is regarded as being in the Graduate School for the purpose of earning semester hours of credit and of acquiring knowledge and otherwise profiting from association with the faculty and other students. After being admitted to candidacy for a degree, a student is regarded as having the encouragement of the appropriate faculty to proceed toward a graduate degree, and is held responsible by the Graduate School for the purpose of earning semester hours of credit and of as determined by consultation with a faculty adviser and described on the application for admission to candidacy.

Foreign Students

Applications for admission from non-U.S. applicants are processed in the same way as those from U.S. applicants, except for the following important distinctions. The foreign student often is supported by the U.S. Government, private foundations, Fulbright travel, home government funds or, in some cases, University programs. In these instances, the sponsor's financial responsibilities are clearly established and the sponsor issues the necessary immigration documents for the exchange visitor. In those cases where the foreign student is supported by personal funds or is provided with a teaching or research assistantship, the necessary certificate of eligibility is issued by the Graduate School. Students who plan to use personal funds to finance their education must provide the University with verification that the necessary funds are available. (The University will provide a form for this purpose.) In any case, an offer of admission will not be made until the applicant has provided positive information that adequate funds for his or her education are available.

All foreign applicants except those from English-speaking countries must provide proof of English language proficiency by obtaining acceptable scores on the Test of English as a Foreign Language. In addition, each new student must take an English language proficiency test at the time he or she first enrolls in the University. While the latter test does not affect the student's admission, failure to pass it may necessitate taking English 101X, a noncredit course designed to improve the student's ability to communicate in the English language.

Fellowships and Financial Aid

Financial support for graduate students is offered in the form of (1) University fellowships and assistantships; (2) work-study awards; (3) departmental assistantships; (4) fellowships and other awards sponsored through federal, state, and private grants; (5) GI benefits; and (6) student loans. Though some awards are restricted to incoming graduate students, many, if not most, are available to all graduate students.

Some awards are made directly from the Graduate School, and others are dispensed by departments. Before a student or prospective student may be considered for any award by the Graduate School, that student or prospective student must be nominated to the Graduate School by the appropriate department. Prospective students who wish to be considered for any award must have completed the Application for Admission to the Graduate School. An applicant for financial aid already enrolled in the Graduate School should notify the departmental Director of Graduate Studies of his or her desire to be considered for financial aid.

All applications from prospective students for Graduate School awards must be received in the Graduate School by February 1. Departmental awards are under the departments' jurisdictions and may still be available after February 1. Announcements of awards will be made in late March or early April.

A student receiving financial support from the University, whether through a nonservice fellowship or a service appointment, is expected to take a full-time program of study leading toward a degree. Failure to register in any term during tenure of an award may be expected to result in automatic termination of that award. An award is also subject to cancellation if a student fails to meet the terms of that award or fails to maintain a satisfactory level of academic performance.

Students are urged to apply for fellowships available through national, regional, and foundation sources, as well as for those offered by The University of North Carolina at Chapel Hill.

For a fellowship or assistantship awarded by the Graduate School, payment arrangements are specified in an award letter to the student. For awards granted by departments, appointees should inquire of the appropriate department for information concerning payment arrangements.

University Fellowships and Assistantships

Morehead Fellowships (three- or four-year nonservice awards), each with a stipend of \$7500 plus tuition and fees per academic year.

Pogue Fellowships (two-year, nonservice awards), each with a stipend of \$5500 plus tuition and fees.

William R. Kenan, Jr., Fellowships (one-year, nonservice awards), each with a stipend of \$5000 plus tuition and fees.

William N. Reynolds Fellowship (one-year, nonservice award), with a stipend of \$5000 plus tuition and fees.

Mrs. Victor (Edna Angle) Humphreys Graduate Fellowship (one year, nonservice award), with a stipend of \$5000 plus tuition and fees.

Alumni First Year Graduate Fellowships and University First Year Graduate Fellowships (one-year, nonservice awards), each with a stipend of \$5000 plus tuition and fees.

Limited Service Assistantships (one-year appointments), each with a stipend of \$4600.

Biomedical Research Assistantships (one-year appointments), each with a stipend of \$4600.

Whitaker Fellowship (one-year, nonservice award), with a stipend of \$5000 plus tuition and fees.

R. J. Reynolds Industries Research Fellowships (one-semester, nonservice awards), each with a stipend of \$3000 plus tuition and fees for off-campus dissertation research.

Werner P. Friederich Fellowship in Humanities (one-year, nonservice award), with a stipend of \$7500 plus tuition and fees for study in Switzerland.

Georges Lurcy Fellowship (one-year, nonservice award), with a stipend of \$7500 plus tuition and fees for study in France.

Minority Presence Awards

Under the Board of Governors general Minority Presence Grant Program, black students may be eligible for special financial assistance if they are residents of North Carolina, enrolled for two or more courses in a degree program, and demonstrate financial need.

The Minority Presence Grant Program for Doctoral Study provides stipends of \$4600 for the academic year, with an option of additional support in the amount of \$600 for study in the summer session, for black residents of North Carolina who are selected to participate. Recipients must be full-time students pursuing doctoral degrees at The University of North Carolina at Chapel Hill.

Lyndhurst Fellowships for the Master of Arts in Teaching

Twenty-four fellowships for 1982-1983 have been made possible by a grant from the Lyndhurst Foundation to The University of North Carolina at Chapel Hill for the purpose of attracting liberal arts graduates in mathematics, English and the biological and physical sciences to careers in public school teaching in the states of North Carolina and Tennessee. The program is jointly sponsored by the Graduate School, the School of Education and the College of Arts and Sciences. During their course of study at Chapel Hill the successful candidates will be designated Lyndhurst Fellows in Teaching. The Fellowship provides a stipend of \$6000 plus tuition and fees for two semesters and up to two summer sessions payable for twelve calendar months.

Upon completion of the Master of Arts in Teaching each Lyndhurst Fellow must agree to teach for three years in the public schools of either North Carolina or Tennessee. At the end of their third year of teaching, Fellows will be invited to return to Chapel Hill for a three-week refresher course in their discipline.

Departmental Fellowships

Several departments offer fellowships funded from private sources. Students are nominated for these fellowships by their departments and selection is made by faculty committees or by the Graduate School. For additional information concerning such fellowships the applicant should contact the appropriate department. Listed below are examples of such fellowships:

The W. C. Coker and the Mrs. W. C. Coker Fellowships in the Department of Botany; The Samuel Kress Fellowship and Ann McCulloch Hill Fellowship in the Department of Art; the Kent James Brown Fellowships in the Department of Germanic languages; the Mellon Fellowships in City and Regional Planning; the Waddell Fellowships in the Department of History; the Sommer Award in the Department of Art; the George E. Nicholson, Jr., Fellowships in the Department of Statistics; the Georges Lucey Fellowship in the Department of Economics, and the Microelectronics Center of North Carolina Fellowships in the Curriculum in Biomedical Engineering and Mathematics, and the Departments of Chemistry, Computer Science, and Physics and Astronomy.

Departmental Assistantships

Approximately 1800 graduate assistantships, research assistantships, or teaching assistantships, with stipends ranging up to \$6500, are available through specific departments.

Graduate assistantships also are available through the various research institutes and centers of the University. (See pages 79-91 for a listing of these units.)

Residence Hall Staff Positions

Upperclass and graduate students who have had experience in residence-hall living may apply for resident assistantships (RA's) and positions as assistant residence directors (ARD's) by writing for further information and application forms to the Department of University Housing, Carr Hall. To be assured of consideration, applications should be returned by January 15. Personal interviews are required as part of the application process.

Federal and State Fellowships and Traineeships

A number of State and federally-funded fellowships and traineeships are available in some departments. To be eligible for these fellowships and traineeships, students must be pursuing graduate training in specified fields of study. Interested students should request additional information from their departments.

National, Regional, and Foundation Fellowships

These awards are made to an individual rather than to the University. Recipients are chosen through competitions expressive of the terms of each award.

Examples of these awards follow:

NSF Graduate Fellowships—The Fellowship Office, National Research Council, 2101 Constitution Avenue, N.W., Washington, D.C. Pre-application packets are available in the Graduate School Fellowship Office, 218 Bynum Hall.

American Association of University Women Fellowships—Applications are available through local chapters.

Tuition Payment for Award Holders—Unless tuition is expressly provided by the terms of the award, a holder of a nonservice award must pay tuition at the rate determined by his residence status. However, a non-resident student who is solicited for a special talent and is thereby awarded a fellowship may be eligible for a special reduced tuition rate. A non-resident graduate student solicited for a special talent and thereby awarded an assistantship of an academic nature may be eligible for a reduced tuition rate no less than that paid by North Carolina residents.

Dates of Award Payments—Graduate students are reminded that, for some appointments, stipends are not paid until after work is performed.

This means that payment checks due many graduate students will not be received until thirty days after registration for each semester. Students are advised to make arrangements for their own support during the time prior to the arrival of a first payment in each semester.

Other Financial Aid

Graduate students also may apply to the Student Aid Office for financial aid in the form of long-term loans and/or College Work-Study employment. All financial aid is based upon a student's financial need, which is the difference between reasonable costs of attendance and the student's available resources. The University expects a student and his/her family to contribute insofar as they are able to educational and living expenses, and the ability of the student and family to help with the costs of attendance is measured by a standard system, used nationally by all colleges and universities.

In order to apply for loan and Work-Study assistance, a graduate student must complete the *Financial Aid Form (FAF)* and submit it to the College Scholarship Service, with the instruction that a copy of the statement be sent to the UNC-CH Student Aid Office (code number 5816). A request for financial aid from the Graduate School or a graduate department will not serve as an application for assistance from the Student Aid Office; the *FAF* is required of all applicants. The *FAF* may be obtained from college financial aid offices or from the UNC Student Aid Office. All sections of the form must be completed.

The preference deadline for receiving the *FAF* from new and returning students is March 1. A student should not wait for admission to a graduate program before applying for aid. Applicants should complete the document as soon as tax information for the preceding calendar year is available, preferably by February 15. Students who apply after March 1 will receive assistance only if resources permit. When financial aid funds are limited, preference is given to undergraduate students.

In addition to the *FAF*, all financial aid applicants who have attended other colleges or universities must submit a *Financial Aid Transcript* for each school previously attended. Copies of the form may be obtained from the UNC Student Aid Office.

A student's request for financial aid will be considered after the *FAF* and *Financial Aid Transcripts* from all previous schools have been received by the Student Aid Office. An award decision cannot be made until an applicant has been admitted to a graduate program, so the student should ensure that the admission procedure is completed as early as possible.

National Direct Student Loans: Federal funds are allocated to the University for the National Direct Student Loan Program, through which eligible students may borrow to meet their educational and living

expenses. A student may borrow up to \$12,000 for undergraduate and graduate study, but because of limited allocations to UNC-CH, the maximum award usually cannot exceed \$3,000 per year. Repayment at 5 percent interest begins six months after a student terminates at least half-time student status, and the borrower must agree to a payment schedule of at least \$30 per month before he/she leaves the University. Under certain circumstances, such as military service, continued student status, or a period of required internship, the repayment of a loan may be postponed. A student who completes the *FAF* may be considered for assistance for the National Direct Student Loan Program.

University Loans: Graduate students may receive assistance from University Loan funds, usually at 3 percent interest, with repayment beginning immediately after termination of student status. The maximum loan is ordinarily \$2,500 per year. A student who completes the *FAF* may be considered for a University Loan.

College Work-Study Employment: Part-time jobs on campus are available to needy students through the federal College Work-Study Program (CWSP). Jobs are assigned by the Student Aid Office, and work is generally available in all University offices and departments. Every effort is made by the Student Aid Office to place a student in a job appropriate to his/her academic interest and skills. A CWSP job requires on the average 10 hours of work per week, and the typical salary for graduate and professional students is \$4.50 per hour. A student who completes the *FAF* may be considered for Work-Study employment.

Guaranteed Student Loans: Graduate students also are eligible for Guaranteed Student Loans awarded by lending agencies in their home states. Typically, the eligibility requirements and maximum loan amounts are more liberal than those for National Direct and University loans. A graduate student may borrow up to \$5,000 per year, with a limit of \$25,000 for undergraduate and graduate study. Repayment at 9 percent interest begins six months after a borrower ceases to be at least a half-time student. A North Carolina student may obtain information and an application for a Guaranteed Student Loan from the College Foundation, 1307 Glenwood Avenue, Raleigh, N.C., 27605. Students from other states may write to the Student Aid Office for the name and address of the lending agency in their home states. Applications for Guaranteed Student Loans must be certified by the UNC-CH Student Aid Office before they can be forwarded to lending agencies, so students are urged to submit applications to the Student Aid Office at least three weeks prior to agency deadlines. A graduate student should apply for a Guaranteed Student Loan, as well as for financial aid from the Student Aid Office, in case University resources are limited and only undergraduate students can be considered. Whenever possible, a student should borrow from only one loan program in order to avoid simultaneous repayments to two sources.

Questions about financial aid and requests for the necessary forms should be directed to the Student Aid Office, The University of North Carolina at Chapel Hill, 300 Vance Hall 057A, Chapel Hill, N.C. 27514.

Other Employment

The Student Aid Office maintains a bulletin board on which job opportunities are advertised in the stairwell of Vance Hall. Jobs so cited may be located either in University departments or in places of business or homes in and around Chapel Hill. Several hundred students secure jobs each year through this information service, which is freely available to everyone needing employment.

TUITION AND FEES, STUDENT HEALTH, AND UNIVERSITY HOUSING

Tuition and Fees

Tuition and fees are assessed on a semester basis and are due at registration. Payments may be made in advance, in person or by mail. However, the entire amount for tuition and fees is due by the last day of registration. Payments may be mailed to: University Cashier, The University of North Carolina at Chapel Hill, 103 Bynum Hall 008-A, Chapel Hill, North Carolina 27514. Checks should be made payable to The University of North Carolina. The student's social security number should be shown on the face of the check. Accounts not paid in full by the last day of registration are subject to a late payment fee and the student's possible disenrollment.

The estimated total expenses for a graduate student for an academic year (two semesters) are as follows:

	<i>N.C. Resident</i>	Nonresident
Tuition	\$ 436.00	\$2,260.00
Fees*	253.50	253.50
Books and Supplies	275.00	275.00
Dormitory Room Rent (Average double-room)	700.00	700.00
Meals (Approximately)	1,350.00	1,350.00
Personal Expense (Approximately)	650.00	650.00
TOTAL	\$3,664.50	\$5,488.50

*All new graduate students are required to pay an Orientation Fee of \$4.00 and an ID Card fee of \$5.00 for their initial semester.

Each student is responsible for payment of his or her University bills. If someone other than the student is responsible for payment of his/her bill, the University Cashier should be notified in ample time so that a bill may be sent to the proper person or agency.

Students who are expected to receive financial aid, scholarship funds, fellowship funds, or payment for service appointments should bring with them sufficient funds (cash or travelers checks) to take care of living expenses for approximately fifteen days. This should provide sufficient time for appropriate funds to be made available.

The last day to *drop a course* for credit on student financial accounts is two weeks from the first day of classes for each semester.

Withdrawals are prorated over a period of nine weeks at a rate of one-tenth of the semester's bill after deduction of a \$25.00 administrative charge. The last date for credit on student financial accounts for *withdrawal* is nine weeks after registration.

A nonrefundable application fee of \$15.00 must be submitted with the Application for Admission to the Graduate School. An applicant who has been offered admission for the fall or spring semester reserves his or her place by the payment of a \$25.00 nonrefundable enrollment deposit which is credited toward tuition for the semester for which he or she is admitted. Such deposits are not required for the Summer Session. Advance deposits are not refundable if the applicant fails to enroll.

The following represents the schedule of tuition and fees for the Fall and/or Spring Semesters, 1982-1983. The schedule of tuition and fees is subject to change without prior notice.

Tuition and Fees by Hours
(Per Semester)

	<i>N.C. Resident</i>	<i>Nonresident</i>
0 Hours (Thesis Only—No Credit)	\$226.75	\$ 326.75
0-2 Hours (Credit Hours & Thesis Credit)	181.75	409.75
3-5 Hours (Credit Hours & Thesis Credit)	235.75	691.75
6-8 Hours (Credit Hours & Thesis Credit)	290.75	974.75
9 or More Hours (Credit Hours & Thesis Credit)	344.75	1,256.75
Master of Business Administration (Includes MBA Fee of \$7.50)	352.25	1,264.25

Residence Status for Tuition Purposes¹

The following sections summarize important aspects of the residency law. A complete explanation of the Statute and the procedures under the Statute is contained in *A Manual to Assist the Public Higher Education Institutions of North Carolina in the Matter of Student Residence Classification for Tuition Purposes*. This *Manual* and other information concerning the application of this law is available for inspection in the Admissions Offices of the University. Copies of the *Manual* are also on reserve at the Robert B. House Undergraduate Library.

All students are responsible for knowledge of the contents of the Statute and the *Manual*.

General. Every applicant for admission is required to make a statement as to his or her length of residence in North Carolina. The tuition charge for legal residents of North Carolina is less than for nonresidents. To qualify for in-state tuition, a legal resident must have maintained his or her domicile in North Carolina for at least twelve months immediately prior to the beginning of the term for which classification as a resident for tuition purposes is sought. The student must also establish that his or her presence in the State during such twelve-month period was for purposes of maintaining a bona fide domicile rather than for purposes of mere temporary

¹The information in this section comes from three sources: (i) North Carolina General Statutes, Sec. 116-143.1, (ii) *A Manual to Assist the Public Higher Education Institutions of North Carolina in the Matter of Student Residence Classification for Tuition Purposes*, Revised August 1981, (iii) Chancellor's Rules and Procedures for Residence Classification of Students for Tuition Purposes.

residence incident to enrollment in an institution of higher education. A student seeking classification as a resident for tuition purposes must complete an application for resident status (obtainable at his or her admissions office) and return it to the proper admissions office. Every student must be classified either resident or nonresident before enrolling. Unless the student supplies enough information to allow the admissions officer to classify the student as a resident-for-tuition-purposes, the student will be classified a nonresident for tuition purposes.

Domicile. Domicile means one's permanent dwelling place of indefinite duration, as distinguished from a temporary place of abode; synonymous with "legal residence."

Burden of Proof and Statutory Prima Facie Evidence. The student has the burden of establishing facts which justify his or her classification as a resident-for-tuition-purposes. The balancing of all the evidence must produce a preponderance of evidence supporting the assertion of in-state residence. Under the statute proof of resident status is controlled initially by one of two evidentiary beginning points which are stated in terms of prima facie evidence.

a. Even if the student is an adult, if his or her parents (or court-appointed guardian in the case of some minors) are not legal residents of North Carolina, this is prima facie evidence that the student is not a legal resident of North Carolina unless the student has lived in this state the five consecutive years prior to enrolling or re-registering. To overcome this prima facie showing of nonresidence, the student must produce evidence that he or she is a North Carolina domiciliary despite the parents' nonresident status.

b. Conversely, if the parents of the student are domiciliaries of North Carolina under the Statute, this fact constitutes prima facie evidence that the student is a domiciliary of North Carolina. This prima facie evidence may also be overcome by other evidence of legal residence. If the student has neither living parents nor legal guardian, the prescribed prima facie evidence rule cannot and does not apply.

Statutory Exceptions

a. *Grace Period.* If a student has been properly classified as a resident-for-tuition-purposes and, thereafter, his or her state of legal residence changes, the student does not automatically lose the benefit of the in-state tuition rate immediately. Instead the statute provides for a grace period if the following conditions are satisfied:

1. The student must have been properly classified as a resident for tuition purposes, on the basis of a valid finding that the student in fact was a legal resident of North Carolina and had been such for the requisite twelve-month period prior to classification;

2. At the time of subsequent change of legal residence to a state other than North Carolina, the student must have been enrolled in a public institution of higher education in North Carolina.

The extent of this grace period (during which the in-state rate is applicable in spite of the fact that the student is not a legal resident of North Carolina) is twelve months from the date of change in legal residence plus any portion of a semester or academic term remaining, as of the expiration date of the twelve-month period, in which the student is enrolled.

b. *Qualifying Periods for Spouses.* By virtue of the provisions of G.S. 116-143.1, if a student otherwise can demonstrate compliance with the fundamental statutory requirement that he or she be a legal resident of North Carolina, the second statutory requirement relating to duration of residence may be satisfied derivatively, in less than twelve months, by reference to the length of the legal residence of the spouse of the student, if the spouse has been a legal resident of the State for the requisite twelve-month period.

c. *Reacquisition of Resident Tuition Status.* The prescribed twelve-month period of legal residence may also be shortened if the person seeking to be classified as a resident for tuition purposes was formerly classified a North Carolina resident for tuition purposes, abandoned North Carolina domicile, and re-established North Carolina domicile within twelve months after abandoning it. Students should consult their admissions offices for a detailed explanation of the conditions which must be met to qualify under this section.

Married Persons. The domicile of a married person, irrespective of sex, is determined by reference to all relevant evidence of domiciliary intent. No person is precluded, solely by reason of marriage to a person domiciled outside of North Carolina, from establishing or maintaining legal residence in North Carolina. No person is deemed, solely by reason of marriage to a person domiciled in North Carolina, to have established or maintained a legal residence in North Carolina. The fact of marriage and the place of the domicile of his or her spouse are deemed relevant evidence to be considered in ascertaining domiciliary intent.

Minors. A minor is any person who has not reached the age of eighteen years. The domicile of a minor is that of the father. With a few exceptions noted below, this presumption is virtually irrebuttable. If the father is deceased, the domicile of the minor is that of the surviving mother. If the parents are divorced or legally separated, the domicile of the minor is that of the parent having custody by virtue of a court order; or, if no custody has been granted by virtue of court order, the domicile of the minor is that of the parent with whom he or she lives; or, if the minor lives with neither parent, in the absence of a custody award, the domicile of the minor is presumed to remain that of the father.

In determining residence status for tuition purposes, there are two exceptions to the above provisions:

1. If a minor's parents are divorced, separated, or otherwise living apart and one parent is a legal resident of North Carolina, during the time period when that parent is entitled to claim, and does claim, the minor as a dependent on the North Carolina individual income tax return, the minor is deemed to be a legal resident of North Carolina for tuition purposes, notwithstanding any judicially determined custody award with respect to the minor.

If, immediately prior to his or her eighteenth birthday, a person would have been deemed to be a North Carolina legal resident under this provision but he or she achieves majority before enrolling in an institution of higher education, that person will not lose the benefit of this provision if the following conditions are met:

a. Upon achieving majority the person must act, as much as possible, in a manner consistent with bona fide legal residence in North Carolina; and
b. The person must begin enrollment at an institution of higher education not later than the fall academic term next following completion of education prerequisite to admission at the institution.

2. If, immediately prior to beginning an enrolled term, the minor has lived in North Carolina for five or more consecutive years in the home of an adult relative (other than a parent) who is a legal resident of North Carolina, and if the adult relative, during those years, has functioned as a de facto guardian of the minor, then the minor is considered a legal resident of North Carolina for tuition purposes. If a minor qualified for resident status for tuition purposes under this provision immediately prior to his or her eighteenth birthday, then, when he or she reaches the age of eighteen, he or she will be deemed to be a legal resident of North Carolina of at least twelve months' duration.

Even though a person is a minor, under certain circumstances the person may be treated by the law as being sufficiently independent from his or her parents as to enjoy a species of adulthood for legal purposes. If the minor marries or obtains a judicial decree of emancipation under N.C. Gen. Stat. §7A-717, *et seq.*, he or she is emancipated. The consequence, for present purposes, of such emancipation is that the affected person is presumed to be capable of establishing a domicile independent of that of the parents; it remains for that person to demonstrate that a separate domicile in fact has been established.

Aliens. Aliens who are permanent residents of the U.S., or who hold a visa which will permit eventual permanent residence in the U.S., are subject to the same considerations with respect to determination of legal residence as citizens. An alien abiding in the United States under a visa conditioned at least in part upon intent not to abandon a foreign domicile (B, F, H, and J visas) cannot be classified a resident. An alien abiding in the

United States under a visa issued for a purpose which is so restricted as to be fundamentally incompatible with an assertion by the alien of bona fide intent to establish a legal residence (C and D visas) cannot be classified a resident.

Under a special statute, a refugee or orphan from the Republic of Vietnam, Laos, or Cambodia, paroled into the United States after March 31, 1975, who has abided in this state for twelve consecutive months may receive in-state tuition privileges. No one shall be eligible for this special benefit for any term which ends after July 1, 1982.

Possession of certain other immigration documents may also allow an alien to be considered for in-state tuition status. For more details aliens should consult their admissions offices and the *Manual*. Aliens must file a Residence Status Supplemental Form in addition to the forms normally required of applicants for resident-status-for-tuition-purposes.

Military Personnel. The domicile of a person employed by the Federal Government is not necessarily affected by assignment in or reassignment out of North Carolina. Such a person may establish domicile by the usual requirements of residential act plus intent. No person loses his or her in-state resident status solely by serving in the armed forces outside of the State of North Carolina.

Prisoners. There are special provisions concerning domicile of prisoners. For more information, persons to whom these provisions may apply should consult the *Manual*.

Property and Taxes. Ownership of property in or payment of taxes to the State of North Carolina apart from legal residence will not qualify one for the in-state tuition rate.

Change of Status. A student admitted to initial enrollment in an institution (or permitted to re-enroll following an absence from the institutional program which involved a formal withdrawal from enrollment) is classified by the admitting institution either as a resident or as a nonresident for tuition purposes prior to actual matriculation. In the absence of a current and final determination by the admitting institution that the student is a resident for tuition purposes, relative to the term of initial enrollment or re-enrollment, the student is classified a nonresident for tuition purposes prior to actual matriculation. A residential classification once assigned (and confirmed pursuant to any appellate process invoked) may be changed thereafter (with a corresponding change in billing rates) only at intervals corresponding with the established primary divisions of the academic calendar.

Transfer Students. When a student transfers from one North Carolina public institution of higher education to another, he or she is treated as a new student by the institution to which he or she is transferring and must be assigned an initial residential classification for tuition purposes.

The transfer into or admission to a different component of the same institution (e.g., from an undergraduate to a graduate or professional program) is not construed as a transfer from one institution to another and thus does not by itself require a reclassification inquiry unless (1) the affected student requests a reclassification inquiry or (2) the transfer or enrollment occurs following the lapse of more than one quarter, semester, or term during which the individual was not enrolled as a student.

Responsibility of Students. Any student or prospective student in doubt concerning his or her residence status must bear the responsibility for securing a ruling by completing an application for resident status and filing it with the admissions officer. The student who, due to subsequent events, becomes eligible for a change in classification, whether from out-of-state to in-state or the reverse, has the responsibility of immediately informing the Office of Admissions of these circumstances in writing. Failure to give complete and correct information regarding residence constitutes grounds for disciplinary action.

It is the responsibility of the student to pay tuition at the rate charged and billed while an appeal is pending. In effect, the student who is classified as a nonresident at the time of tuition billing pays the nonresident rate. Conversely, if a student is classified as a resident at the time of billing, he or she pays the resident rate. Any necessary adjustments in the rate paid will be made at the conclusion of the appeal.

If a student, who has been found to be a nonresident for tuition purposes, receives an erroneous notice from an institutional officer identifying the student as a resident for tuition purposes, the student is not responsible for paying the out-of-state tuition differential for any enrolled term beginning before the classifying institution notifies the student that the prior notice was erroneous.

If a student is classified a resident for tuition purposes after submitting falsified residentiary information or after knowingly withholding residentiary information, the student's application for in-state tuition status is fraudulent. The institution may re-examine any application suspected of being fraudulent, and, if warranted, will change the student's residence status retroactively to the beginning of the term with respect to which the student originally made the fraudulent application. If this occurs the student must pay the out-of-state tuition differential for all the enrolled terms intervening between the fraudulent application and its discovery. Further, knowing falsification of responses on a resident status application may subject the applicant to disciplinary consequences, including dismissal from the institution.

Appeals of Rulings of Admissions Officers. A student appeal of a classification decision made by any admissions officer must be in writing and signed by the student and must be filed by the student with that officer

within fifteen working days after the student receives notice of the classification decision. The appeal is transmitted to the Residence Status Committee by that officer, who does not vote in that committee on the disposition of such appeal. The student is notified of the date set for consideration of the appeal, and, on request of the student, he or she is afforded an opportunity to appear and be heard by the Committee. Any student desiring to appeal a decision of the Residence Status Committee must give notice in writing of that fact, within ten days of receipt by the student of the decision of the Committee, to the Chairman of the Residence Status Committee, and the Chairman promptly processes the appeal for transmittal to the State Residence Committee.

Students or prospective students who believe that they are entitled to be classified residents for tuition purposes should be aware that the processing of requests and appeals can take a considerable amount of time and that applications for classification should not be delayed until registration, when the number of applications make accelerated handling impossible.

Student Health Service

The University offers a comprehensive program of health care for its Student Body and provides a Student Health Service with both inpatient and outpatient facilities.

The Health Service is staffed with physicians, psychiatrists, clinical psychologists, counselors, and a full nursing complement. In addition to programs for physical and mental health, there is also a Sports Medicine Program and a Health Educator. The Student Health Service also provides certain specialty clinics, including clinics in dermatology, ENT, eye, gynecology, and orthopedics.

Patients may be seen either by appointment or on a walk-in basis. At the discretion of the attending physician, a student may be admitted as an inpatient with no charge for services rendered by the Student Health Service staff. Certain highly specialized services (major surgery, consultations, certain types of laboratory and X-ray procedures) not available at the Health Service are rendered by North Carolina Memorial Hospital or commercial laboratories at standard rates. In addition, a charge is made for inpatient meals and for drugs and dressings other than those routinely provided on either an inpatient or outpatient basis. Charges are also made for routine procedures not directly related to a student's health (such as pre-employment physical examinations) and for services rendered between regular University sessions when the student is not actually enrolled.

The University also provides the opportunity to purchase supplemental hospitalization insurance through a group program which provides coverage for married students and their families as well as for single students.

Housing, Food, Laundry, and Linen Service

The University reserves the right to approve the housing of all students whether they live on or off the campus. Each University student is required to maintain a correct local address with the University. By Trustee action the administration is authorized to establish minimum standards of health, safety, and general welfare in regard to housing and to require that students maintain their residence in quarters which comply with these standards.

University-Operated Facilities

Student housing is considered to be an integral part of the educational program. The primary objective of the Department of University Housing is to provide a physical and psychological atmosphere conducive to each student's having the opportunity to develop to the utmost his or her personality, ability and sensitivity. The Department of University Housing is a part of the Division of Student Affairs. The Director works with a professional staff who manage housing contracts and assignments, finances, residence life, maintenance and operation, and student family housing. Nearly 300 people make up the Residence Life staff, which includes Area Directors and Assistant Area Directors for each residential area, a student Resident Assistant for each floor or wing, desk assistants, secretaries and night assistants. Area Directors and Assistant Area Directors have overall responsibility for their residence halls, including overseeing physical operation of the building, managing services provided to residents and supervising residence hall staffs. Resident Assistants are the "front-line" staff of the Department of Housing, acting as an important source of help and information to residents, encouraging residence hall activities, and helping to fairly enforce the regulations necessary for a community of persons to live together. The housing department operations staff includes 135 tradesmen and custodial employees. Their purpose is to help keep the buildings functioning properly and to clean the public areas.

All students have the rights and responsibilities of participating in self-government, of electing officers, of planning and engaging in residence hall programs and of establishing and enforcing the regulations necessary to provide conditions for personal, social and academic development. Students and staff in Craig Graduate Center combine to form an advisory committee to the Director of University Housing. This committee deals with administrative, operational and residence life problems and solutions. Craig has its own Student Executive Council. All residents are citizens and members of the Student Government of the University, and are subject to the executive, legislative and judicial structure of the Campus Governing Council and Student Courts.

The University maintains residence hall space for more than 6600 students in 29 buildings. Among these is Craige Graduate Center, where five of the seven floors are reserved for graduate students. (Undergraduate students of junior and senior standing occupy the two lower floors.) Graduate students are not permitted to live in undergraduate residence halls.

All rooms are equipped with twin-size beds, closet and drawer space, desks, chairs and wastebaskets. Students should provide their own pillows and linens, as well as any draperies or rugs. Students may contract for weekly linen service through the University. Students are expected to keep their own room clean. All residence halls have either a snack bar close by or vending machines for soft drinks and sandwiches. A food service is operated on campus. A telephone is furnished in each room, but it will remain inoperative until the occupants of the room contract for telephone service with the Southern Bell Telephone Company. The University assumes no responsibility for telephone connections, service or disconnections. Mail is delivered to each residence hall. *The Daily Tar Heel*, student newspaper, is delivered daily, and other newspapers are available.

Craige Graduate Center

The following information, excerpted from "Room to Live," specifically describes Craige Graduate Center:

The Department of Housing at UNC-Chapel Hill is committed to providing economical and convenient housing facilities for those single *graduate* students who choose to live on campus. With this goal in mind the department has designated Craige Residence Hall the center for graduate accommodations.

Craige is a seven-story building with rooms arranged in a suite system. Each suite houses eight people, and there are four bedrooms and a shared bathroom per suite. There are a limited number of small single rooms available on the sixth floor at an increased rate, and a limited number of larger singles scattered throughout the building at twice the standard rate. (The latter are referred to as "guaranteed singles.")

Craige houses the most diverse population on the UNC campus. While serving as the living unit for graduate and professional students, the hall also houses approximately 120 undergraduate juniors and seniors on its ground and first floors. In addition, Craige serves as the home of a majority of UNC's international students. This blend of different academic and cultural styles presents Craige residents with a unique opportunity to explore a wide variety of interpersonal experiences.

Over the years a number of groups and facilities have evolved to promote social interaction in Craige; nevertheless, the burden of devel-

oping the Hall's possibilities rests squarely on the shoulders of the residents. We urge prospective members of the Craig community to use the resources to the fullest possible extent.

Assignments to University housing are made by date of receipt of complete application. Application for housing does not guarantee assignment. Early application is advised.

Additional information regarding residence hall accommodations including contract responsibilities, cost, and application procedure is available by writing to: Department of University Housing, Contracts Office, Carr Building 103-A, The University of North Carolina at Chapel Hill, Chapel Hill, North Carolina 27514.

The "Room to Live" booklet is published annually by the Department of University Housing. "Room to Live" will be a later publication and the data therein will clarify or supersede information presented here.

Student Family Housing

The University of North Carolina at Chapel Hill owns and operates 76 one-bedroom unfurnished apartments, 180 two-bedroom unfurnished apartments, and 50 two-bedroom furnished apartments. The apartments are conveniently located in Odum Village, which is one mile south from the center of campus. To be eligible for Student Family Housing, either spouse must be a registered, full-time student. Further information regarding Student Family Housing is available by writing to: Manager, UNC Student Family Housing, Odum Village, Branson Street, Chapel Hill, N.C. 27514.

Summer Session Housing

Information regarding summer housing may be obtained by writing to: Department of University Housing, Contracts Office, Carr Building 103-A, The University of North Carolina at Chapel Hill, Chapel Hill, North Carolina 27514.

Student Dining Facilities

Dining facilities are operated in locations convenient to residence halls, and meals are offered at reasonable rates.

Privately Owned Residence Hall Accommodations

Some graduate students are housed in privately owned Granville Towers, located just off the UNC campus about one block from the Carolina Inn. The three towers of these supervised residence halls have a cafeteria dining commons. The fee charged includes room and board. All

correspondence should be directed to the Granville Towers Business Office, University Square, Chapel Hill, North Carolina 27514.

Laundry, Dry Cleaning, Linen, Pillow, and Blanket Service

Laundry Service: Finished laundry service at reasonable cost is provided by the University Laundry to students who wish to use it. There is also an economical wash-dry-fold service (nothing finished). Both services are available on a Cash-and-Carry basis at any of six laundry call offices.

Linen Rental Service: A complete linen rental service is also available through the University Laundry. The service consists of two sheets, one pillow case, and three bath towels exchanged on a weekly basis through the seven Laundry Call Offices. A fee of \$45.00 includes a \$5.00 refundable deposit, covers the entire academic year and is payable when the service is requested. Pillows may be rented for \$1.50 for the school year. Blankets are available for a deposit of \$3.50 each, with provision for a \$2.00 refund when the blanket is returned in good condition.

Dry Cleaning: Complete dry cleaning service is available at all six laundry call offices on a cash-and-carry basis.

Laundry call offices are located in Granville Towers, Craige, Ehringhaus, James, Joyner, and Morrison dormitories and also at the Laundry Plant on West Cameron Avenue.

Coin-Op Service: Coin-op Service is available at Avery, Connor, Craige, Ehringhaus, James, Joyner, Morrison, Odum Village, and Spencer.

GENERAL UNIVERSITY REGULATIONS AND POLICIES

Persons enrolled in the Graduate School are regarded as members of the student body of The University of North Carolina at Chapel Hill and are held responsible for conducting themselves in conformity with the moral and legal restraints found in any law-abiding community. They are, moreover, subject to the regulations of the student government under the Code of Student Conduct which is divided into two components and reads as follows.

The Honor Code

It shall be the responsibility of every student at The University of North Carolina at Chapel Hill to obey and to support the enforcement of the Honor Code, which prohibits lying, cheating or stealing when these actions involve academic processes or University, student or academic personnel acting in an official capacity.

The Campus Code

And it shall be the further responsibility of every student to abide by the Campus Code, namely to conduct oneself so as not to impair significantly the welfare or the educational opportunities of others in the University community. (Additional information about the student judicial system may be found in *The Instrument of Student Judicial Governance for The University of North Carolina*, copies of which are available from the Office of the Vice Chancellor of Student Affairs of the Office of the Student Attorney General.)

Alcoholic Beverages

The University will establish no policy or regulation that sanctions either the use of alcoholic beverages or any action which contravenes State or Federal law regarding their purchase or consumption. The University discourages the drinking of alcoholic beverages, drunkenness, and other abuses of alcoholic beverages.

Automobile Regulations

Students at the University who own and/or operate a motor vehicle on campus, and are eligible for and desire campus parking privileges, may register their vehicles with the Traffic Office, "Y" Building, in order to secure and display on the vehicle a permit indicating eligibility for parking privileges.

For returning students, applications requesting motor vehicle parking permits must be submitted before the Spring Semester ends; these are

processed and permits are issued during fall registration. Transfer and new students will be given opportunity to register their automobiles or motorcycles during the fall registration. A check or direction to charge the student account must accompany the application.

In addition, permits allowing unlimited rides on the Chapel Hill Transportation System buses may be purchased by the semester from the UNC Traffic Office, "Y" Building. Students wishing to use this bus system instead of paying for campus parking may park off campus in a perimeter lot for a small fee.

Bus schedules and a complete set of rules and regulations governing parking and traffic will be furnished to each student at the time that a parking permit is issued.

Drugs

The illicit and improper use of certain drugs (for example cannabis, amphetamines, barbituates, opiates and hallucinogenic drugs) will not be tolerated by the University. The illicit possession or transfer of these drugs is a State and/or Federal offense, and the University will cooperate fully with appropriate authorities in the enforcement of the law.

The fundamental concern and responsibility of the University relative to the abuser of drugs is constructive rehabilitation. Within the limitations imposed by law, the University will promote a program of education and encourage medical consultation in order to meet this responsibility. But it will act firmly through formal disciplinary procedures to control drug abuse in those instances where these measures prove insufficient.

Smoking Ban

In Fall 1975 by student referendum and Faculty Council action, smoking in classes was banned. Both students and faculty are expected to refrain from smoking in classrooms.

Disciplinary Records

Disciplinary records are maintained in the offices of the Vice Chancellor of Student Affairs for five years following termination of any penalty of record or the awarding of a degree—whichever is later—and then are destroyed. Cases pending are maintained until judicial resolution has been effected. No degree will be awarded during the effective dates of an active penalty of record or while a case is pending resolution.

Release of information contained in a student's disciplinary file or other records is governed by the provisions of the 1974 Family Educational Rights and Privacy Act.

Notice on “Directory Information” to All Students of The University of North Carolina at Chapel Hill

The University of North Carolina at Chapel Hill has routinely made public certain information about its students. Some typical ways this has been done include the following: names of students who are selected by the various honorary societies, who receive scholarships, who make the Dean’s List, who hold offices, or who are members of athletic teams are frequently made public. To facilitate campus communication the University annually publishes the *Campus Directory*. Some professional and graduate school student groups publish directories of students in their departments or schools. The annual commencement program publishes the names of persons who have received degrees during the year.

The Family Educational Rights and Privacy Act defines the term “directory information” to include the following categories of information: the student’s name, address, telephone listing, date and place of birth, major field of study, participation in officially recognized activities and sports, weight and height of members of athletic teams, dates of attendance, degrees and awards received, and the most recent previous educational agency or institution attended by the student. The University will make public information about each student *limited* to these categories in ways such as those described above. Of course, information from all these categories is not made public in every listing. The *Campus Directory*, for example, publishes only names, addresses and telephone numbers.

Students who do not wish to have any or all of such “directory information” made public without their prior consent must notify the Office of Records and Registration, The University of North Carolina at Chapel Hill of this fact in a signed and dated statement specifying items that are not to be published. This notice must be received by the Office of Records and Registration by the end of the registration period for the semester or session of first enrollment or, after an absence, of re-enrollment, and by the end of each fall registration period thereafter.

Nondiscrimination Policy

The University of North Carolina at Chapel Hill is committed to equality of educational opportunity and does not discriminate against applicants, students, or employees based on race, color, national origin, religion, sex, age, or handicap. Moreover, The University of North Carolina at Chapel Hill is open to people of all races and actively seeks to promote racial integration by recruiting and enrolling a larger number of black students. Any complaints alleging failure of this institution to follow this policy should be brought to the attention of the Assistant to the Chancellor.

PUBLICATIONS, RESEARCH FUNDS, AND THE LIBRARY

Scholarly Journals

The University has published scholarly journals since 1884, when *The Journal of the Elisha Mitchell Scientific Society* first appeared. Among the literary and linguistic publications are *Estudios de Hispanófila*, *Hispanófila*, *North Carolina Studies in Romance Languages and Literatures*, *Romance Notes*, *Studies in Philology*, and *The University of North Carolina Studies in Germanic Languages and Literature*. *The Southern Economic Journal*, a quarterly journal, publishes articles by southern as well as other economists, and the *North Carolina Law Review* is aimed at stimulating research and publication by faculty and students in the School of Law. Research summaries and publications of faculty, alumni, and advanced students in history, political science, and the social sciences appear in the *Institute for Research in Social Science Monographs and Working Papers*, *The University of North Carolina News Letter*, *Popular Government*, and the *James Sprunt Studies in History and Political Science*. *The Chapel Hill Workshop Reports*, published by the School of Social Work, is widely used in inservice training in the children's institutional field. *The High School Journal* attracts contributions from educational practitioners and theorists from all parts of the country, and *Social Forces* is one of the best known journals in sociology and related fields. While most of these journals welcome scholarly contributions from other parts of the country, they also serve to reflect something of the persistent and viable spirit of research activity that is an important part of this University.

Research: A Record of Scholarship and Publication, a biennial publication of the Office of Research Administration, records the research publications and creative activities of this University's academic faculty and the dissertations and theses of its graduate students. The contents of the University's scholarly journals, listed above, are also included in this publication.

The University of North Carolina Press

The University of North Carolina Press is the primary publishing arm of the University in the scholarly field. In addition to its publication of the journals of research, it carries on a book publishing program of about fifty new titles a year. Although these books are the work of scholars from all parts of the world, the presence in the University of a professionally staffed book publishing organization, with facilities for the international distribution of works of scholarship, is a stimulus to research and writing by members of the University community. The Press's program is an impor-

tant contribution to the development of that aspect of the University's service which has to do with the advancement of learning.

Research Funds

In addition to research sponsored by research institutes and that financed by contracts, grants, and cooperative agreements from outside agencies, the University Research Council awards grants twice a year (during the fall and spring semesters) for study, research, and publication by the University's faculty members. The Smith Graduate Research Fund supports small grants for thesis and dissertation research expenses. A limited number of Graduate School Transportation Grants are available for doctoral students in their last year of research who present papers at professional meetings. Information and application forms for these grants are available from the Office of the Dean for Research Administration, 300 Bynum Hall. Additional funds for research are awarded twice yearly by the Graduate School as R. J. Reynolds Research Fellowships for doctoral students whose dissertation research must be conducted off-campus.

The University Library

The more general collections of the University Library are housed in the Louis Round Wilson Library building. Among other research facilities, the Library building includes a Humanities Department, a Business Administration and Social Sciences Department, seminar and conference rooms, and 332 carrels located in the bookstacks. In addition, there are two large, general reading rooms, seven special reading rooms, and 27 individual studies for use by visiting scholars and faculty. A stack addition, completed in October, 1977, provides 445 carrels for graduate students, 100 faculty studies, five reading lounges, typing rooms, and study areas. The entire building is air-conditioned. The Robert B. House Undergraduate Library, adjacent to the Wilson Library, also is available to graduate students.

The University Library contains over 2,700,000 bound volumes and over 1,500,000 microforms, constituting one of the more important collections in the South. It has been selected with great care, the purpose being to make it an effective working library, a laboratory for the use of students in those departments in which research must be carried on mainly by means of books, as well as an instrument contributing to general culture. The holdings increase through gift and purchase at the rate of approximately 120,000 volumes a year.

Notable among the special collections is that of North Caroliniana, which contains over 300,000 items and thus is the most complete library of North Carolina history and literature in existence. Other special collections include: the Southern Historical Collection of more than 8 million

manuscripts, bearing on the social history of the South; the Chemistry Collection, including exceptional sets of periodicals in English, German, French, Russian, and other languages; the English Collection, which contains the publications of most of the important societies concerned with the study of English language and literature; important research collections relating to graphic arts, prints, maps, city and regional planning, folklore, and books by and about the Negro; the C. Alphonso Smith Library of Southern literature; the Archibald Henderson Collection of American drama; the seven Whitaker collections of Johnson, Dickens, Cruikshank, Shakespeare folios, costume plates in color, the First Editions on the Grolier Club List of 100 Books Famous in English Literature; the Burton Emmett Collection of Materials Relating to the Graphic Arts; a Judaica collection containing some 3,000 items; the Nash and Pendleton King collections of books relating to Romance Languages and literature; the George Bernard Shaw Collection of clippings, posters, playbills, and first editions of the author's works; the Augustus Thomas Collection; the Tannenbaum Shakespeare Collection; the William Henry Hoyt Collection of French Revolutionary and Napoleonic materials; and the Elisha Mitchell Scientific Society Collection, comprising the exchanges received since 1884 from more than 200 of the leading scientific societies throughout the world.

The collection of the Hanes Foundation for the Study of the Origin and Development of the Book comprises 700 incunabula and 600 early manuscripts, a considerable collection of critical materials for the study of rare and early books, 2,000 books illustrating the development of printing from the fifteenth century to the present day, a collection of Babylonian and Sumerian clay tablets, and other materials depicting the development of the written and printed word.

The document collections of the University Library comprise a rich body of resources, including exceptional files of federal and state publications, in which there is special strength on the federal, congressional and departmental series; state legislative journals, laws, collected documents, colonial and state records; and records of constitutional conventions.

The Law Library, containing over 209,200 volumes, is located in the building occupied by the School of Law. It contains material useful to students of history and government. Advanced students also have the privilege of using the valuable manuscripts of the State Department of Archives and History and the State Library at Raleigh. Departmental libraries containing special collections for graduate study and research are assigned to Art, Botany, Chemistry, City and Regional Planning, Geology, Division of Health Affairs (Medicine, Public Health, Nursing, Dentistry, Pharmacy, and the Hospital), Institute of Government, Library Science, Mathematics and Physics, Music, and Zoology.

The University Library receives more than 38,000 periodicals and other serials annually. Also available are the learned journals, which record contemporary research in all the great fields of investigation, such as the sciences; history and economics; philosophy and sociology; education; classical and modern foreign languages and literatures; and English philology, folklore, and literature. The Library is a member of important philological, biographical, and scientific associations, and receives their publications regularly. More than 200,000 bound volumes of periodicals of permanent worth are available from the beginning of their publication, constituting a working collection of great value to advanced students. The Library also receives the publications of such organizations as the Smithsonian and Carnegie institutions, the Rockefeller Foundation, the Hispanic Society of America, the Russell Sage Foundation, and of many universities, including foreign universities and academies, which issue monographs important in advanced research. It enjoys the privilege, through interlibrary loan, of borrowing from other libraries, for use of graduate students, unusual publications which it does not possess. Through the exchange of catalogue cards and operation of frequent delivery service, the resources of the Duke University Library are readily available, as are those of North Carolina State University at Raleigh and The University of North Carolina at Greensboro. A Union Catalogue includes cards covering special collections in 43 other libraries of the state. Facilities are available for the reproduction of books and manuscripts on microfilm, and microfilm readers are provided for graduate and research students. The Library is a regional depository for United States government documents, United Nations documents and UNESCO publications, and has an important collection of foreign documents.

Both Wilson and House Libraries have open stacks and single exit control. Faculty members and graduate students writing theses may obtain from the Circulation Department Intercampus Borrowers Cards which entitle them to direct borrowing privileges and stack access at Duke and the other fifteen campuses of The University of North Carolina.

Health Sciences Library

The Health Sciences Library is the primary library for the University of North Carolina Schools of Dentistry, Medicine, Nursing, Pharmacy, and Public Health and the North Carolina Memorial Hospital; it serves as well the health information needs of the entire University at Chapel Hill and health personnel throughout the state. The library has an excellent collection consisting of over 183,700 volumes and more than 4,000 serial titles, approximately 3,600 of which are currently received. The new library building, completed in late 1981, has seating for over 800 users, a stack capacity for 263,000 volumes, and a large audiovisuals center. Library users have free access to the open stack collections.

Borrowing privileges are given to faculty, students and staff of the University of North Carolina at Chapel Hill and the North Carolina Memorial Hospital. In addition, the library provides an interlibrary loan service for faculty, staff and students to obtain basic science or other health-related materials which are needed for research, teaching, patient care, or study but are not available on campus.

Information Services librarians are available during almost all of the library's service hours to aid users in locating information, to instruct in the use of library resources, and to provide additional resource assistance. Online Search Services, with access to MEDLINE and over forty other data bases, are also provided.

RESEARCH INSTITUTES AND CENTERS

The intellectual life of the University and the research activities of graduate students and faculty alike receive valuable encouragement and support from various institutes. These institutes do not operate as instructional agencies within the University; rather, they serve to obtain financial and organizational assistance for the scholars who constitute their membership. Those centers and institutes listed below include the principal institutes and centers providing opportunities for graduate students in training.

Institute for Research in Social Science

The Institute for Research in Social Science, founded in 1924 by Howard W. Odum, was established to facilitate research by faculty members at The University of North Carolina at Chapel Hill. Through the years the Institute has been a center for initiating, catalyzing, developing, and financing research in the social sciences. Much of its work has been in stimulating collaboration in interdisciplinary research programs. In addition to stimulating research by faculty members associated with it, the Institute also initiates and conducts research through its own facilities.

The Institute is also a service agency for research projects in social science. Its services include aid in research design, computer programming, editorial assistance, data-processing consultation, support for graduate assistants, and the publication of research monographs and working papers.

The Institute's Social Science Data Library houses the collections of the Louis Harris Political Data Center, U.S. Census data, and data from numerous Institute studies, including the Southeastern Regional Surveys. Through the Data Library, researchers on campus have access to the collections of the International Survey Library Association (Roper Public Opinion Research Center) and the Inter-University Consortium for Political and Social Research.

The Institute also performs another important role within the University—that of giving training to both graduate and undergraduate students. While the Institute offers no formal course work in its own name, Institute staff prepare materials for courses in various social science departments and participate in the analysis of these materials. In addition, the Institute provides students with opportunities for active participation in research projects. Its facilities are increasingly used as laboratories for courses, in the same way that laboratories are used in the physical sciences.

The Institute is governed by an administrative board made up of senior faculty members, department chairmen, and higher administrators. In addition to a small full-time staff, the Institute staff includes about 200 senior members with a part-time Institute affiliation. The senior staff are

faculty members, generally receiving salaries through their academic departments, who are carrying out social science research. New members are appointed to the senior staff by the administrative board on the basis of their written statements about the scientific problem they wish to examine and the means of investigation they propose. Appointments are usually for a year.

Membership of the senior staff varies from year to year, but usually includes faculty from anthropology, business administration, city and regional planning, economics, education, geography, health affairs, history, journalism, library science, political science, psychology, social work, and sociology.

Junior staff members are graduate students with research or trainee appointments in the social sciences whose stipends are paid from Institute funds or by Institute sponsored research projects. Graduate appointees are selected through academic departments on the basis of the students' academic performance and promise and the availability of research projects on which they could gain experience relevant to their graduate training.

The Institute's statistical laboratory—equipped with calculators, unit-record equipment, and a high speed computer printer and card reader/punch connected both to the UNC Computation Center and to the Triangle Universities Computation Center—serves both research and general instructional purposes.

The Institute's publications include the *UNC News Letter*, which is issued four times a year and carries articles on the research of Institute staff members, paperbound monographs and working papers, and a series of books published jointly with The University of North Carolina Press.

Institute of Latin American Studies

The University of North Carolina at Chapel Hill has a tradition of interest in Latin America that is over a half-century old. Courses in the languages, history, politics, geography, and social life of the area were instituted as early as 1915 and made part of a special curriculum. This interest was further manifested in 1940 with the establishment of the Institute of Latin American Studies.

Today the Institute is composed of political scientists, historians, anthropologists, sociologists, geographers, economists, and linguists actively engaged in the study of Latin American life and culture. The individual and collective activities of this distinguished group of Latin Americanists have established UNC-CH as one of the major centers of Latin American Studies in the country. Federico G. Gil, Kenan Professor of Political Science, Emeritus, has been Director of the Institute since 1959.

Major functions of the Institute are: (1) to encourage and stimulate study and research on and the teaching of Latin American subjects at The

University of North Carolina at Chapel Hill; (2) to serve as a campus medium for interdisciplinary communication of Latin American Studies related information, including the sponsorship of a variety of gatherings on campus—Latin American guest lectures and seminars, films and slide shows, Latin American luncheons—to bring together interested faculty and students from different disciplines; (3) to promote the exchange of scholars and students, and to encourage close relationships between UNC-CH and institutions of higher learning in Latin America; and (4) to serve as an agency to undertake contract research on Latin America.

The Institute offers an undergraduate (BA) degree program in Latin American studies which became effective in 1974. The Latin American Studies program of courses is of significant value to students who wish to enter the Foreign Service of the United States or to engage in Latin American trade and commerce. An M.A. program with a certificate in Latin American studies is offered by the Department of Political Science (see statement in the offerings of the Department of Political Science). The University of North Carolina at Chapel Hill has a rich library collection of Latin Americana, and the language instruction facilities of the Department of Romance Languages are among the finest.

Over fifty courses dealing directly with Latin American Studies, ranging from the undergraduate level to that of advanced graduate students, are offered by the Institute's faculty members in their respective disciplinary departments. In the past thirty years these participating departments have awarded disciplinary degrees (B.A., M.A., Ph.D.) to students who have specialized at UNC-CH in Latin American studies.

Each semester a current list of Latin American related course offerings at both UNC-CH and at Duke is made available by the Institute for distribution. For further information about Latin American Studies at UNC-CH and for help in designing a program of study, contact the Institute of Latin American Studies, 313 Hamilton Hall 070A.

Institute of Marine Sciences

The Institute of Marine Sciences was established in 1947 as the Institute of Fisheries Research through the efforts of Robert E. Coker, with cooperation from the Department of Conservation and Development, and with financial assistance from the Knapp Foundation, Inc. It is now administered as a research facility of the University with its primary functions being the investigation of basic and applied aspects of marine science.

The Institute, housed in a modern building completed in 1967, is located on Bogue Sound in Morehead City, N.C. The laboratory is well equipped for research in marine ecology and biology. Special facilities are available for physical, chemical, and ecological experimentation and analysis. The collections and library holdings are specialized but serviceable for the

research activities of the Institute. The Institute vessel is primarily designed for estuarine and in-shore marine collecting and sampling. Deep water oceanographic research can be carried out on the Research Vessel Cape Hatteras constructed in 1981 and operated by the Duke/UNC Oceanographic Consortium.

The facilities of the Institute are made available to faculty and students of the University with research interests in marine biology, physical or chemical oceanography, and related fields. The Institute staff contributes to graduate education programs in the University through lectures, seminars, formal coursework, and in providing laboratory facilities for visiting classes or resident graduate students. A limited number of housing units and research appointments are available for graduate students in residence. The direction of graduate research and instruction of summer courses in marine science are provided by staff members of the Institute on the recommendation of the University departments and with approval of the Administrative Board of the Graduate School. For additional information, see the statement of offerings of the Curriculum in Marine Sciences.

Institute for Environmental Studies

The Institute for Environmental Studies of The University of North Carolina at Chapel Hill is the successor to the Institute for Environmental Health Studies which was organized on the Chapel Hill campus in 1966. The general purposes of the Institute are to foster and coordinate research, teaching, and service in environmental concerns among the various elements of The University of North Carolina at Chapel Hill, and to maintain liaison and cooperate on environmental matters with agencies outside the Chapel Hill campus. To accomplish these purposes it undertakes, on an interdisciplinary basis, to identify and articulate important problems and opportunities related to environmental health, science, and policy; to foster discussions and joint examinations of environmental problems among faculty members from various disciplines; to stimulate new research, teaching, and service programs involving the cooperation of persons from various disciplines; to encourage and assist in cooperative efforts on environmental matters between elements of Chapel Hill campus and other campuses of The University of North Carolina, with other colleges and universities, and with other governmental and private agencies. The Institute is administratively located within the Department of Environmental Sciences and Engineering, School of Public Health.

Institute of Statistics

The Institute of Statistics was established in 1945. It provides a framework for informal cooperation among the Departments of Biostatistics and Statistics on the Chapel Hill campus, and the Department of Statistics

of North Carolina State University. Research work from the three departments is published in the Institute of Statistics Mimeo Series, which now includes over 1,350 titles.

Water Resources Research Institute

The Water Resources Research Institute of The University of North Carolina was established in 1964 to strengthen research and graduate education in water resources. Created under the provisions of the Water Resources Research Act of 1964, as amended, the Institute program is supported with State appropriations, funds from the Office of Water Research and Technology, U.S. Department of the Interior, and grants from other industries and agencies. While the Institute office is located at North Carolina State University at Raleigh, The University of North Carolina at Chapel Hill shares responsibility for its administration and fully participates in all of its programs.

The Institute encourages, coordinates, and supports multidisciplinary research in response to the state and regional water resources problems. It coordinates University programs in water resources with other universities, private industry, and the state and federal water resources agencies; sponsors seminars, short courses, and symposia; and furthers the University graduate program in water resources.

The Institute is governed by a Board of Directors representing The University of North Carolina at Chapel Hill and North Carolina State University. A Technical Committee, composed of faculty members from the University System works with a full-time director and associate director in carrying out the Institute program. An Advisory Committee consisting of senior water resources managers and interest group representatives helps shape the Institute response to state water problems.

Child Development Institute

The University of North Carolina Child Development Institute was established in 1968 as one of the twelve national Mental Retardation Research Centers sponsored, in part, by the National Institute of Child Health and Human Development. The Child Development Institute provides the program opportunity for scientists from many disciplines to engage in research and research training in the area of child development and mental retardation. Included as relevant and highly important are such factors as the retarding effects of cultural deprivation and emotional disturbance.

The Institute consists of two separate, but coordinated, research centers, each representing an interdisciplinary approach to research with retarded, developmentally disabled, and normal children.

The Frank Porter Graham Child Development Center is concerned primarily with the social, psychological, and educational aspects of child development. As part of a comprehensive child development program, Frank Porter Graham Center conducts a demonstration day care program involving children aged three months to four years, and cooperates with the Chapel Hill-Carrboro School System in the operation of a kindergarten-first grade program currently housed in the FPG Center. The Frank Porter Graham Research Building provides practicum settings for students from a number of departments who are interested in the fields of child development and family policy. It conducts a research training program in child development and mental retardation for graduate and post-doctoral students enrolled in a variety of University schools and departments. The Center also is engaged in programs designed to speed the flow of knowledge into practice. It supports technical assistance programs that work with agencies in more than twenty states.

The Biological Sciences Research Center emphasizes the biological and medical aspects of development through research and research training concerned with the development and maturation of the central nervous system and the biomedical factors affecting its proper functioning. Basic research on infrahuman populations and clinical research on the biology of the developing and/or retarded central nervous system are included. Ongoing research includes studies of the effects of lead and other environmental pollutants on the developing nervous system, and studies of the pharmacokinetics of commonly used psychotropic drugs in relation to their clinical efficacy in children. The Center's Division for Disorders of Development and Learning is devoted to training medical, scientific, and paramedical personnel in the diagnosis and management of children with development deficits. The retarding effects of emotional disturbance are under study by the Division of Child Psychiatry Research.

The L. L. Thurstone Psychometric Laboratory

The Psychometric Laboratory was founded by L. L. Thurstone in 1952. In 1967, its name was changed to honor its founder. The Laboratory is located on the third floor of Davie Hall in the Department of Psychology. Laboratory staff, who also are faculty members in the Department, engage in a variety of research activities that have in common the use of quantitative methods in psychological research. Prominent continuing areas of research include the study of individual differences in cognitive and linguistic abilities, experimental analysis of decision making, applications to psychology of multivariate statistical techniques, and the development and application of methods for multidimensional scaling. The laboratory also is the location of the doctoral specialty, "quantitative psychology," within the Department of Psychology.

Research Laboratories of Anthropology

The Research Laboratories of Anthropology were established October 7, 1939, for the purpose of conducting basic anthropological studies in the field of archaeology, ethnography, physical anthropology, and other related fields. Its program is essentially interdepartmental and serves to coordinate these activities among other organizations. It also serves as a central repository and research center. Its present collection exceeds 2,000,000 items and is considered to be one of the primary sources for archaeological research in the South. The offices and processing laboratories are situated in Alumni Building, together with a series of exhibits dealing with the archaeology of North Carolina.

Triangle Universities Nuclear Laboratory

The Triangle Universities Nuclear Laboratory (TUNL) is a cooperative research laboratory located on the Duke University campus and supported by Duke University, North Carolina State University, and The University of North Carolina at Chapel Hill. Currently about 60 faculty and graduate students from the three universities use the facilities. TUNL is the largest university-based nuclear physics laboratory in the Southeast, and one of the largest such laboratories in the U.S.A. The major research interests of TUNL are fundamental studies of nuclear interactions at low to medium energies in the 1 to 30 Million-electron-Volt range.

Among the facilities at TUNL are four nuclear accelerators, sources for spin-polarized particles, and for both light and heavy ions, systems for the production of short-lived radio-isotopes, and detectors for charged particles, gamma rays, x-rays and neutrons. A dilution refrigerator and superconducting magnet system for polarized targets is near completion. There are four mini-computers for data acquisition, display and analysis, including a DEC VAX-11/780.

Further information about TUNL can be obtained from the Department of Physics and Astronomy at The University of North Carolina at Chapel Hill.

The University of North Carolina Highway Safety Research Center

The University of North Carolina Highway Safety Research Center was created by an act of the 1965 North Carolina General Assembly. Its purpose: to conduct research and training in a coordinated effort with other state and university agencies to counter deaths on the state's highways.

The Center reports to the General Administration of The University of North Carolina. Established as a multidisciplinary agency, it is staffed by professionals trained in psychology, transportation and human factors

engineering, biostatistics, epidemiology, computer systems, mathematics, and community mental health. This core staff, in cooperation with other university departments and the Governor's Highway Safety Program, is charged with identifying highway safety problems, conducting research, recommending possible solutions, and making this information available to decision makers, both at the state and national levels. An equally important function of the Center is to evaluate objectively the state's various operational highway safety programs.

The Highway Safety Research Center is funded by the state and federal governments and by grants from private sources.

Some staff members of the Highway Safety Research Center hold joint appointments in other schools and University departments. Attracting graduate students to the expanding field of highway safety research is also a fundamental goal of the Center. In this regard, the Center sponsors the annual North Carolina Conference on Highway Safety.

In addition to the Governor's Highway Safety Program, the Highway Safety Research Center works with other state agencies, including the Division of Motor Vehicles, the Division of Highways, Department of Public Instruction, and the State Highway Patrol.

Research activities of the Center change continually. Among research projects undertaken since the Center was established are studies on motorcycles, seat belts, driver licensing and driver improvement, motor vehicle inspection, police traffic services, driver and safety education, drinking and driving, and various accident analyses, including the impact of the energy crisis on highway safety and the relationship of make and model of car to injuries sustained by drivers in crashes. Different projects emphasize various aspects of the highway safety problem, so that some research efforts focus primarily on the driver, while others deal with the ways in which vehicles or highway features are potential causes of accidents and injuries.

Occupational Safety and Health Educational Resource Center

The Occupational Safety and Health Educational Resource Center was established in 1977 and is supported by the National Institute for Occupational Safety and Health as one of 12 regional centers in the nation. Its purpose is to encourage and support professional and interdisciplinary education in those fields relevant to occupational health. Current programs involve the Department of Biostatistics, Epidemiology, Environmental Sciences, and Public Health Nursing in the School of Public Health, the Department of Medicine in the School of Medicine, UNC-Chapel Hill, the Department of Medicine at Duke University and the Department of Industrial Engineering at North Carolina State University. In addition, the Center sponsors a very active program of continuing

education for practitioners in the field, including a ten-day summer institute which offers fourteen intensive short courses in Industrial Hygiene, Safety, Ergonomics, Statistics, Epidemiology, Toxicology, Nursing and Law.

The Carolina Population Center

The Carolina Population Center, established in 1966, provides coordination for a University-wide, interdisciplinary program in population research and research training. Its efforts span the social, behavioral and health sciences. It assists in building population research and teaching throughout the University and developing interdisciplinary projects by providing both faculty and students involved in the population field with a wide range of services.

The Center maintains a large computerized library collection and computer facilities as well as a programming and data analysis staff. It provides research services for faculty involved in population research in the U.S. and abroad. CPC staff works collaboratively with faculty members in the generation of population research projects, administers graduate research training and research assistantship programs in population, and assists population faculty and departments in their research and teaching programs.

Center for Urban and Regional Studies

Established in 1957, the Center for Urban and Regional Studies serves as a focal point for urban research and public service at The University of North Carolina at Chapel Hill. From its inception, the Center has fostered research on the processes of urbanization by providing a means of communication among faculty who have an interest in urban affairs and a forum at Chapel Hill for dialogue on urban issues.

In addition to serving as a catalyst for interdisciplinary urban research programs, the Center's staff, associated faculty members, and students have worked with federal and state government agencies and with regional bodies and local governments to find solutions to problems of center city revitalization, energy use and conservation, housing, public service delivery, transportation, urban and regional growth, water resources, and environmental management and protection, among others.

An ongoing focus of the Center's research program has been its continuing concern for urban growth policy and environmental management. Beginning with the Piedmont Crescent Studies in 1957, the Center's research has sought to improve understanding of basic urban growth processes and to formulate effective urban growth policies. Over the past twenty years the Center has received national attention and recognition for its research on new community development, housing market dynamics,

urban activity systems, urban growth models, residential mobility and locational preferences, coastal zone management, and water-related land development. The Center maintains a data library and provides assistance to students and faculty in the use of the research materials that have been assembled.

The Center for Urban and Regional Studies is organized as a unit in the Division of Academic Affairs on the Chapel Hill campus. It is one of four units which constitute the Program in Urban Studies of The University of North Carolina. The Program, which includes urban affairs units at North Carolina State University in Raleigh, The University of North Carolina at Charlotte, and The University of North Carolina at Chapel Hill, is coordinated through the Office of the Vice President for Research and Public Service Programs and the University's Council on Urban Studies.

Research and service activities of the Center are carried out by a core professional and clerical staff and by faculty, research associates, and graduate students supported at least in part by research grants and contracts. Faculty membership in the Center varies from year to year, but has included faculty from anthropology, biostatistics, city and regional planning, economics, epidemiology, marine sciences, political science, psychology, social work, and sociology. The Center's research program has been supported by grants and contracts from various state, federal, and private agencies.

The Center for Alcohol Studies

The Center for Alcohol Studies was established in 1970 with State support and the mandate to coordinate and perform studies related to alcohol, alcoholism and alcohol offenses. Alcoholism is viewed as a biopsychosocial disease and thus requires a multidisciplinary approach. Furthermore, the complex nature of alcoholism research requires interdisciplinary, as well as intradisciplinary, coordination and exchange. At the present time, about twenty-five faculty members are members of the Center. Alcohol-related research involves workers from the disciplines of anatomy, anthropology, anesthesiology, biochemistry, biostatistics, child psychiatry, health administration, pharmacology, psychiatry, psychology, sociology and veterinary medicine. The Center facilitates such collaborative studies as well as promotes research communications among interested faculty members and others within and without the University.

The Cancer Research Center

The Cancer Research Center of the University of North Carolina at Chapel Hill was established in 1975 in the School of Medicine. The activities of the Cancer Research Center are interdisciplinary with participation from both basic science and clinical departments of the School of

Medicine as well as the Schools of Public Health, Dentistry, Pharmacy, Nursing and the Departments of Zoology and Chemistry, and Burroughs Wellcome Company, the National Institute of Environmental Health Sciences and the U.S. Environmental Protection Agency.

Administratively, the Center provides staff support for cancer-related activities in program planning, budget management, facilities planning and faculty and staff recruitment. The Center acts as the organization base for cancer-related activities of the Health Sciences Center.

The Center is divided into a Basic Science and a Clinical Division. The basic science programs of the Center are Tumor Immunology, Cancer Cell Biology, Tumor Virology, Chemical Carcinogenesis, Drug Development and Cancer Epidemiology.

The development of inpatient and outpatient interdisciplinary oncology units is the main activity of the Clinical Division. The research activities are broad with emphasis on immunology and endocrinology of surgical and gynecologic malignancies and on the pharmacology of anticancer drugs.

The Clinical Division also includes a computerized Cancer Data Base designed to provide detailed information on approximately 26,171 cancer patients to researchers, physicians and students. An epidemiology-biostatistics unit and drug-screening resource recently have been organized.

The Center's Cancer Control program promotes research in the areas of technology transfer, health education and epidemiology within the State of North Carolina.

The curricular goals of the Cancer Research Center are to be implemented through the academic departments. The aims are to provide students of medicine and allied professions a unified view of the molecular and biologic basis for cancer as well as an integrated approach to the understanding of patients with cancer. In addition, there is an organized program for the postdoctoral training of basic cancer researchers.

The Cancer Center sponsors a weekly basic science seminar series as well as an interdisciplinary series with invited guest scientists of national and international reputation, an annual Postdoctoral Fellow-Faculty Research Day each fall and a two-day cancer research symposium each spring. Clinical symposia, workshops, and special-guest lectures are held throughout the year.

Dental Research Center

The Dental Research Center was established in 1967 as one of five regional Dental Research Centers and Institutes sponsored by the National Institute of Dental Research (NIDR) of the National Institutes of Health (NIH). The Center, one of a number of UNC Centers under the Vice Chancellor of Health Affairs, maintains a close functional relationship to the School of Dentistry.

The major program objective of the UNC Center, like its counterparts on the four other campuses, is: "to broaden and strengthen the scientific base which underlies the national capability to improve oral health." The Center Program is a new approach to health research. It enlists the collaboration of all appropriate elements of the University, builds on and extends existing institutional research strengths, provides for multi-disciplinary efforts, and facilitates the collaboration of a wide range of scientists for studying specific oral health problems. Members of the Program have appointments in appropriate departments throughout the University. In addition to its major funding from the NIDR Center grant, the Program receives substantial support from the University, and from funds obtained by individual investigators through NIH and other agency grants.

Members and friends of the dental profession through the Dental Foundation of North Carolina contributed to the initial support for the construction of the Dental Research Center building. This building, completed in 1967, is part of the School of Dentistry complex and houses the major research efforts of both the Program and the School of Dentistry.

Health Services Research Center

The Health Services Research Center is a multidisciplinary, University-wide center, originally established with the mandate to explore and evaluate alternative ways to provide optimum health services to people at the community level. The Center has supported in whole or in part a number of research and demonstration projects, and it functions as a coordinating and facilitating agency, seeking to assist others in the identification of opportunities for relevant research and demonstrations in the delivery of health services, particularly in the areas of primary care practice and rural health services research.

Computation Center

Since its establishment in 1959, The University of North Carolina at Chapel Hill Computation Center (UNCCC) has maintained one of the most modern and versatile computing systems available. In 1966, the University in cooperation with Duke University and North Carolina State University, established one of the first computer networks, the Triangle Universities Computation Center (TUCC), located in the Research Triangle Park. TUCC is jointly owned and operated by the three universities and provides computer equipment and services beyond the scope of the individual member universities.

Computers of varying capabilities are housed on the individual campuses and are connected by telephone lines to TUCC. Each computer can be used independently, but telephone lines enable jobs to be sent from

UNCCC to TUCC for execution, and to be returned for printing. The computing services are built around an Amdahl 470/V8 and two IBM 370/165's at TUCC, and both an IBM 360/75 and an IBM 370/155 at UNCCC. The network concept has expanded to include a variety of terminals (including typewriter-like, cathode-ray display, and card reader/printer types) which can communicate with the computers at UNCCC or TUCC. They are available at various locations on the campus including several residence halls. These facilities are dedicated to educational and research computing and are not used for university administrative data processing.

To facilitate the use of the computers, the Computation Center maintains an extensive library of computer programs in such areas as statistical analysis, text processing, information retrieval, and graphics display, as well as interactive services and programming languages. A staff of experienced, full-time computer programmers provides a full range of system support and programming services. These services include: consultation, classroom instruction in the use of programs and facilities, and the development, documentation and implementation of new programs and services.

GRADUATE DEGREE REQUIREMENTS

Degrees Offered

- Anatomy — *M.S., Ph.D.*
Anthropology — *M.A., Ph.D.*
Art — *M.F.A., M.A., Ph.D. (Art History)*
Bacteriology and Immunology — *M.S., Ph.D.*
Biochemistry and Nutrition — *M.S., Ph.D.*
Biomedical Engineering and Mathematics — *M.S., Ph.D.*
Botany — *M.A., M.S., Ph.D.*
Business Administration — *M.B.A., Ph.D.*
Chemistry — *M.A., M.S., Ph.D.*
City and Regional Planning — *Master of Regional Planning, Ph.D.*
Classics — *M.A., Ph.D.*
Comparative Literature — *M.S., Ph.D.*
Computer Science — *M.S., Ph.D.*
Dental Auxiliary Teacher Education — *M.S.*
Dentistry — *M.S.*
Dramatic Art — *M.F.A., Licentiate in Dramatic Art*
Ecology — *M.A., M.S., Ph.D.*
Economics — *M.A., Ph.D.*
Education — *M.A., M.A.T., M.Ed., Ed.D., Ph.D.*
English — *M.A., Ph.D.*
Folklore — *M.A.*
Genetics — *M.S., Ph.D.*
Geography — *M.A., Ph.D.*
Geology — *M.A., M.S., Ph.D.*
Germanic Languages — *M.A., Ph.D.*
History — *M.A., Ph.D.*
Journalism — *M.A., Ph.D. (Mass Communication Research)*
Library Science — *M.S. in Library Science, Ph.D.*
Linguistics — *M.A., Ph.D.*
Marine Sciences — *M.S., Ph.D.*
Mathematics — *M.A., M.S., Ph.D.*
Music — *M.M., M.A., Ph.D.*
Neurobiology — *Ph.D.*
Nursing — *M.S. in Nursing*
Occupational Therapy — *M.S.*
Operations Research and Systems Analysis — *M.S., Ph.D.*
Pathology — *M.S., Ph.D.*
Pharmacology — *M.S., Ph.D.*
Pharmacy — *M.S., Ph.D.*
Philosophy — *M.A., Ph.D.*

- Physical Education — *M.A.*
 Physical Therapy — *M.S.*
 Physics and Astronomy — *M.S., Ph.D.*
 Physiology — *M.S., Ph.D.*
 Political Science — *Master of Public Administration, M.A., Ph.D.*
 Psychology — *M.A., Ph.D.*
 Public Health — *M.P.H. (offered in each field, below)*
 Biostatistics — *M.S., M.S.P.H., Dr.P.H., Ph.D.*
 Environmental Sciences and Engineering — *M.S., M.S.E.E.,
 M.S.P.H., Ph.D.*
 Epidemiology — *M.S.P.H., Dr.P.H., Ph.D.*
 Health Administration — *M.S.P.H., Dr.P.H., Ph.D.*
 Health Education — *M.S.P.H., Dr.P.H., Ph.D.*
 Maternal and Child Health — *M.S.P.H., Dr.P.H.*
 Nutrition — *Dr.P.H.*
 Parasitology and Laboratory Practice — *M.S.P.H., Dr.P.H., Ph.D.*
 Public Health Nursing — *M.S.*
 Radio, Television and Motion Pictures — *M.A. in Communications*
 Recreation Administration — *M.S. in Recreation Administration*
 Rehabilitation Counseling — *M.S.*
 Religious Studies — *M.A.*
 Romance Languages — *M.A., Ph.D.*
 Slavic Languages — *M.A., Ph.D.*
 Social Work — *Master of Social Work*
 Sociology — *M.A., Ph.D.*
 Speech and Hearing Sciences — *M.S.*
 Speech Communication — *M.A.*
 Statistics — *M.S., Ph.D.*
 Toxicology — *M.S., Ph.D.*
 Zoology — *M.A., M.S., Ph.D.*

Academic Regulations

The Administrative Board of the Graduate School has adopted regulations for the guidance of the graduate faculty and students. The Graduate School publishes a *Graduate School Handbook*, and the student is urged to become familiar with the major regulations contained therein. Certain of these regulations follow:

1. All students are required to register in accordance with procedures in force at the time. All new students, and all old students who have been out of the University for a full calendar year or more, must have a medical report submitted to and approved by the Director of Student Health Service before their registrations may be effected.

2. Final-semester seniors in this institution who need less than fifteen semester hours to complete requirements for the bachelor's degree may take one or two courses for the purpose of later obtaining graduate credit, provided that they are not enrolled for more than fifteen semester hours for any purpose and provided that approval is obtained in advance from the student's undergraduate dean and from the Graduate School. Applications for such approval may be obtained in the Graduate School.

Undergraduate students from other institutions who have taken graduate course work under similar arrangements may not transfer such work here.

Apart from credit earned according to the plan described above, graduate credit may be received only for courses taken after the student has been duly admitted to the Graduate School or for courses that were taken before formal admission which are approved for transfer credit.

3. If, in the judgment of the Administrative Board of the Graduate School, a student is failing to make satisfactory progress towards the completion of the degree or to demonstrate sufficient promise in the discipline, regardless of grades, the student shall not be allowed to continue in the Graduate School.

4. Grades used in the evaluation of the performance of graduate students are as follows:

H—Clear excellence

P—Entirely satisfactory

L—Low passing

F—Failed

No mark falling below the standard represented by the grade of *L* is counted for graduate credit. A doctoral student who receives a grade of *F*, or nine or more semester hours of *L* is ineligible for continued graduate study. A master's student becomes ineligible upon receiving more than 0 hours of *F* or fifteen hours or more of *L*. Further, such a student becomes ineligible if both of the following hold: *L* hours received are greater than 7 and are greater than 25 percent of hours taken. The computation of hours taken will include only courses for which the student has received a grade of *H*, *P*, *L*, or *F*. Further, it may include 3 hours of *S* in course 393 (the first 3 hours taken) and courses taken through inter-institutional registration where other permanent letter grades may be assigned.

5. A permanent grade may be changed upon the initiative of the instructor only in cases of arithmetic or clerical error, and then only with approval of the instructor's chairman or dean *and* of the Dean of the Graduate School. Such a change may be made no later than the last day of exams of the next succeeding regular semester.

6. The Administrative Board of the Graduate School has endorsed specific procedures to be followed whenever a student wishes formally to protest the assignment of a permanent course grade. Before filing any

protest of a course grade, the student shall first address his or her concerns to the instructor who assigned the grade. Should the instructor detect an arithmetic or clerical error that influenced the grade assignment to the student's detriment, the instructor shall initiate a change of grade form for the approval of the instructor's chairman or dean *and* the approval of the Dean of the Graduate School. *An instructor may not initiate a change of a course grade as a result of a reevaluation of the quality of the student's performance nor as a result of additional work performed by the student.*

For a protest of a course grade to be considered, it must be based upon one or more of the following grounds and upon allegation that the ground or grounds cited influenced the grade assignment to the student's detriment: (1) arithmetic or clerical error; (2) arbitrariness, possibly including discrimination based upon race, sex, religion, or national origin of the student; (3) personal malice; and (4) student conduct cognizable under the *Instrument of Student Judicial Governance*.

A protest of a course grade shall be lodged by the student in writing with an instructor's chairman or dean, with a copy to be provided by the student to the instructor, and shall cite the evidence by which the student judges (a) that an impermissible element existed in the instructor's evaluation of the student's course work and (b) that it influenced the grade assignment to the detriment of the student. *No appeal may be made after the last day of the next succeeding regular semester.*

When a protest of a course grade has been properly lodged with a chairman or dean, the chairman or dean shall determine whether the evidence cited warrants further investigation of the charges. The burden of proof shall fall upon the student. The determination by the chairman or dean shall be made only after providing the instructor with the opportunity to reply to the charges as cited in writing by the student.

If, in the judgment of the chairman or dean, the evidence cited by the student is *insufficient* to warrant further investigation of the charges, the protest shall be denied by the chairman or dean. In this case, the student shall have the right to appeal the ruling in writing to the Administrative Board of the Graduate School.

On the other hand, if in the judgment of the chairman or dean, or the Administrative Board (if the ruling has been appealed to that body), the evidence cited is *sufficient* to warrant further investigation, the chairman or dean of the school, department, or curriculum in which the course was offered will appoint a committee of no less than three members of the graduate faculty to investigate the charges and to render a written set of findings and recommendations. The recommendations shall be transmitted to the student by the chairman or dean, with a copy to the Dean of the Graduate School. Should a change of permanent course grade be recommended, the Dean of the Graduate School shall present that recommendation for action by the Administrative Board of the Graduate

School. Should there be recommended no change of grade, the student retains the right to appeal in writing to the Administrative Board of the Graduate School. To effect a change of grade following these procedures for protest of grade requires a vote of not less than two thirds of those Administrative Board members who are present and voting.

7. Students in the Graduate School are permitted to enroll for a maximum of sixteen semester hours in any one semester. A full semester of residence credit may be earned for the successful completion of a registration for nine or more semester hours of work offered for graduate credit. (Courses approved for undergraduate credit only may not become a part of the graduate degree program. Although a graduate student may take one or more of these on the recommendation of the faculty adviser, no residence credit is assigned for the completion of an undergraduate course.)

A graduate student who is *required by his or her program* to take undergraduate courses, whether as a requisite for admission or for other reasons, must make grades of at least B— on all such courses numbered below 100 in order to maintain eligibility as a graduate student. A graduate student *voluntarily electing* to register for undergraduate courses (those numbered below 100) may make any grade above *F* without jeopardy to his or her graduate standing.

8. On the recommendation of the major department and the approval of the Graduate School, a maximum of six semester hours of graduate course credit may be transferred from another graduate institution or from the University Extension Division (before formal admission), in partial satisfaction of the thirty-hour minimum requirement for a master's degree. More than six hours may be approved for transfer to a master's program requiring over 30 semester hours. Such transfers do not reduce the minimum residence period of one academic year or its equivalent.

A doctoral student also may transfer credit from another graduate institution, but to do so he or she must submit the course work for examination at the time of the doctoral oral examination. In this way, all work, whether taken at the University or elsewhere, is held in the same regard, and the examining committee is able to base its appraisal of the knowledge of subject matter on the student's own performance. The committee may then recommend the transfer of both course and residence credit in its report to the Graduate School, which has the final responsibility for approving the transfer. Transferred credit will not relieve the student of the requirement to earn at least one academic year of credit in continuous full-time study, or the equivalent, at The University of North Carolina at Chapel Hill.

No credit beyond that earned in a master's program may be transferred from an institution that gives the master's as its most advanced degree.

9. A graduate student working for a master's degree has five calendar years from the date of first registration to complete all requirements for the

degree. A graduate student working on a doctorate has eight calendar years from the date of first registration to complete all requirements for the degree.

When special circumstances warrant, extension of time may be granted upon petition by the student to the Dean.

10. A graduate student may request a leave of absence from graduate study for a definite, stated time. In advance of (or near the beginning of) the leave period, the graduate student should present to the Dean of the Graduate School a written request which explains the reasons why he or she wishes to take a leave. This request must be accompanied by a written approval from the chairman or director of graduate studies of the student's department. If the Graduate School approves the leave of absence, the time of that leave shall not count against the total time allowed for the degree for which the student is studying. Readmission to the Graduate School following a formal leave of absence is a formality.

11. A student who has *not* been registered during the preceding semester should apply for readmission to the Graduate School at least sixty days before the date on which the student plans to return.

12. Each student holding an appointment, service or nonservice, in the regular academic year must be registered in order to hold the position. Unless the award requires the student to be at another campus or at a research center, this registration must be as a student "in residence."

13. The following policies pertain to faculty members who wish to work toward graduate degrees in this Institution.

Members of the General Faculty may not pursue a graduate degree at this Institution except under the following conditions:

- 1) The course of study and the conditions of employment are approved by the Dean of the Graduate School following yearly certification by the employing Department Chairperson(s) that the degree to be pursued is of demonstrable value to the Institution.
- 2) Such certification is approved by the appropriate Dean and by the Provost or by the Vice Chancellor for Health Sciences.
- 3) The degree may not be taken in any School or in any Division of the College of Arts and Sciences in which the individual holds a General Faculty appointment.

Inter-Institutional Registration

Students registered for at least three credit hours on this campus may take graduate courses at North Carolina State University, The University of North Carolina at Charlotte, North Carolina Central University, and Duke University with approval by the student's adviser. The student must obtain a special form, Request for Inter-Institutional Registration, from the Graduate School. This form, certifying that the course(s) is appro-

appropriate for the student's degree program and that an equivalent course is not available on this campus, must be signed by the student's adviser. If the request is approved by the Graduate School, the student will be given a letter or authorization to be presented to the Registration Office in Hanes Hall. The Registration Office will prepare an Inter-Institutional Form, a copy of which the student carries to the Registration Office of the school being visited. Tuition for a course under inter-institutional registration will be charged as if the registration were for a course offered on this campus. Courses taken by inter-institutional registration are given residence credit as if they were courses on this campus. During a summer session, a student taking all of his or her courses at one institution should register at that school and pay tuition and fees accordingly.

Admission to Candidacy

A student in a master's degree program applies for admission to candidacy at the time of application for the degree. To be eligible for graduation at the next commencement, *the student must make an application by the deadline shown in the Calendar of Events*. The candidate should be certain that he or she has removed any conditions attached to his or her admission or any conditions imposed at a later time. A doctoral candidate should apply for admission to candidacy after he or she has passed both the doctoral oral and written examinations, has completed all course work required by the department of the major and minor(s), has completed any foreign language or language-substitute requirements, and has submitted an acceptable dissertation prospectus.

Application for a Degree

Each student must make an application for a graduate degree for a specific commencement. In order to graduate at that commencement, *the student must make application by the deadline shown in the Calendar of Events*. The Graduate School cannot make exceptions to this rule. Application cards are available in the Graduate School. Candidates for master's degrees make applications for degree and candidacy at the same time. If a student (master's or doctoral) has already applied for candidacy and for the degree but has failed to meet the deadline for a particular commencement, he or she must again make an application for the degree.

Master of Arts and Master of Science

To be allowed to enter a program of study leading to the degree of Master of Arts or Master of Science, the student must qualify for admission to the Graduate School. In the event that admission is provisional, all special conditions must be removed before a student may be admitted to candidacy for the degree.

Both degrees, the Master of Arts and the Master of Science, require the satisfactory completion of no less than thirty semester hours of graduate work. At least twenty-four semester hours of this credit must be earned in courses and at least three semester hours in the completion of a thesis. A thesis is required of all candidates for the M.A. degree. For the M.S. degree in certain departments, the Graduate School has approved a substitute for the thesis requirement.

Typically, the master's program will be constituted of distinct major and minor components. The major consists of from eighteen to twenty-one semester hours of course and research credit, and the minor consists of a minimum of nine semester hours. The thesis is required to be on a subject related to the major. In some cases, the minor may be split between two subjects, provided that each is represented by two courses. The minor program must be approved in advance by both the major and the minor departments. In some departments a minor is optional.

The master's program, which must be shown fully in the application for admission to candidacy, is planned by the student and a departmental advisory committee that is usually represented by the director or adviser of the student's thesis research. All courses must be chosen from those offered for graduate credit.

Before receiving the degree of Master of Arts or Master of Science, the student must earn at least one academic year, i.e., two semesters, of residence credit. A semester of residence credit may be earned through the satisfactory completion of a registration of at least nine semester hours of graduate course work. Satisfactory completion of six through eight semester hours of work in a given semester yields one-half a semester of residence credit; completion of three through five semester hours yields one-fourth of a semester of residence credit. The required academic year of residence credit may be earned either through continuous enrollment for two semesters or through part-time study sufficient in amount to permit the earning of thirty semester hours of course and research credit. It should be observed that the required residence credit is not necessarily related to the length of the period of time used by the student in completing the degree program.

In some master's programs, the student must demonstrate a reading knowledge of one modern foreign language. Usually reading knowledge of French, German, Spanish, and Russian is tested through the Graduate School Foreign Language Testing Program of the Educational Testing Service. Information regarding the scheduling of these examinations may be obtained by writing to the Educational Testing Service, Princeton, New Jersey, or Berkeley, California, or in the testing office on most campuses. Prospective students are urged to take the E.T.S. examination at or near the end of their undergraduate programs. It will be to the student's advantage to arrive on campus with the language requirement completed.

Also, in some departments, the language requirement in French, German, Spanish, Italian, Latin and Russian may be fulfilled by the successful completion of the second semester of a special two-semester course series numbered 101X and 102X. For languages other than these, reading knowledge is tested usually by a special examination given by the language department concerned. Foreign students whose native language is not English may not offer their native tongue in satisfaction of this requirement, but they may be permitted to stand examination in English.

Every master's candidate must pass either a written comprehensive examination covering his or her field of study, or an oral comprehensive examination covering all course work required for the degree, or both, according to the decision of the department. Neither examination may be taken until the course work is completed or until the final courses are in progress. The examinations must be scheduled in conformance with the appropriate deadline date shown in the Calendar of Events. The student must have removed any conditions attached to admission prior to the examinations.

Every student required to write a master's thesis must register for master's thesis with a minimum of three credit hours. The master's thesis may carry three or more semester hours of credit. However, only six credit hours of thesis may be counted toward the minimum credits required for a master's degree. It is expected that the thesis will represent the conclusion by the student of an independent research project, and will show command of the bibliography and research methodology of his or her specialty. The thesis is to be written in English and in conformity with accepted standards of form used in research writing. In exceptional cases languages other than English may be used; the substitution is not permitted as a matter of the student's convenience, but may be allowed when the student has demonstrated sufficient skill in English composition and has a thesis topic that is, in the judgment of the adviser, especially suited to treatment in the second language. The Dean's approval of the use of a language other than English must be obtained in advance.

A committee of three members of the graduate faculty, two of whom must be full members, evaluates the student's work for the master's degree, approves the thesis and administers any oral examination that may be given. If the student has a minor field of study, at least one member of the committee typically represents the department of the minor. In case of a joint minor, involving two departments, one faculty representative on the committee is sufficient, provided that both minor departments agree that the faculty member can adequately represent the entire minor course of study. A student who fails either examination may take it a second time after a lapse of three months. A student who fails either examination twice becomes ineligible to continue graduate study.

The final oral shall be held only after all members of the committee have had adequate opportunity to review a draft of the thesis which the candidate is prepared to submit for final typing. The thesis adviser is responsible to the members of the thesis committee for determining that the draft is in an appropriate form for their evaluation. The committee may, at the time of the final oral but not later, require alterations and corrections. The thesis adviser is responsible for verifying that the changes required by the committee have been made, and may delegate this responsibility to the committee member(s) who imposed the requirements. When these requirements have been met, the Report of the Final Oral Examination is submitted, and the thesis, in final typed form designed to meet the standards as defined in *A Guide to the Preparation and Submission of Theses and Dissertations*, is registered with the Graduate School.

Three copies of the thesis should be prepared and submitted by the appropriate deadline date as shown in the Calendar of Events to the Graduate School for binding and storage in the library and in the candidate's major department. All copies must be on paper of prescribed size and quality and in proper form. A copy of *A Guide to the Preparation and Submission of Theses and Dissertations* is available free from the Graduate School. An abstract must be submitted with the thesis. A binding fee of \$20.00 must be collected by the Graduate School when the thesis is submitted.

Receipt of an approved thesis in the Graduate School is tantamount to publication, and the thesis will be available to the public in the University library and available for inter-library loan.

Doctor of Philosophy

The degree of Doctor of Philosophy is conferred only upon those who have completed, with high distinction, a period of intensive study and investigation in an established field of learning. Candidates must have gained control of the materials in the chosen field, mastered the methods of advanced study, and illustrated these methods through a dissertation, the results of independent research, which adds to the sum of human knowledge or presents results that have enduring value. Neither the accumulation of facts, however great in amount, nor the completion of advanced courses, however numerous, can be substituted for this power of independent investigation and the proof of its possession. It is possible for a well-prepared student of good ability to secure the degree upon the completion of three years of graduate study.

Every doctoral student must register for doctoral dissertation with a minimum of three credit hours. Otherwise, the Graduate School has no course requirement as such in the major field, nor does it require a minor.

However, the department may require a minor, or the student may elect one. When the student offers a minor, he or she must present at least fifteen credit hours. All courses to count towards the minor must be listed (or cross-listed) in departments other than the student's major. A minor may consist of a set of related courses, some of which are listed by one department and some by another. If so, the student must take at least six credit hours in each department. The minor should be planned in advance, and both the major and minor departments must give the Graduate School written approval for the program.

Normally the student will be expected by his or her departmental faculty to spend two years or more in formal course work and directed research. Many schools and departments have certain courses required of all prospective doctoral candidates, and some have special requirements. Such requirements are outlined in the appropriate school or department section of this catalogue.

Foreign language requirements vary from department to department. In certain departments a student may be required to offer a research skill (for example, mathematics, statistics, computer science, biostatistics, or symbolic logic) in lieu of or in addition to a foreign language.

If a student wishes to offer French, German, Spanish, or Russian, the foreign language requirement may in most departments be met by passing the examination administered by the Educational Testing Service, Princeton, New Jersey or Berkeley, California. When possible, the student should take these examinations prior to commencement of work in Chapel Hill.

Also, in some departments, the language requirement in French, German, Spanish, Italian, Latin and Russian may be fulfilled by the successful completion of the second semester of a special two-semester course series numbered 101X and 102X. For languages other than these, reading knowledge is tested usually by a special examination given by the language department concerned. Foreign students whose native language is not English may not offer their native tongue in satisfaction of this requirement, but they may be permitted to stand examination in English.

To obtain a doctoral degree, a student must earn four semesters of residence credit. At least two of these must be earned at this University by continuous registration for no fewer than six semester hours per regular semester or summer session, although registration during summer session is not required for continuity. The other two required semesters of residence credit may be obtained by registration at this University and/or by transfer of credit as described in the following paragraph. Residence credit is computed as follows: Nine semester hours of credit is considered a full-time load and earns a full semester of residence credit. Satisfactory completion of six through eight semester hours of work in a given semester yields one-half semester of residence credit; completion of three through

five semester hours yields one-fourth semester of residence credit.

Each doctoral student is required to take a written and an oral examination, which together constitute a comprehensive examination of the student's command of his or her field. The doctoral comprehensive examinations should cover all work in major and minor subjects. Moreover, if the student proposes the transfer of credit from another recognized graduate school, the work for which he or she seeks transfer credit also must be covered by this examination and the transfer must be recommended by the examining committee before the Graduate School will credit the work in the student's degree program here. While there is no limit on the number of hours of credit that may be transferred in the doctoral program, the student may not receive the degree of Doctor of Philosophy unless he or she has earned at least two semesters of residence credit in continuous residence study at The University of North Carolina at Chapel Hill, as described in the previous paragraph.

The doctoral oral examination committee must consist of at least five members, all of whom are members of the graduate faculty. Ordinarily, the chairman of the committee is the student's dissertation adviser. Both major and minor subjects are to be represented in the committee membership, and it is expected that, among its purposes, the committee will strive to evaluate the student's fitness to be recommended for continued study in the Graduate School and for admission to candidacy for the highest degree offered by the institution. It is within the committee's authority to require that additional course work be taken if the members feel that the student shows weaknesses that could be corrected by further instruction.

In addition to the doctoral oral examination, each doctoral student will be given a written comprehensive examination on material to be determined by the faculty of the school, department, or curriculum in which the student is enrolled. A student who fails either examination may not take the examination a second time until at least three months have elapsed. A student who fails either examination twice becomes ineligible to continue graduate study.

Departments and schools determine the order to doctoral oral and written examinations, but before the student can take the second one (be it written or oral) he or she must obtain a permit from the Graduate School. The student must be in the final stages of course work before such a permit is authorized. No permit will be issued unless the candidate has removed any conditions attached to admission. In the departments where cumulative written examinations are used, and where those writtens constitute the second part of the doctoral examinations, the permit must be obtained prior to the last section of the examination. The examination as a whole may not be considered complete until such a permit has been issued.

Before being admitted to candidacy for the degree of Doctor of Philosophy, the student must have completed all major and minor required

courses, passed the doctoral written and doctoral oral examinations, satisfied the foreign language requirement if there is one, and developed a dissertation research problem or project that has been approved by the student's dissertation committee. In general, it is desirable that only a short interval separate the two examinations.

The dissertation committee shall consist of no fewer than five persons, at least one of whom shall be named the dissertation adviser, nominated by the Director of Graduate Studies at the time of a dissertation proposal, and appointed by the Dean of the Graduate School. At least three members of each committee shall be full members of the Graduate Faculty. The committee examines the prospectus, either as part of the first doctoral oral, in which case the dissertation committee also is the doctoral oral examination committee, or subsequent to it, consults with the student throughout the progress of the research, and participates in the final oral examination. Each doctoral student is expected to consult with members of the dissertation committee at frequent intervals throughout the progress of his or her research, and is required to submit a progress report to each member of the committee at least once a year.

The dissertation is expected to be of such scope, independence, and skillful presentation as to indicate that the candidate has acquired a command of the subject, has the demonstrated ability to contribute fresh knowledge or a fresh outlook to the subject, and has mastered the research methodology of the discipline. The dissertation is to be written in English and in conformity with accepted standards of form used in research writing. In exceptional cases languages other than English may be used; the substitution is *not* permitted as a matter of the student's convenience, but may be allowed when the student has demonstrated sufficient skill in English composition and has a thesis topic that is, in the judgment of the adviser, especially suited to treatment in the second language. The Dean's approval of the use of a language other than English must be obtained in advance. It is further expected that the dissertation will be an independent work approved expressly as partially fulfilling requirements for the degree of Doctor of Philosophy at this institution, but prior publication of parts of the work is not forbidden.

At the end of the student's course of study, the candidate will stand for a final oral examination. No fewer than five persons shall constitute the committee for the final oral. A majority of the members of the dissertation committee and a majority of the persons signing the dissertation must be full members of the Graduate Faculty. Other members may be limited members of the Graduate Faculty or "special appointees." The final oral examination should be primarily a true defense of the dissertation. It may be either open to the public, or limited in attendance to the candidate and the committee, or a combination of the two. Questions which relate the dissertation to the field are appropriate. Members of the committee are

invited to submit individual written comments on the examination and/or the dissertation to the program chairman and/or the Dean of the Graduate School, if they so desire.

The final oral shall be held only after all members of the committee have had adequate opportunity to review a draft of the dissertation which the candidate is prepared to submit for final typing. The dissertation adviser is responsible to the members of the dissertation committee for determining that the draft is in an appropriate form for their evaluation. The committee may, at the time of the final oral but not later, require alterations and corrections. The dissertation adviser is responsible for verifying that the changes required by the committee have been made, and may delegate this responsibility to the committee member(s) who imposed the requirements. When these requirements have been met, the Report of the Final Oral Examination is submitted, and the dissertation, in final typed form designed to meet the standards as defined in *A Guide to the Preparation and Submission of Theses and Dissertations*, is registered with the Graduate School.

The dissertation must be submitted to the Graduate School in accordance with the deadlines appearing in the Calendar of Events. It must be typewritten on paper of prescribed size and quality, and its form must be in accordance with approved methods of scholarly writing. *A Guide to the Preparation and Submission of Theses and Dissertations* may be obtained free from the Graduate School. Two copies of the dissertation, including an abstract, are required by the Graduate School for binding and storage. An additional two copies of the abstract also must be submitted.

Publication of the dissertation by means of microfilming is required by the Graduate School. To provide for this, the University has entered into an agreement with University Microfilms, Ann Arbor, Michigan. This firm will in all cases publish an abstract of each dissertation in *Dissertation Abstracts*. The fee for binding and microfilming the dissertation is \$50.00.

Receipt of an approved dissertation in the Graduate School is tantamount to publication, and the dissertation will be available to the public in the University library and available for inter-library loan.

If a student desires to copyright the dissertation, he or she may obtain a copyright for \$20.00 through the Graduate School Office.

A more concise summary of requirements for graduate degrees may be found in *The Graduate School Handbook*, available from the Graduate School Office.

Professional Degree Programs

Requirements for professional graduate degrees, under the supervision of the graduate faculty, are described elsewhere in this catalogue and in some special catalogues of schools and departments concerned. Since

these requirements differ in some respects from those summarized above, those sources should be consulted for the following: School of Business Administration, Department of City and Regional Planning, School of Dentistry, School of Education, School of Library Science, School of Nursing, Department of Political Science, School of Public Health, School of Social Work and Department of Radio, Television, and Motion Pictures.

Commencements

Master's and doctoral degrees are awarded at the end of each semester and the second summer session. Formal commencement exercises are held only in May.

DEPARTMENTAL LISTINGS OF GRADUATE FACULTY AND COURSES OF INSTRUCTION

Graduate Faculty

Graduate faculty members whose appointments are current as of the publication date of this *Record* are listed by academic rank in the department(s) in which they serve. Following the faculty member's name is a section number, which students should use when registering for independent studies, readings, research, and thesis and dissertation courses with that particular professor. As many as three areas of specialization are listed for each faculty member following the section number.

Course Numbers and Credit

Courses numbered from 100 through 199 are for advanced undergraduates *and* graduates, from 200 through 299 for graduates only. Those numbered 300 through 399 are seminar and research courses and also are limited to graduate student enrollment.

The unit of measurement in meeting degree requirements is the semester hour, by which is meant, as a rule, one hour of lecture or at least two hours of laboratory or field work a week for a semester. The valuation of each course is stated in parentheses following the course title.

DEPARTMENT OF ANATOMY

CHARLES R. HACKENBROCK, *Chairman*

Professors

CHARLES R. HACKENBROCK	(28)	Cell and Membrane Biology, Bioenergetics
O'DELL W. HENSON, JR.	(19)	Gross Anatomy, Sensory Physiology, Comparative Anatomy
MALCOLM C. JOHNSTON	(27)	Developmental Biology, Oral Histology, Teratology
WILLIAM E. KOCH	(8)	Developmental Biology
EDITH K. MACRAE	(9)	Histology and Fine Structure
WILLIAM S. POLLITZER	(14)	Gross Anatomy, Physical Anthropology, Human Genetics
WALTER E. STUMPF	(17)	Neuroendocrinology, Autoradiography, Histopharmacology

Associate Professors

ALLEN E. BLAUROCK	(37)	Membrane Structures, X-Ray Diffraction
KENNETH A. JACOBSON	(39)	Dynamic Structure of Membranes, Cytoplasmic Structure, Video Microscopy
ABRAHAM L. KIERSZENBAUM	(25)	Histology, Reproductive Biology
JEAN M. LAUDER	(36)	Developmental Neurobiology and Neuroanatomy
DOUGLAS M. LAY	(18)	Gross Anatomy, Sensory Physiology, Comparative Anatomy
JOHN J. LEMASTERS	(29)	Cell Biology, Structure and Function of Energy Transducing Membranes, Bioluminescence
ROYCE L. MONTGOMERY	(11)	Gross Anatomy, Neuroanatomy, Hippocampus
ROY PEACH	(12)	Histology, Electron Microscopy, Growth and Development
PETER PETRUSZ	(13)	Histology, Reproductive Endocrinology
ALDO RUSTIONI	(15)	Neuroanatomy
THOMAS W. SADLER	(46)	Embryology, Teratology, Developmental Biology

Assistant Professors

KEITH W.T. BURRIDGE	(41)	Cell Biology, Structure and Function of the Cytoskeleton
NOELLE A. GRANGER	(42)	Gross Anatomy, Comparative and Vertebrate Endocrinology, Neuroendocrinology
MATHIAS HÖCHLI	(30)	Structure and Function of Biomembranes, Electron Microscopy
DAVID B. JENKINS	(31)	Gross Anatomy, Comparative Otology
H. EDWARD MAYBERRY	(10)	Histology, Embryology, Growth and Development

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| MICHAEL G. O'RAND | (38) | Reproductive Biology, Immunochemistry of Cell Surfaces |
| KATHLEEN K. SULIK | (40) | Embryology, Teratology, Gross Anatomy |

Research Associate Professors

- | | | |
|-------------------------|------|---|
| CHARLES W. CARTER, JR. | (20) | X-Ray Crystallography, Structure and Function of Macromolecules |
| MADHABANANDA SAR | (32) | Endocrinology |
| LAURA TRES-KIERSZENBAUM | (33) | Reproductive Biology, Cell Biology of Male Gametes |

Research Assistant Professors

- | | | |
|---------------------|------|--|
| RONALD J. CHANDROSS | (34) | Molecular Biology, X-Ray Diffraction |
| HELMUT KREBS | (43) | Developmental Neurobiology and Neuroanatomy, Neuronal Regeneration and Sprouting |

Adjunct Professor

- | | | |
|----------------------|------|---|
| ROBERT M. PRATT, JR. | (44) | Craniofacial Development, Hormones and Growth Factors, Teratology |
|----------------------|------|---|

Emeritus Professors

- | | |
|-----------------------|------|
| RICHARD S. BEAR | (2) |
| H. STANLEY BENNETT | (3) |
| WESLEY C. GEORGE | (22) |
| CHARLES W. HOOKER | (6) |
| CORNELIUS T. KAYLOR | (7) |
| MARY C. SINGLETON | (16) |
| CHARLES D. VAN CLEAVE | (23) |

Anatomy is the scholarly discipline which deals with the structural organization of living forms. The Department of Anatomy of the School of Medicine offers programs of study leading to the Master of Science and Doctor of Philosophy degrees. The master's degree is not normally a recommended step towards the doctorate, and only in unusual cases is it taken as a terminal degree.

Program of Study

The programs and courses deal with biological structure and function from the molecular to the gross anatomical levels. Some of the department's areas of specialization include: electron microscopy (including transmission, scanning, freeze-fracture, and high-voltage EM); X-ray and optical diffraction; cell biology; molecular biology of cell surfaces, membranes, mitochondria, cytoskeleton, and nuclei; developmental and reproductive biology; endocrinology; structure and function of the auditory system; neuroscience, including neuroanatomy, neurochemistry, and

developmental neurobiology; gross and comparative anatomy; physical anthropology; and human population genetics.

Ph.D. students receive broadly based training in biological structure, biochemistry, and physiology before examination for advancement to candidacy. Specific course requirements may be varied to meet the needs and career objectives of individual students. This is followed by optional further formal study while a dissertation based on original research is prepared and defended. The goal of the program is to produce well trained biomedical scientists with expertise in the methods used in the study of biological structure. The Ph.D. student is also required to serve as a graduate teaching assistant for two semesters, to demonstrate a reading knowledge of a foreign language, and to complete a course in biostatistics or computer science.

The program for the Ph.D. normally takes four to five years. Persons interested in a combined M.D.-Ph.D. program must be accepted into the School of Medicine and the departmental graduate program, whereupon the combined studies are scheduled in accordance with individual requirements.

Admission Requirements

A B.A. or B.S. degree is required for admission. It is generally expected that applicants will have a strong background in the biological sciences, chemistry, physics and mathematics. A completed application, including transcripts, GRE scores (with an advanced test score), and three letters of recommendation should be sent to the Office of the Graduate School, Bynum Hall. A letter outlining career goals and why they would be helped by study in the Department is also required. Complete applications for fall registration should be received no later than February 1 if financial aid in the first year is requested. Prospective students are advised to contact the Director of Graduate Studies in Anatomy and faculty members whose fields interest them.

Research Facilities

The Department occupies 28,000 square feet of research and office space in addition to teaching space. The majority of the Department is located in the modern Swing Building, which includes the Laboratories for Cell Biology and the Electron Microscope Laboratories of the Department. The Swing Building is also occupied by the University's Cancer Research Center, with which the Department participates in collaborative programs. An adjacent building is devoted to the Department's section in gross anatomy.

The Department and its research laboratories contain high resolution transmission, scanning, and scanning transmission electron microscopes,

X-ray diffraction generators, freeze-fracture units, ultramicrotomes, spectrophotometers including a dual-beam dual-wavelength instrument, preparatory ultracentrifuges, scintillation counters, and a PDP 11/60 computer. Auxillary equipment and facilities are available for optical imaging of all kinds, autoradiography, cytochemistry, radioimmunoassay, tissue culture, electrophoresis, cell and organelle isolation, membrane and protein fractionation, and for other techniques of modern tissue, cell, and molecular biology.

Assistantships and Other Student Aid

Financial assistance in the form of Graduate Research and Teaching Assistantships is available on a competitive basis to a limited number of students.

Courses for Graduate and Advanced Undergraduates

- 101 NEUROANATOMY (Neurobiology 101)(5). The central nervous system and organs of special sense. *Three lecture and four laboratory hours a week, spring.* Rustioni, Lauder.
- 102 HUMAN HISTOLOGY (4). Prerequisites, Biology 21, 21L, Chemistry 11A, 11L, 21A, 21L-, 61, 62; Physics 24, 25, or equivalent; permission of instructor. Introduction to the study of cells, organized tissues and organ systems at levels of the light and electron microscopes with emphasis on human material. *Fall.* MacRae, staff.
- 103 EMBRYOLOGY (2). Prerequisite, permission of instructor. An introductory study of normal and abnormal human development, including fertilization, cleavage, placentation, early body formation and organogenesis. *Spring.* Mayberry, Koch.
- 103L EMBRYOLOGY LABORATORY (2). Prerequisite, permission of instructor. Lecture topics in Anatomy 103 will be expanded through discussions, demonstrations, and practical laboratory experiences. Course to run concurrently with Anatomy 103. *Spring.* Mayberry, Koch.
- 105fs GROSS ANATOMY (5). Systematic approach to gross anatomy emphasizing a regional approach in the fall and stressing head and neck in the spring. Primarily for dental students. *Fall and spring.* Montgomery.
- 106 THE CELL (3). Prerequisite, permission of instructor. Comprehensive introduction to cell structure and function. Emphasis on membrane organization, organelles, the cytoskeleton, cell recognition and the regulation of cell growth including cancer cell biology. *Spring.* Jacobson, Burridge, staff.
- 107ab GROSS ANATOMY (7). Prerequisite, permission of instructor. Primarily for medical students. Graduate enrollment by availability of space and material. *One lecture, six laboratory hours, fall; two lecture, six laboratory hours, eight weeks of spring.* Henson, staff.
- 111fs MICROSCOPIC ANATOMY (3). Lectures and laboratory classes provide an understanding of the microscopic anatomy and histology of the basic tissues and major organ systems of the human body. *Fall and spring.* Mayberry, Peach.
- 112 HUMAN ORIGINS (Anthropology 112) (3). An introductory survey of physical anthropology, including the place of man among the primates, human evolution, and racial differences. Consideration is also given to osteology and the interrelationship of cultural and biological factors. *Three lecture hours a week, fall.* Holcomb.

- 114 DEVELOPMENTAL TISSUE INTERRELATIONSHIPS (2). Prerequisite, permission of instructor. Lectures and seminar discussion on the development, differentiation and interaction of embryonic and adult tissues. *Fall*. Koch.
- 115 HUMAN GENETICS AND EVOLUTION (Anthropology 115) (Genetics 115) (3). Fundamental principles of genetics; population genetics; factors of evolution; race and species formation; evolution of primates and man. The interaction of genetics and culture in human behavior, society, and evolution. *Three lecture hours a week, spring*. Pollitzer.
- 116 IMAGING IN BIOLOGY—MICROSCOPY (4). Prerequisite, permission of instructor. Physical principles of microscopy: geometric and physical optics; resolution; light microscopy; brightfield, darkfield, phase, interference, and polarization microscopy; Nomarski optics; electron and X-ray microscopes. *Two lecture and four laboratory hours a week, fall*. Blaurock.
- 117 IMAGING IN BIOLOGY—DIFFRACTION ANALYSIS (4). Prerequisite, permission of instructor. Analysis of biological structure by means of diffraction: principles of diffraction by noncrystalline structures; diffraction of X-rays, neutrons, and electrons; molecular modelling. X-ray lab work. *Two lecture and four laboratory hours a week, spring*. Blaurock.
- 118 NEUROENDOCRINOLOGY (Pharmacology 118) (Neurobiology 118) (2). Prerequisite, permission of instructor. A review of presently held concepts in neuroendocrinology with emphasis on topographical aspects of brain structures related to hormone action. *Spring*. (1982 and alternate years.) Stumpf, Sar.
- 119 FUNCTIONAL ANATOMY OF MAMMALIAN REPRODUCTION (3). Prerequisite, permission of instructor. Structural and functional basis of mammalian reproduction, including sex differentiation, germ cells and fertilization, reproductive cycles, pregnancy and lactation, and artificial control of reproduction. *Spring*. (1983 and alternate years.) Petrusz.
- 120 ADVANCED CHORDATE ANATOMY & BIOLOGY (5). Prerequisite, Zoology 103. This course will consider vertebrate origins, diversity and evolution. The origin and evolution of the vertebrate classes are considered from the perspective of the anatomical and physiological problems encountered in the shift from one way of life to another. *Fall*. Lay.
- 121 CELL MOTILITY (3). Prerequisite, permission of instructor. A graduate course directed at understanding the molecular basis of non-muscle cell motility, form and the cytoskeleton. *One lecture, one seminar, and two laboratory hours per week, spring*. Staff.
- 122 DEVELOPMENTAL NEUROBIOLOGY (3). Prerequisite, permission of instructor. A comprehensive overview of nervous system development including detailed analysis of selected research topics in developmental neuroanatomy. *Spring*. (1983 and alternate years.) Lauder.
- 123 DEVELOPMENTAL TOXICOLOGY AND TERATOLOGY (Toxicology 123) (2). Prerequisites, basic biology and permission of instructor. A review of aspects of development which are particularly susceptible to teratogenic insults. Mechanisms by which teratogens affect development will be emphasized. *Spring*. Johnston, Pratt.
- 124s BIOLOGICAL SCIENCE LABORATORY (4). Primarily for students of Dentistry. *Eight hours a week, spring*. Staff.
- 191 GROSS ANATOMY FOR PHYSICAL THERAPISTS (Physical Therapy 191) (6). Prerequisites, Zoology 11 and Zoology 41 or equivalents and permission of instructor. Fundamental principles and concepts of human gross anatomy for physical therapists taught by lectures and cadaver dissection. Emphasis on functional anatomy. *Three lecture and six laboratory hours a week, fall*. Lay, Pollitzer.

- 192 GROSS ANATOMY FOR OCCUPATIONAL THERAPISTS (Occupational Therapy 192) (4). Prerequisites, Zoology 11 and Zoology 41 or equivalents and permission of instructor. Fundamental principles and concepts of human gross anatomy for occupational therapists taught by lectures, cadaver dissection, and projected material. Emphasis on functional anatomy. *Three lecture and two laboratory hours a week, fall.* Lay, Pollitzer.
- 193 FUNCTIONAL NEUROANATOMY (Physical Therapy 193) (3). Prerequisites, Anatomy 191, Anatomy 107 or equivalent and permission of instructor. Study of basic structure of the brain and spinal cord, including both lecture and laboratory. Primarily for Physical Therapy students. *Four hours a week, spring.* Krebs.

Courses for Graduates

- 200ab ADVANCED GROSS ANATOMY (4 + 4). Prerequisites, Anatomy 107 and permission of instructor. Detailed dissection of the human body. Specific regions may be selected; topics will include phylogeny and topographic and radiographic anatomy. *Eight hours per week per region. Fall and spring.* Henson.
- 202ab BIOLOGICAL ELECTRON MICROSCOPY (Dentistry 202ab) (2). Prerequisite, permission of instructor. *Conference thirty hours.* Peach.
- 204 CONGENITAL MALFORMATIONS OF THE OROFACIAL REGION (Dentistry O.B. 204) (1). Prerequisite, permission of instructor. *Spring.* Staff.
- 207 REGIONAL ANATOMY (3). Prerequisite, permission of instructor. For students of oral surgery, surgical residents, graduate students. *Second Summer Session.* Montgomery.
- 209 ELECTRON MICROSCOPY—PRINCIPLES AND APPLICATIONS (5). Prerequisite, permission of instructor. Introduction to modern techniques of specimen preparation used in EM. Laboratory training in operating scanning and transmission electron microscopes, freeze-fracturing, thin sectioning, metal shadowing and dark-room procedures. *One lecture and eight laboratory hours, fall.* Staff.
- 212ab CYTOCHEMISTRY AND HISTOCHEMISTRY (Dentistry O.B. 212ab) (2). Prerequisite, permission of instructor. Hanker; staff.
- 222 SEMINAR IN STRUCTURAL AND HARD TISSUE PROTEINS (Dentistry O.B. 222) (1). Prerequisite, permission of instructor. *Spring.* Mechanic.
- 233ab CURRENT TOPICS IN BASIC SCIENCE (Dentistry O.B. 233ab) (3, 3). Primarily for dental students. Open to a few anatomy students with permission of instructor. *Conference sixty hours, fall and spring.* Staff.
- 301 SEMINAR IN GENERAL ANATOMY (1). Prerequisites, permission of instructor and enrollment in the Anatomy Graduate Program. A series of weekly lecture-seminars by faculty members and visiting scientists on current research in anatomy. *One and one-half hours per week, fall and spring.* Staff.
- 310 RESEARCH (2 or more). Credit to be arranged in individual cases. *Fall, spring, and summer.* Staff.
- 315 RESEARCH LABORATORY APPRENTICESHIP (3). Prerequisites, permission of instructor and enrollment in the Anatomy Graduate Program. A course for first- and second-year graduate students in Anatomy, consisting of a research project of limited scope, pursued under the supervision of a faculty member. *Eight to twelve hours of laboratory per week, fall, spring, summer.* Staff.
- 393 MASTER'S THESIS (3).
- 394 DOCTORAL DISSERTATION (3).
- 400 GENERAL REGISTRATION (0).

DEPARTMENT OF ANTHROPOLOGY

DONALD L. BROCKINGTON, *Chairperson*

Professors

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|-----------------------|------|---|
| DONALD L. BROCKINGTON | (1) | Archaeology, Latin America, Middle America |
| JOFFRE L. COE | (2) | Archaeology, North American Indians, U.S. Southeast |
| JULIA G. CRANE | (3) | Field Methods, Social Organization, Caribbean |
| JOHN GULICK | (6) | Gender Roles and Population, Urban Cultures, Modern Middle Eastern Cultures |
| GEORGE R. HOLCOMB | (8) | Physical Anthropology, Functional Anatomy, Morphogenesis |
| JAMES L. PEACOCK | (11) | Culture Change, Symbolic Systems, Southeast Asia |
| RICHARD A. YARNELL | (15) | Ecology, Evolution, Ethnobotany |

Associate Professors

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| DOROTHY C. HOLLAND | (16) | Anthropology and Education, Cognitive Anthropology, Quantitative Methods |
| CAROLE L. CRUMLEY | (22) | Archaeology, Complex Societies, Europe |
| TERENCE M.S. EVENS | (5) | Social Anthropology, Social Theory, Utopian and Communal Societies |
| ANTHONY E. THOMAS | (14) | Medical Anthropology, Anthropology of Law, Eastern Africa |

Assistant Professors

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|-----------------------|------|---|
| ROBERT E. DANIELS | (4) | Social Anthropology, Culture and Personality, Africa |
| NANCY SCHEPER-HUGHES | (7) | Medical-Psychological Anthropology, Gender Roles, Ireland |
| NORRIS BROCK JOHNSON | (25) | Cultural Anthropology, Anthropology of Art and Literature, Anthropology and Education |
| BRUCE P. WINTERHALDER | (27) | Physical Anthropology, Evolutionary Ecology Subarctic (Canada) |

Instructor

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| LEE I. SCHLESINGER | (26) | Social Anthropology, Social Theory, India |
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Lecturer

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| DOROTHY D. WILLS | (28) | Sociolinguistics, Language Acquisition, West Africa |
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Adjunct Professor

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| WILLIAM S. POLLITZER | (13) | Physical Anthropology, Human Genetics |
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The Department offers advanced work leading to the Master of Arts and Doctor of Philosophy degrees.

Candidates for the M.A. must prepare themselves in such a way that they are informed on each of the four branches of anthropology (ethnology, linguistics, prehistoric archaeology, and physical anthropology). The M.A. thesis should be regarded as a concise research exercise of high quality. All requirements for the M.A. will ideally be completed no later than the end of the second year of graduate study, but may be completed by the end of the first year.

Candidates for the Ph.D. specialize in one of the four major branches of anthropology and plan and develop their program in close contact with a faculty advisory committee. It is highly desirable that part of the training of a professional anthropologist be a research experience undertaken in the midst of a culture which is significantly different from the candidate's own culture. Normally, it is expected that such experience will be the context in which data for dissertations in ethnology (or social anthropology) are gathered.

Students at both the M.A. and Ph.D. levels may, in accordance with the regulations of the Graduate School, take some courses in other departments. Courses in anatomy, epidemiology, folklore, geography, geology, genetics, linguistics, psychology, or sociology are often particularly appropriate. The Department's policy is to help the individual student select such courses which supplement and strengthen his or her specialization in anthropology.

The Department works closely with the Institute for Research in Social Science, with the Carolina Population Center, and with the Research Laboratories of Anthropology, and it has various active training and research interests in conjunction with other departments and schools of the University.

Courses for Graduates and Advanced Undergraduates

- 100 OLD WORLD PREHISTORY (3). A course to provide anthropology majors and other students of comparable behavioral science sophistication with a basic background in the development of man and culture in the Old World. *Fall*. Crumley.
- 101 PREHISTORY OF THE FAR EAST (3). A course designed to acquaint anthropology majors and upperclassmen from other fields with a general view of the prehistory of Siberia, China, Japan, and southeast Asia and Oceania. *Spring*. Brockington. (Not offered 1981-1982.)
- 105 ANTHROPOLOGY OF THE SOUTH (3). Anthropological materials and insights bearing on modernization and other current trends in southern culture; research problems in the South. *Fall*. (Alternate years.) Peacock.
- 110 PRINCIPLES OF ARCHAEOLOGY (3). An examination of archaeology as a set of techniques and a sub-field of anthropology, including history of archaeology, survey and excavation techniques, laboratory treatment of remains, archaeological analysis, historical and processual inference. *Spring*. Brockington.

- 112 HUMAN ORIGINS (Anatomy 112) (3). An introductory survey of physical anthropology, including the place of man among the primates, human evolution, and racial differences. Consideration is also given to osteology and the interrelationship of cultural and biological factors. *Fall*. Holcomb.
- 115 HUMAN GENETICS AND EVOLUTION (Anatomy 115) (Genetics 115) (3). Fundamental principles of genetics; population genetics; factors of evolution; race and species formation; evolution of primates and man. The interaction of genetics and culture in human behavior, society, and evolution. *Spring*. Pollitzer.
- 116 PRIMATE SOCIAL BEHAVIOR (3). Social behavior and ecology of prosimians, monkeys and apes and the evolution of human behavior. *Fall or spring*. Staff.
- 117 EVOLUTIONARY PERSPECTIVES ON HUMAN ADAPTATION AND BEHAVIOR (3). Critical, partially historical discussion of evolutionary theories, including Darwinism, Neo-Darwinism, ethology and sociobiology, and their social science analogs. Relevance and limitations of these theories for anthropologists will be focal. *Fall*. Winterhalder.
- 120 CULTURE CHANGE AND UNDERDEVELOPED AREAS (3). Theories and case studies of cultural change will be discussed. Problems of culture change in less developed areas of Asia, Africa, and Latin America will receive particular attention. *Fall*. Thomas.
- 121 CULTURE AND PERSONALITY (3). Broad survey of methods and problems connected with studying personality features characteristic of tribes and modern nations, child training and personality, and the relationship of culture to mental illness. *Spring*. Daniels.
- 122 CULTURAL ANTHROPOLOGY (Folklore 122) (3). Not recommended for students who have had Anthropology 41. Recommended for advanced undergraduates and graduate students who have little or no background in anthropology. A survey of anthropological approaches to the study of human cultural and social behavior, with some emphasis on the relation of anthropology to other social sciences. *Fall*. Staff.
- 123 MAGIC, RITUAL, AND BELIEF (3). An examination of the rationality of "magic and religious thought" in traditional societies. Some attention to scientific thought is included. *Spring*. Evens.
- 124 LAW, CULTURE, AND SOCIETY (3). Law and legal mechanisms in their cultural and social contexts. Historical and contemporary problems of "law and development" will be analyzed. *Spring*. (Alternate years.) Thomas.
- 125 DEVELOPMENT OF ANTHROPOLOGICAL IDEAS (3). Prerequisite, Anthropology 41. Review of selected cultural anthropologists and their predecessors to define recurrent as well as innovative perspectives with which they have viewed man, culture, and society. *Fall*. Staff.
- 126 AFRICA: PEOPLES AND CULTURE (Folklore 126) (3). Prerequisite, Anthropology 26 or 41 or 122 or permission of the instructor. Advanced ethnographic survey of cultures of sub-Saharan Africa; some emphasis on the historical development of major African sociocultural systems; application of anthropological theories to Africa and uses of African data in the development of such theories. *Spring*. Staff.
- 127 ABORIGINAL CULTURES OF MEXICO AND CENTRAL AMERICA (Folklore 127) (3). The development of Indian cultures of Middle America; culminating in such civilizations as the Aztec and Maya; archaeological and ethnohistorical data synthesized. *Spring*. Brockington.
- 128 AFRICAN/AFRO-AMERICAN CULTURAL HERITAGE (African and Afro-American Studies 170) (3). (See African and Afro-American Studies 170 for description.) On demand. Staff.
- 129 SOUTHEAST ASIA: PEOPLES AND CULTURES (Folklore) (3). A survey of cultures in Indonesia, the Philippines, and mainland Southeast Asia. Traditional

- influences and the impact of major contemporary changes on societies of the area will be discussed. *Spring*. Peacock.
- 130 INDIANS OF NORTH AMERICA (Folklore 130) (3). A descriptive study of culture areas of North America at the time of European contact, with emphasis on the Southeast. *Spring*. Coe.
- 131 ARCHAEOLOGY OF SOUTH AMERICA (3). The development of native South American cultures according to archaeological and early ethnohistorical records. *Fall*. Brockington. (Not offered 1981-1982.)
- 132 LATIN AMERICAN CULTURES (Folklore 132) (3). An ethnographic survey of the peoples of Latin America with emphasis on the analysis of the tribal and community organization. *Fall*. Staff.
- 133 THE PEOPLE OF THE CARIBBEAN (3). A survey of Caribbean cultural development. Particular attention will be given to human ecology, population segments, metropolitan influences, and culture change. *Fall*. Crane.
- 134 ART AND CULTURE (3). An aesthetic approach to the ethnographic survey of art traditions in several cultures and culture areas. A review of anthropological approaches to art and aesthetics. *Fall*. Johnson.
- 135 CONSCIOUSNESS AND SYMBOLS (Folklore 135) (3). Symbolizing as exemplified in the arts, religions, languages, and world-views of various cultures. Emphasis is on the relation of symbolizing to social process, as analyzed by theorists such as Durkheim, Weber and Levi-Strauss. *Fall*. Peacock.
- 136 KINSHIP AND SOCIAL ORGANIZATION (3). Prerequisite, permission of the instructor. Intensive study of kinship and marriage systems through Australian, African, and Asian cases. Historical, functionalist, structuralist approaches, descent and alliance theories, and the relation of kinship to social organization and social structure. *Fall*. Schlesinger.
- 137 MODERN CULTURES OF THE MIDDLE EAST (Folklore 137) (3). Desert-oasis ecological adaptations and communities; the peril-refuge dialectic within political structures, religions, kin groups, and the self; directly observed present-day behavior patterns, from Morocco to Afghanistan, are emphasized. *Fall*. Gulick,
- 139 ENVIRONMENTAL ANTHROPOLOGY (3). The general nature of interrelationships between people and environment; biological vs. cultural adaptation, archaeological evidence of ecological relationships, adaptation in the ethnographic present, and environmental alteration will be examined. *Fall*. Yarnell.
- 140 SEX ROLES: CROSS-CULTURAL PERSPECTIVES (3). A comparative and evolutionary perspective on social roles as determined by sex in both traditional and modern societies. Sociobiological, Psychoanalytic, Materialist and Marxist interpretations will be explored. *Spring*. Scheper-Hughes.
- 143 FIELD TRAINING IN ANTHROPOLOGY (3). Supervised, on-site data collection and analysis. Students develop background knowledge and select research topic before leaving campus. Instructor's permission required. Staff.
- 145 ANTHROPOLOGY OF LITERATURE (3). A critical examination of selected literary works as cultural products. Discussion of anthropological approaches to the study of literature. Comparison of literary and ethnographic accounts of selected cultures. *Spring*. Johnson.
- 146 INTRODUCTION TO FOLKLORE (Folklore 146) (3). (See Folklore 146 for description.) *Spring*. Staff.
- 150 ARCHAEOLOGY OF NORTH AMERICA (3). A study of the growth of American Indian cultures north of the Rio Grande as interpreted by archaeological research. Special emphasis on the prehistory of North Carolina and eastern woodlands. *Fall*. Coe.
- 155 METHOD AND THEORY IN ETHNOHISTORIC RESEARCH (3). Integration of data from ethnographic and archaeological research with pertinent historic informa-

- tion. Familiarization with a wide range of sources for ethnohistoric data and practice in obtaining and evaluating information. Pertinent theoretical concepts will be explored. *Fall*. (Alternate years.) Crumley.
- 163 PSYCHOLOGICAL ASPECTS OF MODERNIZATION (3). Exploration of patterns of psychological development experienced by persons undergoing modernization. Students will cooperate in comparing and analyzing life histories collected in non-Western as well as local settings. *Spring*. Peacock.
- 164 POLITICS AND SOCIAL ORGANIZATION IN TRADITIONAL SOCIETIES (3). Intensive study of theory in social anthropology, through use of standard anthropological monographs, and with emphasis on the political aspect of society. *Spring*. Evens.
- 165 ECONOMIC ANTHROPOLOGY (3). An intensive survey of theoretical and empirical concerns of the sub-field of economic anthropology. Cross-cultural analysis of tribal, peasant and modern economic formations. *Fall*. Schlesinger.
- 166 INTENTIONAL CULTURE CHANGE (3). Study of social and cultural elements involved in deliberate reformulation of the way of life of communities. Problems of community development and human resources in anthropological perspective. *Spring*. Staff.
- 167 URBAN ANTHROPOLOGY (3). Emphasis on the social systems and modernization processes of contemporary cities in the Third World. Also considered: problems and opportunities of American anthropologists studying American industrial cities. *Spring*. Gulick.
- 168 EMERGENCE OF THE STATE (3). Prerequisite, permission of instructor. Integration of ethnohistoric, ethnographic and archaeological data on the topic of state formation. Definitions of the state are analyzed and the determining factors relative to increasing cultural complexity discussed. *Fall*. (Alternate years.) Crumley.
- 170 MEDICINE AND ANTHROPOLOGY (3). An introduction to social and cultural aspects of illness and healing in a wide range of societies. Examines alternative healing systems in the U.S. Especially relevant to pre-medical students. *Fall*. Scheper-Hughes, Thomas.
- 172 CULTURAL FACTORS IN POPULATION PLANNING (3). Prerequisite, permission of the instructor. Cultural factors bearing on the need, ethics, design, and implementation of programs attempting to deal with population growth. *Spring*. Staff.
- 175 ETHNOGRAPHIC METHOD (3). Intensive study of and practice in many of the most commonly used anthropological data-collection techniques. *Spring*. Crane.
- 179 INTRODUCTION TO GENERAL LINGUISTICS (Linguistics 100) (3). (See Linguistics 100 for description.) *Fall and spring*.
- 180 LINGUISTIC PHONETICS (Linguistics 120) (3). (See Linguistics 120 for description.) *Fall*.
- 181 INTRODUCTION TO COMPARATIVE AND HISTORICAL LINGUISTICS (Linguistics 101) (3). (See Linguistics 101 for description.) *Spring*. Tsiapera.
- 183 PHONOLOGICAL ANALYSIS (Linguistics 123) (3). (See Linguistics 123 for description.) *Spring*.
- 184 LANGUAGE AND CULTURE (Linguistics 184) (3). The relationship of language to other aspects of culture for the analysis and description of cognitive and affective features of the semantic component of languages. *Spring*. Holland.
- 185 CULTURE AND COGNITION (3). Examination of competing views of the influence of culture on thinking. Includes conceptual and methodological issues in the cross-cultural study of cognitive processes, social cognition, and inferences from brain lateralization research. *Fall*. Holland.

- 186 ANTHROPOLOGY AND EDUCATION (3). Application of anthropological method and theory to education, both in contemporary educational settings as well as in cross-cultural perspective. Emphasis on education as cultural transmission. *Spring*. Holland.
- 188 OBSERVATION AND INTERPRETATION OF RELIGIOUS ACTION (3). Prerequisite, permission of instructor. Exercises (including field work) in learning to read the primary modes of public action in religious traditions: sermons, testimonies, rituals, prayers, etc. Primary focus on construction and interpretation of texts from field observation. *Spring*. Peacock.
- 190 INTRODUCTION TO GRAMMAR: I (Linguistics 130) (3). (See Linguistics 130 for description.) *Fall*. Staff.
- 193 INTRODUCTION TO GRAMMAR: II (Linguistics 133) (3). (See Linguistics 133 for description.) *Spring*. Staff.
- 194 STRUCTURAL LINGUISTICS (Linguistics 134) (3). (See Linguistics 134 for description.) *Spring*. Staff.
- 199 SPECIAL TOPICS (3). Examines selected topics from an anthropological perspective. Course description for a particular semester is available in the departmental office. *Fall and spring*. Staff.

Courses for Graduates

- 200 ADVANCED SURVEY OF ANTHROPOLOGY (3). Prerequisite, permission of the professor. An intensive survey of all branches of anthropology as a scientific discipline, with attention to current findings and orientations. *Fall*. Yarnell.
- 201 THEORETICAL FOUNDATIONS IN SOCIOCULTURAL ANTHROPOLOGY (3). Critical study of major social theorists or of two or more current theories for the purpose of acquiring the broad conceptual frameworks or problematics of anthropological thought. *Spring*. Staff.
- 222 RESEARCH METHODS IN ARCHAEOLOGY (3). A study of the basic principles underlying archaeological study of prehistoric sites. Field trips and laboratory work. *Spring*. Coe.
- 223 SEMINAR IN ANTHROPOLOGICAL LINGUISTICS (Linguistics 223) (3). Selected topics from general linguistics and sociolinguistics, special emphasis on methods and problems involved in analysis and description of semantic structure of language and its relation to the rest of culture. *Spring*. Holland.
- 224 SEMINAR IN ANTHROPOLOGY AND CYBERNETICS (3). Examination of systems theory, or cybernetics, evaluation of previous applications of cybernetic models in anthropology, and original analysis, by students, of anthropological data in these terms. *Spring*. Daniels.
- 225 QUANTITATIVE METHODS IN ANTHROPOLOGY (3). Survey of standardized data-gathering techniques, problems in research design, and methods of quantitative analysis encountered in anthropological research. *Fall*. Holland.
- 233 ADVANCED SEMINAR IN CARIBBEAN STUDIES (3). Prerequisite, Anthropology 133 or permission of instructor. Survey of Caribbean cultural development for students having some knowledge or experience in the area. Particular attention will be given to current problems and recent theoretical issues. *Spring*. Crane.
- 250 SEMINAR IN MEDICAL ANTHROPOLOGY (3). Specially designed for, but not restricted to, students who are specializing in medical anthropology. Medicine as part of culture; medicine and social structure viewed cross-culturally; medicine in the perspective of anthropological theory; research methods. A special purpose is to help students plan their own research projects, theses, and dissertations. *Spring*. Thomas.

- 252 TRANSCULTURAL PSYCHIATRY (3). Prerequisite, Anthropology 121 or 170 or permission of instructor. Considers cross-cultural variations in the perception/definition of, reaction to, course and treatment of deviant behavior—especially mental disorders. *Fall*. Scheper-Hughes.
- 254 PHENOMENOLOGICAL ANTHROPOLOGY (3). Prerequisite, permission of the instructor. The course aims to apply the theories and methods of phenomenology to the practice of anthropology. *Fall*. Evens.
- 255 SEMINAR IN CULTURAL ECOLOGY AND POPULATION (3). Mutual relationships of environment, social structure, mortality and natality, reviewed in an evolutionary framework. Detailed consideration of a few selected cultures, e.g., Bushmen, Tikopia, Ashanti, Japan, and Vicos (Peru). *Spring*. Staff.
- 260 SEMINAR IN HUMAN EVOLUTIONARY ECOLOGY (3). Permission of instructor for undergraduates. Examination of evolutionary ecology concepts with existing or potential uses in human adaptation research, including: adaptation and optimization, effective environmental properties, foraging strategies, niche, competitive exclusion, life history tactics, and biogeography. *Spring 1981 and alternate years thereafter*. Winterhalder.
- 265 SEMINAR IN THE ANTHROPOLOGY OF LAW (3). Prerequisite, permission of the instructor. Drawing upon recent work of social anthropologists, this course will analyze the nature of law and conceptions of authority in various Asian, African and American preliterate societies. Law will be related to the economy, social organization, religious ideology, and political instruments of each society. Underlying theories of social cohesion and process will be examined in detail. *Fall*. Thomas.
- 266 SEMINAR IN ETHNOBOTANY (3). Prerequisite, permission of instructor. The focus is on economic plants and primitive technology, ecological relationships between man and plants, and analysis and interpretation of archaeological plant remains. Some laboratory work is expected. *Spring*. Yarnell.
- 290 LINGUISTIC GEOGRAPHY (Linguistics 250) (3). (See Linguistics 250 for description.) *Spring*. Staff.
- 293 LINGUISTIC FIELD WORK I (Linguistics 293) (3). (See Linguistics 293 for description.) *Fall*. Staff.
- 294 LINGUISTIC FIELD WORK II (Linguistics 294) (3). (See Linguistics 294 for description.) *Spring*. Staff.
- 301 READING AND RESEARCH (1 to 4). Registration with permission of professor. *Fall*. Staff.
- 302 READING AND RESEARCH (1 to 4). Registration with permission of professor. *Fall and spring*. Staff.
- 315 READING AND RESEARCH IN METHODOLOGY (1 to 4). Registration with permission of professor. *Fall*. Staff.
- 316 READING AND RESEARCH IN METHODOLOGY (1 to 4). Registration with permission of professor. *Fall and spring*. Staff.
- 317 THE CONCEPT OF TEACHING OF GENERAL ANTHROPOLOGY (3). Prerequisite, permission of Associate Chairperson. Directed course preparation and review of teaching techniques, films, and other aids. *Fall*. Gulick.
- 318 TRAINING IN THE TEACHING OF ANTHROPOLOGY (3). Prerequisites, Anthropology 317, M.A. degree and permission of Associate Chairperson. The trainee teaches a small class in general anthropology under supervision. *Fall and spring*. Staff.
- 321 FIELD RESEARCH (3 each). Registration with permission of the professor. *Fall*
- 322 *and spring*. Staff.
- 327 SEMINAR IN SELECTED TOPICS (1 to 4). *Fall*. Staff.
- 328 SEMINAR IN SELECTED TOPICS (1 to 4). *Spring*. Staff.

- 393 MASTER'S THESIS (3 or more). Individual research in a special field under the direction of a member of the Department. *Fall and spring*. Staff.
- 394 DOCTORAL DISSERTATION (3 or more). Individual research in a special field under the direction of a member of the Department. *Fall and spring*. Staff.
- 400 GENERAL REGISTRATION (0).

DEPARTMENT OF ART

PETER PLAGENS, *Chairman*

MARY C. STURGEON, *Assistant Chairman for Art History*

JERRY L. NOE, *Assistant Chairman for Studio Art*

Professors

ROBERT J. BARNARD	(9)	Art Education, Painting
JOHN W. DIXON, JR.	(4)	Art & Religion, Italian Art, Criticism
JAROSLAV T. FOLDA, III	(10)	Medieval Art
ROBERT A. HOWARD	(3)	Sculpture
FRANCES HUEMER	(7)	Baroque Art
J. RICHARD JUDSON	(20)	16th & 17th Century Dutch & Flemish Art
RICHARD W. KINNAIRD	(11)	Painting, Printmaking
PETER L. PLAGENS	(40)	Painting, Criticism
MARVIN SALTZMAN	(6)	Painting, Printmaking

Associate Professors

C. EDSON ARMI	(30)	Medieval Art, Architecture, Design
JAMES GADSON	(19)	Printmaking
ARTHUR S. MARKS	(21)	American & British art & architecture
JERRY L. NOE	(13)	Sculpture
RICHARD SHIFF	(32)	Modern Art
MARY C. STURGEON	(31)	Ancient Art, Archaeology
DENNIS J. ZABOROWSKI	(15)	Painting

Assistant Professors

MICHAEL A. CINDRIC	(27)	Ceramic sculpture
STEVEN A. MANSBACH	(33)	19th & 20th Century Art

Lecturer

CAROLYN M. BLOOMER	(43)	Art Education
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Visiting Artists-in-Residence

HARMONY HAMMOND	(44)	Painting
JULIUS TOBIAS	(45)	Sculpture
PETER D'AGOSTINO	(49)	Sculpture, Video Art

Visiting Lecturers

DEAN WALKER	(47)	Renaissance Art
JEAN BORGATTI	(50)	Non-Western Art, African Art

Adjunct Professor

EVAN H. TURNER	(36)	American Art
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Adjunct Assistant Professor

INNIS SHOEMAKER	(29)	Renaissance Painting & Sculpture
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Professors Emeriti

JOHN V. ALLCOTT
 SARA A. IMMERWAHR
 KENNETH NESS
 JOSEPH C. SLOANE

Modern Art & Architecture
 Greek Art, Archaeology
 Painting
 Nineteenth Century Art

For those considering professional careers as critics or art historians (teaching and research), graduate work is offered leading to the degrees of Master of Arts and Doctor of Philosophy. Those desiring professional careers in painting, sculpture, or printmaking should take the degree of Master of Fine Arts.

The William Hayes Ackland Memorial Art Center provides exhibition galleries, departmental library, offices, study areas, and classrooms. Studios and classrooms are also located in Lenoir Hall, Caldwell Hall, and the Art Laboratory Building. New facilities are currently being constructed, to be occupied in 1983.

The University Library holds about 60,000 volumes in the field of art history and classical archaeology, of which 39,000 are housed in the art library of the Ackland Art Center.

One feature of the Department is its access to the Ackland Art Museum, which is housed in the Ackland Building. A growing collection of works of art in all media offers the opportunity for graduate students to work on research problems using actual objects. Frequent exhibitions give further opportunities for study.

Admission

In addition to completing an application to the Graduate School, the candidate for admission to the Master of Fine Arts program in studio art must submit directly to the Department of Art a portfolio of representative examples of creative work. Good photographs or slides, adequately identified and labeled, are required. *Do not send original works.* If you wish your slides or photographs returned, a self-addressed, stamped envelope must be enclosed. No application will be considered until the slide portfolio has been submitted. There are no spring semester admissions.

In addition to completing an application to the Graduate School (which must include up-to-date GRE scores), the candidate for admission to the programs in art history must submit directly to the Department of Art the departmental self-interview form, available from the Department upon request. All applicants for graduate study in art history are admitted to the Master of Arts degree program, unless they already have received or expect to receive this degree in art history from another institution. An undergraduate major in art history is not required, but the *minimum* standard for admission is twelve semester hours of good work in art history, archaeology, cultural anthropology, or aesthetics, and a reading

knowledge at entrance of French or German. There are no spring semester admissions.

Graduate Study in Art Education

Students planning on advanced degrees in the field of Art Education are enrolled in the School of Education even though they may take a large part of their work in art. Any inquiry about graduate programs in the teaching of art should be made to Associate Dean Barbara H. Wasik, School of Education, University of North Carolina, Chapel Hill, N.C. 27514. Application for admission to the graduate program in art education should be made to the Graduate School, University of North Carolina, Chapel Hill, N.C., 27514. The programs of students who have been admitted to Graduate School are arranged by the School of Education upon consultation with the Department of Art.

Degree Requirements for Studio Art

The Master of Fine Arts degree follows the requirements of the Graduate School for the Master of Arts degree, as described on pages 98-101, with the following exceptions: the minimum period of residence study will be at least three semesters, or part-time residence of sufficient length for completion of the requirements. The major consists of forty credit hours, including a graduate seminar, and a thesis. No formal written thesis is required; instead, an informal written statement (its form and length to be determined by the candidate) will accompany the candidate's thesis exhibition of original works of art held in the Ackland Museum. Private or semi-private studios are provided for all graduate students in studio art. At the end of the first semester of residency the student will indicate with which instructor he or she will study. At the end of the second semester of residency a review will be held to determine if continued study at UNC-CH is recommended. Favorable action will require each student in consultation with the advisor to develop a committee consisting of two additional faculty members. For further information about the M.F.A. degree program, the applicant should write the Assistant Chairman for Studio Art.

Financial Aid for Studio Art Students

All applicants for admission to the M.F.A. program whose applications are complete by February 1 are automatically considered by the Department for nomination in the University Fellowship competition. Applicants and students in residence are eligible for Teaching Assistantships and Graduate Assistantships; these have frequently been awarded on a semester basis. The Ann McCullough Hill Fellowship has been awarded in past years through the generosity of a private patron and is not guaranteed

yearly. The Office of Student Aid, 300 Vance Hall, Chapel Hill, N.C. 27514, has information about work-study jobs and loans; that office should be consulted as early as possible by those desiring such help.

Degree Requirements for Art History

The Master of Arts degree in general follows the requirements of the Graduate School as described on pages 98-101. A student admitted to graduate study in art history who has had adequate preparation in art history and foreign languages will normally take a minimum of ten three-hour one semester courses for the M.A. including one three-hour course registration for Thesis. The student normally also will take no fewer than four 300-level seminars, four other courses at the 100 and 200 levels, and Art 393, Thesis registration. At least one course or seminar must be taken in each of the four major periods of art history: Ancient, Medieval, Renaissance-Baroque, and Modern. Two of the three-hour one-semester courses are considered electives. These may be additional art history courses or courses in any area relevant to the student's study (with the permission of the Director of Graduate Studies). If a student elects to do an external minor, the two elective courses will be considered part of the minor. One additional elective will then be necessary, making a total of eleven three-hour courses for the M.A.: eight in the history of art and a minimum of three in the external minor.

Students must pass the reading knowledge examination in French or German before completing twelve hours of graduate course work. In the semester after which the student completes twenty-seven hours of graduate credit, the M.A. written examination will be taken. The student then will prepare an M.A. thesis. If the student wishes to continue into the Ph.D. program, the Department should be notified of intention at the time of the M.A. examination, in order that a full evaluation of the student's graduate work can be conducted by the Art History Graduate Committee. A student may not continue in the Art History Graduate program for more than one semester beyond thirty hours of graduate credit unless approval has been granted by the Graduate Committee for entrance into the Ph.D. program.

The degree of Doctor of Philosophy in general follows the requirements of the Graduate School as described on pages 101-5. Students who have the M.A. in art history from another institution are admitted directly to this program, but must take four general field examinations in Ancient, Medieval, Renaissance-Baroque, and Modern Art. In addition to the courses completed for the M.A., doctoral students normally will take at least four 300-level seminars in at least two fields of study, two additional courses in art history, and two electives. A studio field or an external minor may be offered, but either choice will require the completion of more courses. The candidate must pass the reading examinations in two foreign

languages, generally French and German; the student may be required to pass other foreign language examinations for study in special fields. The doctoral written examinations cover three fields: a major field, a minor related to the major field, and an unrelated minor, normally chosen from the following: Greek, Roman, Early Christian and Byzantine, Western Medieval, Renaissance, Baroque, Modern, and Criticism.

For further information inquire of the Director of Graduate Studies in Art History.

Financial Aid for Art History Students

All applicants for admission who have completed their applications by February 1 are automatically considered by the Department for nomination in the University Fellowship competition. Applicants and students in residence are also eligible for Teaching Assistantships and Graduate Assistantships which are awarded by the Department with University funds. Furthermore, the Department has certain discretionary funds of its own from which it annually makes both service and nonservice awards. However, it should be noted that few awards are made to first-year students. A limited amount of hourly work is available to graduate students in the art library and slide library. The Office of Student Aid, 300 Vance Hall, Chapel Hill, N.C. 27514, has information about work-study jobs and loans. Applicants and resident students desiring such help should contact that office as early as possible.

ART HISTORY

Courses for Graduates and Advanced Undergraduates

- 150 TOPICS IN MODERN DESIGN (3). Armi.
- 151 STUDIES IN ITALIAN RENAISSANCE ART (3). Shoemaker.
- 155 RELIGION AND MODERN ART (Religion 181) (3). Dixon.
- 156 THE ART OF FLORENCE (Religion 182) (3). Dixon.
- 158 THE ILLUMINATED BOOK (3). Folda.
- 160 DUTCH AND FLEMISH ART OF THE SIXTEENTH AND SEVENTEENTH CENTURIES (3). Judson.
- 161 LATE NINETEENTH CENTURY FRENCH PAINTING (3). Shiff.
- 162 ITALIAN BAROQUE PAINTING (3). Huemer.
- 163 REMBRANDT COLLOQUIUM (3). Judson.
- 170 POST-1945 AMERICAN PAINTING (3). Shiff.
- 171 MODERN SCULPTURE (3). Mansbach, Shiff.
- 172 MODERN ARCHITECTURE (3). Marks.
- 173a NORTHERN EUROPEAN ART OF THE FOURTEENTH AND FIFTEENTH CENTURIES (3). Folda.
- 173b NORTHERN EUROPEAN ART OF THE SIXTEENTH CENTURY (3). Staff.
- 174 GENRE PAINTING IN SEVENTEENTH CENTURY HOLLAND (3). Judson.
- 175 MODERN ART CRITICISM 93). Shiff, Mansbach.

- 176 TOPICS IN THE HISTORY OF ART (3). Staff.
- 177 MEDIEVAL ART (3). Folda, Armi.
- 178 STUDIES IN THE HISTORY OF GRAPHIC ART (3). Staff.
- 179 SPECIAL STUDIES IN AMERICAN ART (3). Marks.
- 180 THEORY OF MODERN ART (3). Mansbach, Shiff.
- 181 GOTHIC ARCHITECTURE AND SCULPTURE (3). Armi.
- 182 RENAISSANCE AND BAROQUE ARCHITECTURE (3). Huemer.
- 184 MUSEUM STUDIES (3). Staff.
- 185 ART OF THE EIGHTEENTH CENTURY (3).
- 187 HISTORY OF PHOTOGRAPHY (3). Staff.
- 189 STUDIES IN NEAR EASTERN ARCHAEOLOGY (Clar. 189) (3). Gates.
- 190 GREEK ARCHITECTURE (Clar. 190) (3). Staff.
- 191 ARCHITECTURE OF ETRURIA AND ROME (Clar. 191) (3). Staff.
- 193 GREEK PAINTING (Clar. 193) (3). Sturgeon.
- 194 ARCHAIC GREEK SCULPTURE (Clar. 194) (3). Sturgeon.
- 195 CLASSICAL GREEK SCULPTURE (Clar. 195) (3). Sturgeon.
- 196 HELLENISTIC GREEK SCULPTURE (Clar. 196) (3). Sturgeon.
- 198 AEGEAN CIVILIZATION AND NEAR EASTERN BACKGROUNDS (Clar. 198) (3). Gates.
- 199 BYZANTINE ART (3). Folda.

The content of these courses will vary slightly from year to year in accordance with the needs of the students and the special competence of the instructor.

(Additional courses offered in the Department of Classics may be taken by qualified students in Art History. Consult the Department of Classics listings.)

Courses for Graduates

In the seminars listed, the topics for study change from year to year depending on the professor conducting the course. Architecture, sculpture, painting or a combination of these, may be the subject. Consult the Department schedule for detail on specific courses in any given semester.

- 200 LITERATURE OF ART (3). Dixon.
- 274 NORTHERN BAROQUE ART (3). Huemer.
- 276 ADVANCED TOPICS IN THE HISTORY OF ART (3). Staff.
- 277 ROMANESQUE ARCHITECTURE (3). Armi.
- 294 GREEK TOPOGRAPHY (Clar. 294) (3). Staff.
- 296 ROMAN SCULPTURE (Clar. 296) (3). Koepffel.
- 297 ROMAN PAINTING (Clar. 297) (3). Richardson.
- 298 ROMAN TOPOGRAPHY (Clar. 298) (3). Koepffel.
- 299 ETRUSCAN ART (Clar. 299) (3). Richardson.
- 301 PROBLEMS IN ART HISTORY (3). By permission of instructor. Staff.
- 350 SEMINAR IN MEDIEVAL ART (3). Folda.
- 351 SEMINAR IN MEDIEVAL ART (3). Armi.
- 352 SEMINAR IN RENAISSANCE ART (3). Shoemaker.
- 353 SEMINAR IN RENAISSANCE ART (3). Staff.
- 354 SEMINAR IN BAROQUE ART (3). Huemer.

- 355 SEMINAR IN NINETEENTH CENTURY ART (3). Mansbach.
- 356 SEMINAR IN AMERICAN ART (3). Marks, Turner.
- 357 SEMINAR IN MODERN ART (3). Shiff.
- 358 SEMINAR IN ANCIENT ART (Clar. 358) (3). Sturgeon.
- 359 LOW COUNTRIES SEMINAR (3). Judson.
- 378 SEMINAR IN MUSEUM STUDIES (3). Turner.
- 393 MASTER'S THESIS (3 or more). Staff.
- 394 DOCTORAL DISSERTATION (3 or more). Staff.
- 400 GENERAL REGISTRATION (0).

STUDIO ART

Courses for Graduates and Advanced Undergraduates

NOTE: These courses may be repeated as necessary upon the advice of the student's advisor.

- 105a ADVANCED PAINTING (3). Departmental permission required. Prerequisite, Art 82b. Continuation of 82b. Zaborowski, Kinnaird.
- 105b ADVANCED PAINTING (3). Departmental permission required. Prerequisite, 105a. Continuation of 105a. Zaborowski, Kinnaird.
- 107 SPECIAL STUDIES IN CRAFTS AND CRAFTS DESIGN (3-6). Departmental permission required. Advanced craft techniques and design. Course open only to students in Art Education program.
- 108 INDIVIDUAL STUDIES: STUDIO (3-6). Permission of instructor required. Special projects based on student's performance and capacity in other advanced courses. Staff.
- 109 SPECIAL STUDIES IN ART EDUCATION (3-6). Permission of instructor required. Special projects in art education based on student's performance and capacity in other advanced courses. Open to Art Education majors only. Barnard, Bloomer.
- 112a ADVANCED SCULPTURE (3). Departmental permission required. Prerequisite, Art 86b. Continuation of 86b. Noe, Tobias.
- 112b ADVANCED SCULPTURE (3). Departmental permission required. Prerequisite, Art 112a. Continuation of 112a. Noe, Tobias.
- 120a ADVANCED PRINTMAKING (3). Departmental permission required. Prerequisite, Art 88b. Continuation of 88b. Gadson.
- 120b ADVANCED PRINTMAKING (3). Departmental permission required. Prerequisite, Art 120a. Continuation of 120a. Gadson.
- 145 CRAFTS AS MEDIA (3). Open to Art Education majors only. Bloomer.

Courses for Graduates

- 230 GRADUATE STUDIO ART SEMINAR (1). Hammond, D'Agostino.
- 240 GRADUATE PAINTING (9 hours for each 3 credits each week). This course may be repeated for credit. *Fall and spring*. Staff.
- 241 GRADUATE SCULPTURE (9 hours for each 3 credits each week). This course may be repeated for credit. *Fall and spring*. Staff.
- 242 GRADUATE PRINTMAKING (9 hours for each 3 credits each week). This course may be repeated for credit. *Fall and spring*. Staff.
- 393 MASTER'S THESIS (3 or more). *Fall and spring*. Staff.
- 400 GENERAL REGISTRATION (0).

DEPARTMENT OF BACTERIOLOGY AND IMMUNOLOGY

P. FREDERICK SPARLING, *Chairman*

Professors

KENNETH F. BOTT	(3)	Molecular Biology Bacterial Sporulation, Molecular Cloning
WALLACE A. CLYDE	(4)	Infectious Disease, Biology of Mycoplasmas
WILLIAM J. CROMARTIE	(6)	Innate Resistance to Infection Mechanisms of Streptococcal Disease and Rheumatic Fever
MARSHALL H. EDGELL	(7)	Genetic Engineering, Molecular Biology
HARRY GOODER	(10)	Bacterial Cell Walls and L-forms
GEOFFREY HAUGHTON	(11)	Immunogenetics and Immunology of Tissue Transplantation
CLYDE A. HUTCHISON III	(12)	Molecular Genetics, Genetic Engineering Virus Structure
G. PHILIP MANIRE	(1)	Virology, Growth Cycles and Cell Wall Antigens of <i>Chlamydia</i>
JOSEPH S. PAGANO	(14)	Interactions of Animal Virus Nucleic Acid and Mammalian Cells
JOHN H. SCHWAB	(15)	Autoimmunity, Cross-Reactive Antigens on Bacterial and Mammalian Membranes
P. FREDERICK SPARLING	(18)	Infectious Disease, Antibiotic Inhibitors of the Ribosome
WILLIAM J. YOUNT	(25)	Genetic Control of Antibody Response and Gamma Globulin Synthesis in Humans

Associate Professors

STEPHEN L. BACHENHEIMER	(30)	Molecular Biology of Viruses
JANET J. FISCHER	(8)	Infectious Disease, Enteric Bacteria Infections of the Urinary Tract
JAMES D. FOLDS	(9)	Regulation of Antibody Synthesis, Assembly and Secretion
JACK GRIFFITH	(35)	Chromosome Structure: Viruses and Their Host Cells
NORTIN M. HADLER	(26)	Mechanism and Control of Chronic Inflammatory Response
J. STEVEN HASKILL	(38)	Cancer Immunology; Role of Antibody, Macrophages, Chemoimmunotherapy
MICHAEL MCGINNIS	(31)	Dematiaceous Pathogenic Fungi
JOHN E. NEWBOLD	(13)	Molecular Virology, Mechanical Analysis of Eukaryotes
GORDON D. ROSS	(39)	Immunology Leukocyte Membrane Receptor

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|---------------------|------|--|
| ROBERT TWAROG | (21) | Regulation of Synthesis of Amino Acid Biosynthetic Enzymes in Bacteria |
| GAIL T. WERTZ | (23) | Molecular Virology, Virus; Host Cell Interaction |
| PRISCILLA B. WYRICK | (24) | Host-Parasite Relationships, Pathogenesis of Infectious Diseases |

Assistant Professors

- | | | |
|---------------------|------|--|
| PHILIP J. BASSFORD | (41) | Bacterial Genetics; Mechanism of Protein Secretion and Membrane Biogenesis |
| JEAN H. BOWDRE | (37) | Cellular Mechanisms of Oxygen Toxicity; Role of Iron in Microbial Virulence and Host Defense |
| ROBERT A. EISENBERG | (46) | Immunology; Autoimmunity; Rheumatic diseases |
| ELIZABETH FOWLER | (40) | Control of Gene Action; Membrane Receptors and Antigens |
| DAVID G. KLAPPER | (33) | Immunochemistry, Immunogenetics; Structure of Proteins of Immunologic Interest |
| HOWARD M. REISNER | (32) | Immunogenetics of Human Plasma Proteins Particularly IgG and Coagulant Factors VII and IX |
| MARK D. SOBSEY | (28) | Environmental Health Microbiology |

Lecturer

- | | | |
|-------------------|-----|---|
| JAMES J. CRAWFORD | (5) | Oral Microbiology, Anaerobic Bacteriology |
|-------------------|-----|---|

Research Assistant Professors

- | | | |
|--------------------------|------|---|
| JANNE CANNON | (43) | Genetics of Pathogens; Pathogenesis of Infectious Disease |
| LAWRENCE GUYMAN | (44) | Bacterial Cell Wall Biochemistry; Bacterial Physiology |
| LINDSEY M. HUTT-FLETCHER | (34) | Immune Responses to Infections with Animal Viruses |
| JAMES E. SHAW | (36) | Analysis of Human Tumor Virus Nucleic Acids |

Adjunct Associate Professors

- | | | |
|--------------------|------|---|
| JOEL B. BASEMAN | (2) | Pathogenesis of Microbial Disease, Animal Cell Physiology |
| STEPHEN W. RUSSELL | (45) | Immunopathology, Veterinary Pathology |

Emeritus Professors

- | | | |
|---------------------|------|--|
| D. GORDON SHARP | (16) | |
| MYRON S. SILVERMAN | (17) | |
| WILLIAM R. STRAUGHN | (20) | |

The Department of Bacteriology and Immunology, an administrative division of the School of Medicine, is a unit of the Graduate School. It offers instruction leading to the degrees of Master of Science and Doctor of Philosophy. Research programs, supported by funds from the University, U.S. Public Health Service, National Science Foundation, Department of Energy, American Cancer Society, and private foundations, are being conducted on a wide variety of programs concerning the nature of bacteria and viruses, on host-parasite interaction, pathogenic mechanisms, molecular biology, and various areas of immunology.

The Department is now located in a completely new research building. The building's spacious research laboratories are supplemented by special tissue culture facilities, fermentation capacity potential for cultivating large quantities of bacterial viruses, several special-purpose darkrooms, animal care facilities, electron microscopy laboratories, computer facilities, and more than 600 square feet of space designed specifically as a P3 physical containment facility for recombinant DNA research. All the routine apparatus and instrumentation required for the most sophisticated modern microbiology research is available. Students also have the use of such special equipment as amino acid analyzers, low-background isotope counters, liquid scintillation counters, spectrofluorometers, ultracentrifuges, and specialized high-voltage electrophoresis apparatus.

Individual faculty members are provided with well-equipped laboratories for their own work and that of postdoctoral fellows, graduate students, technicians, and other personnel. Equipment available for graduate student research includes analytical and preparative type ultracentrifuges, automatic amino acid analyzers, automatic scalars and gas flow radioactivity counters, liquid scintillation radioactivity counters, Beckman DU and DK recording spectrophotometers, high voltage electrophoresis apparatus, electron microscopes, thin section microtomes, International cryostats, CO₂ and conventional incubators, sterile culture rooms, small scale fermenters for producing substrate quantities of microbial byproducts, and P3 physical containment facilities for potentially hazardous experiments, plus a wide variety of other equipment used in chemical, biological and biophysical analyses of microbes and infected hosts.

Funds are available from the University, individual research grants, and government supported training grants to provide stipends for predoctoral students admitted for graduate work in the Department. At present, stipends are \$5,040 per year. Some awards provide full tuition allowances.

The Department of Bacteriology and Immunology considers applications from prospective graduate students who present evidence of superior scholarship and who have completed courses in general, analytical and organic chemistry, mathematics including calculus, and two semesters of physics. Students planning a research career in microbiology are strongly

urged to take additional courses in physical chemistry, biochemistry, and biology.

Students who are admitted to the Graduate Program in the Department of Bacteriology and Immunology usually take Bacteriology 105; 110; 120; 130; 2 of the five seminars, Bacteriology 210, 211, 212, 213, or 214; Bacteriology 201 and Bacteriology 202. Although no minor is required, most students take a minor in Biochemistry. Graduate courses in Anatomy, Pathology, Parasitology, and other departments are available for those students seeking special preparation in these areas. Courses to be taken by each student will be determined by a departmental committee selected specifically for the student with his professional objectives in mind.

Students entering in September will usually enroll in one of several Biochemistry courses, Bacteriology 105, Bacteriology 110, and Bacteriology 201 in the Fall Semester; Bacteriology 120, Bacteriology 130, Bacteriology 202 and Biochemistry 106 in the Spring; two Bacteriology seminars and an additional elective course in the Fall Semester of the second year. Except for seminars, this should complete the major course requirements for the Ph.D. degree. An open book type comprehensive preliminary exam covering general microbiology, virology, immunology, and molecular biology is given to all students early in the spring of their second year. Students should begin laboratory research during their second semester in residence. Additionally, they are required to serve as laboratory assistants for one semester per year beginning in their second year. Although truly exceptional students may well be able to complete all requirements for the Ph.D. degree in three years, most students complete their work in four years.

Courses for Graduates and Advanced Undergraduates

- 100 BIOLOGY AND BIOCHEMISTRY OF MICROORGANISMS (5). Prerequisites, Biology 21, 22, or Zoology 11 or Botany 11, and Chemistry 61 or their equivalents or permission of instructor. The structure and function of bacteria and viruses and their chemical and genetic relationships are stressed. Their use as model systems for genetic, developmental and environmental studies is also explored. *Three lecture, four laboratory hours, fall.* Bassford, Bott. (Not offered 1981-1983.)
- 105 MOLECULAR AND CELLULAR BASIS OF PROKARYOTIC MICROBIOLOGY (4). Prerequisites, organic chemistry, and permission of department except for departmental majors. Basic concepts of the structure, metabolism, growth and reproduction, genetics and control and regulation of prokaryotes. *Four lecture hours a week, fall.* Bassford; staff.
- 110 IMMUNOLOGY (3). Prerequisites, organic chemistry and permission of department except for departmental majors. The molecular and cellular basis of antibody formation, hypersensitivity, resistance to infection, immunochemistry and immunogenetics. *Three lecture hours, fall.* Klapper; staff.
- 111 IMMUNOLOGY LABORATORY (2). Laboratory portion only of Bacteriology 110. *Four laboratory hours per week, fall.* (Not offered 1981-1982.) Klapper; staff.

- 112 INTRODUCTION TO MICROBIOLOGY (2). Open only to dental students. A course covering basic aspects of microbiology including sterilization, disinfection, action of antimicrobial chemotherapeutic agents, concepts of infection and immunity and the study of certain selected infectious agents. *Twenty-eight lecture hours and seven laboratory hours, spring.* Klapper; staff.
- 115 SPECIAL TOPICS IN BACTERIOLOGY OR IMMUNOLOGY (3 or more each semester). Permission of the Department required except for departmental majors. Designed to introduce the student to research methods. Minor investigative problems are conducted with advice and guidance of the staff. May be repeated for credit two or more semesters. *Hours and credit to be arranged, any term.* Staff.
- 120 MICROBIAL PATHOGENESIS (4). Prerequisites, Bacteriology 105, 110. Molecular and biological basis of pathogenic properties of bacteria. *Four lecture hours per week, spring.* Wyrick; staff.
- 130 VIROLOGY (4). Prerequisites, Bacteriology 105, 110. Current concepts of the chemistry, structure, replication, genetics and natural history of animal viruses and their host cells. *Four lecture hours a week, spring.* Newbold; staff.
- 150 CLINICAL MICROBIOLOGY (5). Prerequisites, Bacteriology 105, 110. Current concepts and techniques in laboratory diagnosis of infectious diseases and immunological disorders. *Three lecture and four laboratory hours, spring.* McCarthy; staff. (Not offered in 1981-1982.)
- 180 CELLULAR AND MOLECULAR BIOLOGY OF CANCER (3). Basic concepts of the etiology, molecular biology, genetics, immunology and clinical aspects of cancer. Lectures and discussion by members of Cancer Research Center. *Three lecture hours, fall.* Fowler; staff.
- 190 EUKARYOTIC GENE ORGANIZATION (Genetics 190) (4). Prerequisites, Organic Chemistry, permission of instructor. Basic concepts of classical chromosomal structure, function and mechanics. Eukaryotic molecular genetics and cellular regulation will be emphasized. Readings, short answer examinations, term project. *Four lecture hours, fall.* Bachheimer.
- 191 MECHANISMS OF EUKARYOTIC GENE CONTROL (Genetics 191) (3). Prerequisites, Bacteriology 190 and permission of instructor. Current research and possible new approaches to elucidating the mechanisms of eukaryotic gene control will be critically analyzed. *Three seminar hours, spring.* Fowler.
- 192 MEDICAL MYCOLOGY (Botany 192, Parasitology 192) (4). Prerequisites, general microbiology or botany and permission of instructor. Isolation, identification, epidemiology, mycoserology, and clinical importance of medically significant fungi. Identification of hyphomycetes and yeasts will be stressed. *Two lecture and four laboratory hours a week, spring.* McGinnis.

Courses for Graduates

- 201 SEMINAR IN MICROBIOLOGY (1 each). Discussion of selected topics in Microbiology. *Fall and spring.* Staff.
- 210 SEMINAR/TUTORIAL IN MICROBIAL CHEMISTRY AND GENETICS (3). One or two faculty and a small number of students will consider in depth current research of importance. Emphasis will be on current literature, invited speakers, etc., rather than textbooks. *Fall.* Hutchison.
- 211 SEMINAR/TUTORIAL IN ANIMAL VIROLOGY (3). One or two faculty and a small number of students will consider in depth current research of importance. Emphasis will be on current literature, invited speakers, etc., rather than textbooks. *Fall.* Staff.
- 212 SEMINAR/TUTORIAL IN IMMUNOLOGY (3). One or two faculty and a small number of students will consider in depth current research of importance. Emphasis

- will be on current literature, invited speakers, etc., rather than textbooks. *Fall*. Staff.
- 213 SEMINAR/TUTORIAL IN THE BIOLOGY OF CANCER: VIRUSES AND THE IMMUNE RESPONSE (3). One or two faculty and a small number of students will consider in depth current research of importance. Emphasis will be placed on current literature, invited speakers, etc., rather than textbooks. *Fall*. Staff.
- 214 SEMINAR/TUTORIAL IN BACTERIAL STRUCTURE AND PATHOGENESIS (3). Prerequisites, Bacteriology 120 and permission of instructor except for departmental majors. One or two faculty and a limited number of students will consider in depth current concepts relating to structure and pathogenesis of bacteria. *Fall*. Staff.
- 275 GENETICS SYSTEMS (Biochemistry 275, Botany 275, Genetics 275, Pathology 275) (3). An advanced course open to students in genetics and required for trainees in genetics. Each member of the Curriculum in Genetics will present information and problems in the areas of specialization and the organism with which he or she works. *Fall*. Staff.
- 301 RESEARCH IN BACTERIOLOGY OR IMMUNOLOGY (3 or more each semester). Permission of the department required. Designed to introduce the student to research methods and special techniques. Short term problems are conducted with advice and guidance of the staff. May be repeated for credit two or more semesters. *Hours and credit to be arranged, any term*. Staff.
- 393 MASTER'S THESIS (3 or more each semester). Staff.
- 394 DOCTORAL DISSERTATION (3 or more each semester). Staff.
- 400 GENERAL REGISTRATION (0).

DEPARTMENT OF BIOCHEMISTRY AND NUTRITION

MARY ELLEN JONES, *Chair*

Professors

MICHAEL CAPLOW	(16)	Chemistry of Microtubules
DONALD T. FORMAN	(38)	Clinical Biochemistry; Enzymology, Tumor Markers; Lipid Metabolism
EDWARD B. GLASSMAN	(40)	Genetics and Alcohol Metabolism
JAN HERMANS	(46)	Structure and Physical Chemistry of Proteins
J. LOGAN IRVIN	(52)	Molecular Biology; Isolation and Functions of Histones; Basic Proteins in Spermatogenesis
MARY ELLEN JONES	(54)	Enzymology; Regulation of Metabolism; Ornithine, Proline, Arginine and UMP Biosynthesis
MORRIS A. LIPTON	(64)	Neuropharmacology, Neuroendocrinology; Nutrition and Behavior
ROGER L. LUNDBLAD	(67)	Isolation and Mechanism of Action of Blood-Clotting Proteins
GERALD L. MECHANIC	(76)	Connective Tissue Biochemistry and Structure of Collagen
PIERRE MORELL	(85)	Neurochemistry; Metabolism of Myelin; Axonal Transport
RALPH PENNIALL	(97)	Studies of Cellular Aging and Function of Phosphate in Higher Organisms; Nuclear Protein Phosphorylation and Gene Activation
CLAUDE PIANTADOSI	(100)	Lipid Chemistry; Synthesis Oriented Biochemistry
GEORGE K. SUMMER	(121)	Biochemical Regulation; Human Biochemical Genetics; Analytical Biochemistry
ROBERT H. WAGNER	(127)	Biochemistry of Blood Coagulation
JAMES R. WHITE	(133)	Mechanism of Action of Antibiotics; Nucleic Acid Metabolism
JOHN E. WILSON	(136)	Neurochemistry; Metabolic Correlates of Experience or Behavior; Environmental Neurotoxins
RICHARD V. WOLFENDEN	(139)	Transition State Analogs for Enzyme Catalysis; Affinities of Biological Compounds of Solvent Water

Associate Professors

FRED E. BELL	(4)	Protein Biosynthesis; Mechanism of Enzyme Action
CHARLES W. CARTER, JR.	(19)	Protein Stereochemistry in Catalysis and Recognition; Nucleoprotein Structure and Function; Electron-Transfer Proteins
CHI-BOM CHAE	(22)	Gene Regulation; Chromosomal Proteins and their Functions; Globin Genes

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|------------------------|------|--|
| JACK GRIFFITH | (41) | Chromosome Structure; Viruses and their Hosts |
| DAVID J. HOLBROOK, JR. | (49) | Nucleic Acid and Protein Metabolism; Biochemical Effects of Toxic Agents |
| BARRY R. LENTZ | (62) | Biomembrane Structure and its Relationship to Function; Membrane Structure in Diseased State; Physical Chemistry of Phospholipid Model Membranes |
| JAN M. McDONAGH | (73) | Biochemistry of Blood Coagulation and Fibrinolysis |
| GERHARD W. MEISSNER | (79) | Structure, Function and Assembly of Membranes; Excitation-Contraction Coupling in Muscle |
| SHIHADAH N. NAYFEH | (88) | Mechanism of Action of Steroid and Polypeptide Hormones in Normal and Neoplastic Cells |

Assistant Professors

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|---------------------|-------|--|
| KEITH W. BURRIDGE | (14) | Cell movement; Biochemistry of the Acting Cytoskeleton |
| STEPHEN G. CHANEY | (25) | Molecular Biology; RNA Metabolism; Protein Synthesis |
| PATRICIA A. MANESS | (68) | The Biochemical Basis of Malignant Transformation |
| RONALD I. SWANSTROM | (123) | Interaction of Retroviruses with the Host Genome |
| MICHAEL D. TOPAL | (126) | Fidelity of DNA Replication; Chemical Mutagenesis; Chemical Carcinogenesis |
| THOMAS W. TRAUT | (128) | Enzymology and Enzyme Complexes; Pyrimidine Nucleotide Metabolism |

Research Professors

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|---------------------|------|---|
| ARISTOTLE J. DOMNAS | (35) | Sterol Biochemistry of Plant and Animal Parasites |
| DAVID G. KAUFMAN | (53) | DNA Replication; Carcinogenesis |

Research Associate Professors

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|--------------------|-------|--|
| ROBERT E. CROSS | (31) | Clinical Biochemistry |
| JOHN E. HAMMOND | (42) | Clinical Chemistry |
| DARREL W. STAFFORD | (118) | Control of Gene Transcription; DNA Sequencing; Recombinant DNA |

Research Assistant Professors

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|-----------------------|-------|---|
| FREDERICK A. DOMBROSE | (32) | Blood Coagulation Enzymology; Protein-Lipid Membrane Interactions |
| ROY R. HANTGAN | (44) | Molecular Basis of Blood Coagulation; Structure of Proteins in Solution |
| LAWRENCE M. SILVERMAN | (113) | Tumor Markers; Clinical Enzymology |
| ARREL D. TOEWS | (125) | Neurochemistry; Axonal Transport; Nervous System Membrane Metabolism |

ELIZABETH M. WILSON (134) Androgen Regulation of Gene Transcription

Adjunct Associate Professors

THOMAS A. KRENITSKY (145) The Use of Enzymes as Synthetic Catalysts; Inhibition, Specificity, and Mechanisms of Enzymes; Regulation of Pathways

STEVEN S. LI (65) Protein Structure Function; Biochemical Genetics

GEORGE W. LUCIER (66) Metabolism and Binding of Foreign Chemicals and Steroids in Developing Systems

CAROL M. SCHILLER (107) Gastrointestinal Function and Toxicology

BOYD R. SWITZER (124) Nutritional Biochemistry

Adjunct Assistant Professor

TERRI DAMSTRA (34) Behavioral and Neurotoxicology

DIANNE M. FRAZIER (37) Nutrition and Immunochemistry

MARVIN I. SIEGEL (148) Hormonal Mechanisms; Arachidonate Acid Metabolism

Emeritus Professors

CARL E. ANDERSON

MICHAEL K. BERKUT

HOWARD A. SCHNEIDER

The field of biochemistry applies and extends the concepts of chemistry and physics to the investigation of biological problems. The Department of Biochemistry and Nutrition is located in the Faculty Laboratory Office Building. As part of the Graduate School, it offers training leading to the M.S. and Ph.D. degrees in Biochemistry. There are about 50 graduate students in the Department. Strong emphasis is placed on training students to meet future challenges in the study of the biochemistry of living systems and molecular biology. Research programs are being conducted in molecular biology, genetics, proteins, mechanism and regulation of enzymes, physical biochemistry, cellular membranes and ion transport, nucleic acids, lipids, steroids, metabolic control mechanisms and diseases, chromatin and histones, antibiotics, neurochemistry, blood coagulation, clinical biochemistry, biochemical toxicology, and cancer research.

For detailed information concerning published research papers of the faculty of the Department of Biochemistry and Nutrition, it is recommended that the American Chemical Society Directory of Graduate Research or the reference librarian of a university-affiliated library be consulted. Some additional information can also be obtained by writing to the Director of Graduate Studies, Department of Biochemistry and Nutrition.

Fellowships and Research Assistantships

Predoctoral Fellowships and Research Assistantships: These fellowships, limited in number, are designed to support graduate students working toward the M.S. or Ph.D. degree. Stipend: \$6,287 for 12 months, with tuition allowances. All applicants are considered for these awards. After the second year, graduate students are eligible to receive travel awards for the purpose of presenting papers at national scientific meetings.

Postdoctoral Fellowships and Research Associateships

A number of postdoctoral fellowships are available to persons who have acquired the Ph.D. degree in biochemistry, genetics, chemistry, biophysics, or biology. Persons who have received the M.D., the D.D.S., or the D.V.M. degree are also eligible for these fellowships. Stipends will vary depending upon experience and arrangements must be made with the faculty sponsor.

Requirements for Admission

The Department of Biochemistry will entertain applications from students who have majored or minored in one of the following disciplines: biochemistry, chemistry, genetics, biology (zoology or botany), physics, mathematics, bacteriology, pharmacy. All undergraduates who intend to have a career in biochemistry are urged to take differential and integral calculus, organic chemistry, physical chemistry, physics, general biology, and at least six semester hours credit in French, German or Russian, although these are not absolute requirements for admission. Students with deficiencies in training and in background will be required to make these up in the first year of study. All applicants will be required to score well on the Graduate Record Examination prior to acceptance.

Requirements for the Ph.D. Degree

Candidates for the Ph.D. degree in Biochemistry must be well trained in the fundamentals of chemistry, physics, biology and mathematics, in addition to biochemistry. Although a minor program is not required, students may take minors. All students must earn at least nine semester hours of graduate credit in courses outside biochemistry. A student's program of courses outside of biochemistry will be designed to meet individual needs. A reading knowledge of French, German or Russian is required.

Departmental requirements will vary to suit the needs of individual students. However, all candidates will be required to take a selection of courses from the Core Curriculum. All students should have completed an introductory biochemistry course equivalent to Biochemistry 100 before

registering for any of the Core Courses. The Core Courses include Biochemistry 104, 105, 106, 108, 133, 134, 205 and 207. All students will be required to take Biochemistry 205 and 207. Students will be permitted to elect any four of the six remaining Core Courses so that the Core Curriculum for any student will consist of a total of six Core Courses.

In addition to the Core Curriculum, the Ph.D. candidate will be permitted to take up to 27 semester hours of elective courses (not including Research) of which at least 6 semester hours should be in seminar courses. The most important requirement is a dissertation on original research independently carried out by the candidate.

Courses for Graduates and Advanced Undergraduates

- 100 BIOCHEMISTRY FOR STUDENTS OF BIOLOGY AND CHEMISTRY (Chemistry 107) (Neurobiology 100) (Zoology 107) (3). Prerequisites, Chemistry 61 and one course in biology. Lectures on the mechanism and regulation of reactions in living organisms, with emphasis on general principles. Protein structure and enzyme function; central pathways in intermediary metabolism; metabolic control; expression of genetic information; molecular disease. *Fall*. Wolfenden and staff. *Spring*. Meissner.
- 100L BIOCHEMISTRY LABORATORY (2). Prerequisite or corequisite, Biochemistry 100. Laboratory for Biochemistry 100. Includes experiments on cell growth, subcellular fractionation, isolation and kinetic studies on enzymes, intermediary metabolism; preparation and biosynthesis of macromolecules, fractionation of lipids, utilizing modern research techniques in biochemistry. *Four Laboratory hours a week, fall and spring*. Chac.
- 101a BIOCHEMISTRY FOR DENTAL STUDENTS (2). Prerequisite, Chemistry 62, or equivalent. This course may be taken by qualified students who are not majoring in biochemistry. *Fall*. Bell; staff.
- 101b BIOCHEMISTRY FOR DENTAL STUDENTS (2). Continuation of 101a. *Spring*. Bell; staff.
- 103 COMPARATIVE AND EVOLUTIONARY BIOCHEMISTRY (Botany 123) (3). Prerequisite, Biochemistry 100 or equivalent. Lectures and discussions dealing with various evolutionary solutions to conducting essential biological processes such as osmotic regulation, respiration, nitrogen metabolism and energy storage. *Spring*. Domnas, Morell, Humm.
- 104 INTERMEDIARY METABOLISM (3). Prerequisite, Biochemistry 100 or equivalent. Metabolic pathways, mitochondrial electron transfer, their integration and regulation. *Spring*. Penniall, Wilson.
- 105 MOLECULAR BIOLOGY (3). Prerequisite, Biochemistry 100 or equivalent. Mechanisms of replication, transcription, and translation of genetic material in prokaryotic and eukaryotic systems, gene sequence and organization, biochemical genetics, and regulatory mechanisms. *Fall*. Holbrook (Coordinator).
- 106 MOLECULAR MECHANISMS IN BIOCHEMISTRY (3). Prerequisite, Biochemistry 100 or equivalent. An analysis of enzyme catalysis and related biological processes such as energy transfer in muscle contraction in regulatory processes. *Spring*. Caplow, Jones, Wolfenden.
- 108 LIPID AND MEMBRANE BIOCHEMISTRY (3). Prerequisite, Biochemistry 100 or equivalent. Chemistry and structure of complex lipids and lipoproteins; cell fractionation, membrane structure, function and assembly; intercellular communication and ion transport. *Spring*. Meissner, Lentz.

- 115 SKILLS IN TEACHING BIOCHEMISTRY AND OTHER SCIENCES (3). Prerequisite, a major or minor in any science. Participants will work together in small *learning groups*. A likely outcome is an increase in the level of skills associated with the types of teaching used in colleges and universities (lectures, seminars, discussion groups, individual study, etc.); and an increased ability to think creatively about teaching. A minimum of 10 students is necessary. *Fall*. Glassman.
- 124 PLANT BIOCHEMISTRY (Botany 124) (3). Prerequisite, Chemistry 61. Study of carbohydrates, lipids, N₂ fixation, NO₂, and NO₃ reduction, pigments and photosynthesis, and respiration of plants. *Spring*. (1983 and alternate years.) Domnas.
- 130 PROTEIN CHEMISTRY (Chemistry 130) (3). Prerequisite, Chemistry 107 or consent of instructor. Topics will include: structural properties of proteins; active site chemistry; chemical modification of proteins; metalloproteins; coenzyme-enzyme interactions; organization of enzyme systems. *Spring*. Harrison, Hiskey, Spemulli.
- 131 NUCLEIC ACID CHEMISTRY (Chemistry 131) (3). Prerequisites, Chemistry 62. Biochemistry 100 or equivalent or permission of instructor. Study of the reactions and chemical properties basic to nucleic acids; chemical synthesis as well as biosynthesis; nucleic acids in protein biosynthesis. *Spring*. Spemulli.
- 133 PHYSICAL BIOCHEMISTRY (3). Prerequisites, Biochemistry 100, Chemistry 181 and 182 or equivalent. (Chemistry 181 may be taken concurrently.) Theory and methods applicable to the study of macromolecules. Topics discussed will include transport and spectroscopy, conformational analysis and multiple equilibria. *Fall*. Hermans, Lentz, Hantgan.
- 134 CASE STUDIES IN STRUCTURAL MOLECULAR BIOLOGY (3). Prerequisite, Biochemistry 100 or equivalent. Isolation methods; principles of macromolecular structure and function with emphasis on proteins, molecular assemblies, and ATP enzymology. *Fall*. Carter.
- 137 MEMBRANE CHEMISTRY (Chemistry 137) (3). Prerequisites, Chemistry 62, Zoology 11, and Biochemistry 100 or equivalents; corequisite or prerequisite, Chemistry 180, 181, or 183 or equivalent; or permission of instructor. Structure and properties of synthetic membranes and naturally-occurring biological membranes; discussion of relation between properties of synthetic membranes and functioning of natural membranes. *Spring*. Biochemistry and Chemistry Faculty.
- 140 CLINICAL CHEMISTRY (3). Prerequisite or corequisite, Biochemistry 100 or equivalent. Permission of the instructor. Techniques for the measurement of chemical constituents in biological materials and significance of laboratory measurements in the study of human disease. *Three lecture hours per week, fall or spring*. Forman, Cross, Hammond, McLendon, Nayfeh, Silverman.
- 142 BIOCHEMICAL TOXICOLOGY (Toxicology 142) (3). Prerequisites, Biochemistry 100, and one additional biochemistry course (or permission of Coordinator). Biochemical actions of toxicants, and assessment of cellular damage by biochemical measurements. Course intended primarily for graduate students. *Spring*. Holbrook (Coordinator).
- 180 DNA AND CELL PATHOLOGY (Genetics 180) (Pathology 180) (3). Prerequisites, Biochemistry 100 and permission of the instructor. The basic chemistry of DNA and its associated structural and replicative proteins as it relates to mechanisms of mutagenesis and carcinogenesis. *Three lecture hours a week, spring*. (1983 and alternate years.) Topal.

Courses for Graduates

- 205 RESEARCH TOPICS IN BIOCHEMISTRY (3). Prerequisites, Biochemistry 100 or equivalent and permission of the Coordinator. Seminar and Critical Study of Modern Research topics in Biochemistry under the supervision of individual Biochemistry Faculty. *Fall*. Nayfeh; staff.

- 207 ADVANCED BIOCHEMISTRY LABORATORY (4). Prerequisite, Biochemistry 100 or equivalent. A laboratory course designed to acquaint graduate students majoring in Biochemistry with the equipment and methods used in modern biochemical research. *Twelve laboratory hours a week, either semester.* Staff.
- 211 APPLICATION OF DIGITAL COMPUTERS IN BIOCHEMICAL RESEARCH (2). Prerequisite, permission of instructor. Use of computers for automated collection, transmission and processing of research data for instrumental control and for evaluation of theoretical models. In alternate years, course will be offered at different level; it may be repeated once for credit. Maximum number of students admitted will be determined by availability of equipment. *Spring.* Hermans.
- 220 NUCLEIC ACID METABOLISM AND REGULATORY MECHANISMS (3). Prerequisite, Biochemistry 105. A lecture course on nucleic acid metabolism and its regulatory mechanisms; DNA replication, restriction enzymes, gene isolation, RNA synthesis, protein synthesis, DNA repair, DNA and RNA sequencing, and methodology. *Spring.* (1984 and alternate years.) Chae, Holbrook (Cocoordinators).
- 227 NEUROCHEMISTRY (Neurobiology 227) (3). Prerequisites, two semesters of Biochemistry. An introductory course in the biochemistry of the nervous system. Topics include aspects of energy metabolism, ion movements, neurotransmitters, intermediary metabolism and the metabolism of macromolecules in the nervous system. *Fall.* (1982 and alternate years.) Wilson, Morell.
- 228 ADVANCED TOPICS IN PROTEIN CHEMISTRY (Pathology 228) (3). Prerequisite, Biochemistry 100 or equivalent. A discussion of the chemical approaches to the elucidation of the structure of simple and complex proteins. Special topics will include normal and abnormal hemoglobins, proteins involved in biological matrices and glycoproteins. *Spring.* (1983 and alternate years.) Lundblad.

The following Seminar Courses are designed for students who are majoring or minoring in Biochemistry and who wish to further their knowledge in particular areas. Unless otherwise stated, two semesters of Biochemistry are prerequisites for Seminar Courses. Most of these courses are given in alternate years by interested staff members. Students may register for only one seminar a semester but may audit any number. Unless otherwise stated, these seminars may not be repeated for credit. Seminar courses provide teaching experience which is required for a graduate degree in Biochemistry and Nutrition.

- 224 SEMINAR IN MEMBRANE STRUCTURE AND FUNCTION (3). Prerequisite, Biochemistry 108. Students organize and present in depth seminars on selected topics of modern membrane research. *Fall.* (1983 and alternative years.) Lentz, Meissner.
- 225 BIOENERGETICS AND MITOCHONDRIAL BIOGENESIS (3). Prerequisite, Biochemistry 104, or equivalent. A consideration of the mechanisms for the conservation and interconversion of free energy in eukaryotic cells; including consideration of the influences of development, aging and toxic substances on mitochondrial contents and function. *Fall.* (1982 and alternate years.) Penniall.
- 230 SEMINAR IN BIOLOGICAL MACROMOLECULES I. PROTEINS (3). Prerequisite, Biochemistry 130 or 134 or 228. (*Either semester as announced.*) Hermans, Carter.
- 231 SEMINAR IN BIOLOGICAL MACROMOLECULES II. NUCLEIC ACIDS (3). Prerequisite, two semesters of biochemistry including Biochemistry 105. *Spring.* (1983 and alternate years.) Bell, Chaney.

- 232 SEMINAR IN STRUCTURE AND FUNCTION OF CHROMATIN AND GENES (3). Prerequisite, Biochemistry 105 or equivalent. Covers the structural organization of chromatin and eukaryotic genes and regulation of gene transcription. *Fall*. (1982 and alternate years.) Chae; staff.
- 233 SEMINAR IN BIOCHEMICAL REGULATION (3). Prerequisites, two semesters of biochemistry. *Spring*. (1983 and alternate years.) Wilson, Jones, Traut.
- 234 SEMINAR IN PROTEIN BIOSYNTHESIS (3). Prerequisites, two semesters of biochemistry including Biochemistry 105. *Spring*. (1984 and alternate years.) Bell.
- 235 SEMINAR IN CHEMICAL NEUROBIOLOGY (Neurobiology 235) (3). Prerequisites, two semesters of biochemistry. *Fall*. (1983 and alternate years.) Wilson, Morell.
- 240 SEMINAR IN LIPID METABOLISM (3). Prerequisite, Biochemistry 104 or 108 or equivalent. *Spring*. (1984 and alternate years.) Morell.
- 241 SEMINAR ON SPECIAL TOPICS IN BIOCHEMICAL RESEARCH (3). Prerequisites, two semesters of biochemistry. Covers areas of biochemical research that are currently active and productive. Specific subjects will be announced. May be repeated for credit. (Either semester as announced.) Staff.
- 242 SEMINAR IN CLINICAL BIOCHEMISTRY (3). Prerequisite, permission of instructor. Current topics in Clinical Biochemistry including analytical methodologies and clinical interpretation. *Spring, fall, or summer*. Silverman.
- 275 GENETICS SYSTEMS (Bacteriology 275, Genetics 275, Botany 275, Pathology 275, Zoology 275) (3). An advanced course in genetics emphasizing the genetics and molecular biology of viruses, bacteria, fungi, insects and mammals based upon the personal research of the staff. Required of all candidates for the degree in Genetics. *Fall*. (1982 and alternate years.) Staff.
- 301 RESEARCH IN BIOCHEMISTRY (3 or more). Prerequisite, permission of the department. *Six or more hours a week, throughout both semesters, when requested*. Staff.
- 310 RESEARCH IN NEUROBIOLOGY (Neurobiology 310, Pathology 310, Pharmacology 310, Physiology 310, Zoology 310, Psychology 310) (3-12). Prerequisite, permission of a staff member. Research in various aspects of neurobiology. *Six to twenty-four hours a week, fall and spring*. Faculty of the Neurobiology Program.
- 393 MASTER'S THESIS (3 or more). Staff
- 394 DOCTORAL DISSERTATION (3 or more). Staff.
- 400 GENERAL REGISTRATION (0).

CURRICULUM IN BIOMEDICAL ENGINEERING AND MATHEMATICS

NORMAN A. COULTER, JR., *Chairman*

Professors

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|---------------------|------|---|
| CHARLES BAKER | (4) | Communication Theory, Stochastic Processes, Functional Analysis |
| *N. A. COULTER, JR. | (1) | Hemodynamics, Neural Information Processing, Teleogenic System Theory |
| JAN HERMANS | (5) | Molecular Biophysics |
| *R. N. JOHNSON | (27) | Evoked Potentials, Epilepsy, Computer Applications |
| W. ROBERT MANN | (9) | Iteration Theory, Numerical Methods in Partial Differential Equations |
| PAUL G. SHINKMAN | (11) | Visual Neurophysiology, Brain-Behavior Relations |
| BARRY L. WHITSEL | (12) | Somatosensory System |
| BENSON R. WILCOX | (13) | Pulmonary Circulatory Hemodynamics and Cardiovascular Physiology |

Associate Professors

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|--------------------|------|--|
| *FRANK A. DIBIANCA | (32) | Digital Medical Imaging; Microelectronics Applications, Radiologic Physics |
| *HENRY S. HSIAO | (3) | Medical Instrumentation, Cardiovascular Dynamics, Insect Behavior |
| RICHARD JOHNSTON | (6) | Internal Radiation Desimetry, Nuclear Medicine Instrumentation |
| LAWRENCE L. KUPPER | (7) | Regression Analysis, Statistical Applications in Public Health |
| STEPHEN M. PIZER | (23) | Medical Image Processing |
| D. M. WOOD | (14) | Computer Applications, Instrumentation, Experimental Design |
| L. R. YONCE | (15) | Cardiovascular Physiology |

Assistant Professors

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|-------------------|------|--|
| *J. J. BRICKLEY | (28) | Clinical Neurophysiology, Evoked Potentials, Computer Applications |
| *CAROL L. LUCAS | (24) | Hemodynamics, Pulmonary Circulation, Mathematical Modeling |
| *STEPHEN R. QUINT | (29) | CNS Evoked Potentials, EEG Spectral Analysis, Cerebral Blood Flow |

Research Assistant Professors

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|-----------------|------|--|
| *ELIE G. HAYECK | (31) | Biomedical Computing and Patient Data Base |
| *ROY H. PROPST | (33) | Applications of Hybrid Microelectronics |

Adjunct Professors

RALPH W. STACY	(26)	Physiological Effects of Pollutants, Cardiovascular Biophysics, Bio- medical Computing
C. FRANK STARMER	(18)	Hemodynamics, Pattern Recognition, Clinical Decision-Making

Adjunct Associate Professor

MICHAEL L. MCCARTNEY	(30)	Biomedical Ultrasonic Applications
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Adjunct Assistant Professor

MICHAEL D. FEEZOR	(17)	Bioelectric Signal Processing
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*Core Faculty

Biomedical Engineering and Mathematics is a new field stressing the application of engineering techniques and mathematical analysis to biomedical problems. The Curriculum offers graduate education in this field leading to the Master of Science and Doctor of Philosophy degrees.

Students enter this program with a wide variety of backgrounds—some in engineering or physical science, some in mathematics, some in biological science. Curricula are tailored to fit the needs and develop the potentials of individual students. All students take the courses of the core curriculum (described below)—with exceptions if they have had equivalent courses elsewhere. In addition, courses in biostatistics, computer science, physiology, and mathematics or engineering provide a well-rounded background of knowledge and skills.

This program is fortunate in its intimate association with faculty of the School of Medicine. It enjoys close working relations with the Departments of Physiology, Biostatistics, Statistics, Computer Science, Mathematics, and the School of Engineering at Raleigh. It also has close working relations with the Neurobiology Program. These associations enable students to obtain research training in a wide variety of fields and facilitate the selection and performance of dissertation research. The student is thus provided with excellent opportunities to realize the basic goal of those who choose careers in this field—the enhancement of medical care for the society in which we live through the application of modern technology.

Admission Requirements

There is no fixed set of requirements for entrance into this program. In general, the student must satisfy the entrance requirements for the Graduate School of The University of North Carolina at Chapel Hill and must

have demonstrated interest and capability commensurate with the quality designed into this program.

It is recommended that the student have a good working knowledge of mathematics at least through differential equations, plus two years of physical or engineering science and basic courses in biological science. Where deficits in this preparation are encountered, they can be made up in the first year or so of graduate training.

Requirements for Degrees

Candidates for degrees in Biomedical Engineering and Mathematics must have met the general requirements of the Graduate School. Degree candidates in this program will be expected to obtain experience working in a research laboratory during their residence here, and to demonstrate proficiency in both teaching and research. For the Ph.D. degree, the dissertation should be adjudged by the graduate committee to be of publishable quality.

Courses for Graduates and Advanced Undergraduates

- 102 INTRODUCTION TO BIOMECHANICS (4). Prerequisites, Physics 26, BMME 120, and BMME 131 or equivalent, and permission of the instructor. Fundamental principles of mechanics, biologically exemplified, are presented, including solid and fluid mechanics applied to cardiovascular respiratory, cerebrospinal fluid and musculoskeletal systems. Minicomputer simulations are used to demonstrate system properties. *Spring*. Brickley.
- 103 INTRODUCTION TO BIOELECTRICITY (4). Prerequisites, Physics 27, BMME 111, BMME 120, BMME 131, or equivalent, and permission of the instructor. Fundamental principles of electromagnetism, biologically exemplified, are presented. Circuit models and volume conductor theory are applied at all biological levels. Minicomputer simulations are used to demonstrate bioelectric properties. *Fall*. Brickley.
- 111 BIOMEDICAL INSTRUMENTATION (3). Prerequisites, Mathematics 32 or equivalent, and permission of the instructor. Designed for students who do not have and want experience in electronics. The fundamentals of circuit microprocessors theory and practical circuit design are presented in the context of biological applications. This course includes a laboratory and individual student projects. *Fall*. Hsiao.
- 112 INTRODUCTION TO BIOMATERIALS (3). Prerequisites, Physiology 140 or equivalent. The interaction between non-living implants and living tissue is studied, with emphasis on the properties of implant materials. *Spring*. Hsiao and Coulter.
- 120 BIOMEDICAL COMPUTER APPLICATIONS (3). Prerequisite, Computer Science 16 or equivalent. Introduction to digital and analog computers for on-line, real-time processing of biomedical signals. Assembly language programming is stressed with applications ranging from control of peripheral devices to interactions with higher level languages. *Fall*. Quint.
- 121 INTRODUCTION TO BIOMEDICAL DATA PROCESSING (3). Prerequisite, Computer Science 16 or equivalent. This is an introduction to methods of automatic computation of special relevance to bio-medical problems. Sampling theory, analog-to-digital conversion, digital filtering, will be explored in depth. *Spring*. Lucas.

- 122 INTRODUCTION TO BIOMEDICAL DATABASE SYSTEMS (3). Prerequisite, Computer Science 16 or equivalent. Relational, hierarchial, and network data models are applied to medical systems. Management of system integrity, security, and reliability is discussed. *Fall*. Hayeck.
- 131 INTRODUCTION TO BIOMATHEMATICS (3). Prerequisite, Mathematics 32 or equivalent. An introduction to the dynamic analysis of biological systems, including: differential equations of behavior, transient response, Fourier analysis and frequency response, and applications of the LaPlace transform in biology and medicine. *Fall*. Lucas.
- 132 BIOLOGICAL CONTROL THEORY (3). Prerequisite, BMME 131 or equivalent. Linear control systems analysis and design are presented, with emphasis on biological applications. Frequency and time domain characteristics and stability criteria are studied. *Fall* Quint.
- 140 INTRODUCTION TO MEDICAL IMAGING TECHNIQUES AND INSTRUMENTATION (3). Prerequisites, Physics 27 and Mathematics 32. Modern medical diagnostic imaging techniques and instrumentation are studied including computer tomography, classical and digital radiography, nuclear medicine and other technologies. Emphasis is placed on digital instrumentation and image analysis. *Spring*. DiBianca.

Courses for Graduates

- 201 ADVANCED BIOMEDICAL INSTRUMENTATION (3). Prerequisite, BMME 111 or permission of the instructor. Topics include analysis of medical instrumentation with emphasis on pressure, flow, bioelectric, and ultrasonic transducers. This course includes a laboratory and interfaces microprocessors with transducers. Students are given the opportunity to design and fabricate original devices. *Spring*. Hsiao.
- 202 APPLICATIONS OF MICROELECTRONICS TO MEDICINE (3). Prerequisites, BMME 111, BMME 201, Physiology 140, or equivalent, and permission of the instructor. Principles of integrated circuit design for implantable biomedical devices are studied. *Spring*. Hsiao.
- 203 BIOMEDICAL APPLICATIONS OF MICROPROCESSORS (3). Prerequisites, BMME 111 or equivalent, and permission of instructor. Fundamental principles of microprocessor based medical instrumentation are presented. Students are given practical experience in medical instrument design in laboratory. *Fall*. Hsiao.
- 220 ADVANCED BIOMEDICAL COMPUTER APPLICATIONS (3). Prerequisite, BMME 120. Problems of interfacing minicomputers with biomedical devices and systems are studied, with projects including process control, data acquisition, disk system interfaces and serial, parallel and DMA interfaces between interconnected minicomputers. *Spring*. Johnson.
- 221 NEURAL INFORMATION PROCESSING (3). Prerequisites, BMME 101 and Physiology 140 or equivalent. This approaches the nervous system as a data processing network, the brain as the computer for a homeostat. *Spring*. (Alternate years.) Coulter.
- 222 HEMODYNAMICS (3). Prerequisites, BMME 102, Physiology 140 or equivalent. The dynamics of blood flow in blood vessels is studied from the standpoint of modern continuum mechanics. Mathematical models of cardiac action and cardiovascular regulation are included. *Fall*. Coulter.
- 223 ADVANCED BIOMEDICAL SIGNAL PROCESSING (3). Prerequisites, BMME 121, BMME 131, BMME 132 or equivalent. Advanced techniques for analyzing biomedical systems and signals are presented, including signal characterization, pattern recognition, and parameter estimation. Examples from biomedical literature are studies. *Spring*. Johnson.

- 231 SPECIAL TOPICS (Hours to be arranged). Prerequisite, permission of the instructor. Special library and/or laboratory work on an individual basis on specific problems in biomedical engineering and biomedical mathematics. Direction of students will be on a tutorial basis, and subject matter will be selected on the basis of individual needs. *Every semester*. Staff.
- 232 ADVANCED BIOLOGICAL CONTROL THEORY (3). Prerequisite, BMME 132 or equivalent. Advanced methods of linear and non-linear control are addressed, with applications to both engineering and biological systems, including solutions using the digital computer. *Spring*. Quint.
- 241 SEMINAR (1). Prerequisite, none. Regular seminars on topics of current interest given by staff members, visiting professors, and advanced students. Attendance required of all students in the biomedical engineering-biomedical mathematics program. Staff.
- 301 ADVANCED TOPICS IN BIOMEDICAL ENGINEERING AND BIOMEDICAL MATHEMATICS (Hours to be arranged). Prerequisite, BMME 101 or equivalent. Advanced topics in the field will be covered in depth from one of the following areas: Bioelectricity, Biomechanics, Hemodynamics, Neural Information Processing, Bioacoustics, Biomathematical Models, and Biological Control Systems. *On demand*. Staff.
- 311 RESEARCH IN BIOMEDICAL ENGINEERING AND BIOMEDICAL MATHEMATICS (Hours to be arranged). Prerequisite, permission of the instructor. Staff.
- 393 MASTER'S THESIS (Hours to be arranged).
- 394 DOCTORAL DISSERTATION (Hours to be arranged).
- 400 GENERAL REGISTRATION (0).

DEPARTMENT OF BOTANY

TOM K. SCOTT, *Chairman*

Professors

EDWARD G. BARRY	(1)	Genetics
C. RITCHIE BELL	(2)	Systematics
R. MALCOLM BROWN, JR.	(3)	Cell Biology, Ultrastructure
ARISTOTLE J. DOMNAS	(5)	Biochemistry
MAX H. HOMMERSAND	(6)	Phycology, Physiology
WILLIAM J. KOCH	(7)	Mycology
JAN J. KOHLMEYER	(16)	Mycology
LINDSAY S. OLIVE	(11)	Mycology
ALBERT E. RADFORD	(13)	Systematics
TOM K. SCOTT	(14)	Physiology

Associate Professors

WILLIAM C. DICKISON	(4)	Morphology, Anatomy
PATRICIA G. GENSEL	(15)	Paleobotany, Morphology
ANN G. MATTHYSSE	(9)	Plant Physiology
CLIFFORD R. PARKS	(12)	Systematics, Genetics
ROBERT K. PEET	(10)	Ecology
PETER M. VITOUSEK	(22)	Ecology

Adjunct Professor

HELMUT H. LIETH	(8)	Ecology
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Adjunct Associate Professors

JIMMY R. MASSEY	(23)	Systematics
MICHAEL R. MCGINNIS	(25)	Mycology, Medical Mycology
GEORGE V. SOVOCOL	(26)	Biochemistry

Research Professor

PAUL C. MANGELSDORE	(18)	Genetics
ROGERS MCVAUGH	(24)	Systematics

Emeritus Professors

JOHN H. COUCH	(20)	Mycology
VICTOR A. GREULACH	(21)	Physiology

The Department of Botany offers graduate work leading towards the degrees of Master of Arts, Master of Science, and Doctor of Philosophy. The master's degree helps to qualify students for positions as teachers in high school and junior colleges, as research assistants, and as botanical technicians. The doctor's degree prepares the student for teaching and research positions in colleges and universities, and for research positions in a variety of government, private, and industrial research laboratories.

The Department has well-equipped research laboratories for mycology, phycology, plant physiology, cytology, microbial genetics, paleobotany, plant anatomy and microtechnique, taxonomy, plant ecology, and plant biochemistry. Its library has a fine collection of standard classical works of prime importance in research. Particular attention has also been given to American publications in botany of historical importance. It contains a majority of the important botanical journals, as well as thousands of books and reprints. The Coker Arboretum and the North Carolina Botanical Garden areas are of much value to students in the study of special problems. The Herbarium, containing more than 550,000 specimens, is especially rich in collections of the vascular plants and fungi of the Carolinas and the Southeastern United States. The Department also has a modern well-equipped Electron Microscopy Laboratory. An Hitachi-HU-11E Electron Microscope, a Balzers Freeze Etch Instrument, ultramicrotomes, vacuum evaporators, etc. are available for training and research in plant ultrastructure. Biochemical and molecular biological research laboratories are fully equipped with centrifuges, ultracentrifuges, liquid scintillation counters, gas-liquid chromatography, etc. The Department maintains a modern photographic and art laboratory.

The staff is prepared to direct the study and research of graduate students in the following fields of botany: (1) mycology; (2) phycology; (3) physiology; (4) plant cell biology and ultrastructure; (5) molecular biology of plant systems; (6) genetics; (7) taxonomy; (8) anatomy and morphology of the vascular plants; (9) geobotany, particularly of the Southeastern states; (10) plant ecology; (11) plant biochemistry; and (12) paleobotany.

Students applying for admission to graduate study in botany ideally should have an undergraduate major in botany or in biology, including a substantial number of botany courses; however, capable students with a bachelor's degree may be accepted with the following minimal undergraduate background: general botany and general zoology (or an acceptable year course in general biology) and a year of general chemistry. Organic chemistry is urged as a prerequisite to Botany 105. A student with a limited undergraduate background in botany and related sciences should expect to spend more than the usual time on graduate degree work.

The requirements for the two master's degrees are the same except that the M.A. degree requires a thesis, while a candidate for the M.S. degree may substitute six additional semester hours of approved course work for the thesis. The Ph.D. degree requires a reading knowledge of one foreign language appropriate to the student's research interests. The Department of Botany does not require minors for any of its graduate degrees, the student's program of courses being specified to meet the particular needs of the student by the advisor and research committee after consultation with the student.

Fellowships and Assistantships

The William Chambers Coker Fellowship. The fellowship, awarded annually, is available to a graduate student in the last year of work toward the degree of Doctor of Philosophy. The holder of this \$4,500 (plus tuition and fees) fellowship is not required to perform any departmental services.

The Mrs. W. C. Coker Fellowship. This nonservice fellowship is awarded annually to an outstanding first-year graduate student. While the stipend varies, the amount to be awarded for 1982-83 is \$6,300 plus tuition and fees.

Graduate students in botany are regularly considered by the Graduate School for the several kinds of nonservice fellowships it offers. It is not necessary to apply for these, since superior students recommended by the Department are given full consideration by the Graduate School.

One Teaching Fellowship is available at \$4,800 for the academic year. The Teaching Fellow is responsible for supervising the laboratory preparations and laboratory instruction in general botany.

A number of teaching and graduate assistantships are open to graduate students, the stipend ranging from \$4,200 to \$4,800 depending on experience. The duties for the assistants may include preparation for and supervision of laboratory classes, grading of examination and laboratory papers, or greenhouse or herbarium work. There are a few research assistantships available with stipends which may equal those of the graduate assistants.

Applications for admission may be obtained from the Graduate School, The University of North Carolina at Chapel Hill. To be considered for financial aid, the application must be completed by February 1.

Courses for Graduates and Advanced Undergraduates

The stated prerequisites should be interpreted to read "or equivalent" and may be waived by the professor for students apparently qualified to do the work of that course.

- 100 CELL BIOLOGY (Biology 100, Zoology 100) (3). Prerequisites, Botany 11-11L or Biology 21-21L, or Bacteriology 51, or Zoology 11, and Chemistry 11, 21, or permission of the instructor. Cell structure in relation to function. Cytology, biochemistry and physiology of animal, plant, and bacterial cells and their viruses. The cell in division and development. *Fall and spring.* Brown, Domnas, Misch, Salmon.
- 100L CELL BIOLOGY LABORATORY (Biology 100L, Zoology 100L) (1). Corequisite, Botany 100. Contemporary methods for the analysis of cell structure, function and contents are illustrated by laboratory exercises and demonstrations. *Three laboratory hours a week, fall and spring.* Brown, Domnas, Misch, Salmon.
- 101 GENETICS (Biology 101, Genetics 113, Zoology 101) (3). Prerequisite, Botany 11 or equivalent. An introduction to the principles of inheritance. Molecular aspects of gene action. Mendelian laws of transmission, the role of genes in development, the genetics of populations. *Fall and spring.* Barry, Lucchesi, Maroni, Pukkila.

- 101L GENETICS LABORATORY (Biology 101L, Genetics 113L, Zoology 101L) (1). Corequisite, Botany 101 or permission of the instructor. The principles of inheritance are illustrated by experiments with viruses, bacteria, fungi, and higher plants and animals. *Three laboratory hours a week, fall and spring.* Barry, Lucchesi, Maroni, Pukkila.
- 102 ECOLOGY (Biology 102, Ecology 102, Zoology 102) (3). Prerequisite, Botany 11-11L or Biology 21-21L or Zoology 11. A study of the principles governing the environmental interrelationships of organisms, populations, communities, and ecosystems. *Fall and spring.* Peet, Reice, Stiven, White, Vitousek.
- 102L ECOLOGY LABORATORY (Biology 102L, Ecology 102L, Zoology 102L) (1). Corequisite, Botany 102. Laboratory and field studies of ecology. *Three laboratory hours a week, fall and spring.* Peet, Reice, Stiven, White, Vitousek.
- 103 INTRODUCTION TO PLANT TAXONOMY (4). Prerequisite, Botany 11. Introduction to the taxonomy of vascular plants. Principles of classification, identification, nomenclature, and description. Laboratory and field emphasis on phytophany, families, description, identification, and classification of vascular plant species. *Three lecture and three laboratory hours a week, fall.* Massey, staff.
- 104 BIOLOGY AND CHEMISTRY OF MICROORGANISMS (BACT 100) (5). Prerequisites, Biology 21-21L or Zoology 11-11L or Botany 11-11L, and Chemistry 61 or their equivalents or permission of instructor. Stresses the structure and function of bacteria and viruses in relation to their biochemical and genetic composition. The use of microorganisms as model systems for genetic, developmental and environmental studies is also explored. *Three lecture and four laboratory hours a week, fall.* Twarog, Bott.
- 105 PLANT PHYSIOLOGY (4). Prerequisites, Botany 11-11L or Biology 21-21L. A general introductory study of the life processes of plants including photosynthesis, energy relations, biosynthesis and biochemical regulation, movement of materials, growth and differentiation. *Three lecture and three laboratory hours a week, spring.* Scott, Matthyse.
- 114 ALGAE (MASC 114) (3). An introduction to the development, biology, ecology, and evolutionary significance of the algae. *Three lecture hours a week, spring.* Hommersand.
- 114L ALGAE LABORATORY (MASC 114L) (2). Identification, classification, culture techniques and field experience with algae. *Six laboratory hours a week, spring.* Hommersand.
- 115 FUNGI (3). Prerequisites, Botany 11-11L, Biology 21-21L, or Zoology 11-11L. Fungi are introduced in three areas: diversity and classification, ecology (including plant pathology, medical mycology, uses of fungi by people), and control of development (physiology, biochemistry, genetics, and cell biology). *Fall.* Koch, McGinnis.
- 115L FUNGI LABORATORY (1). Prerequisites, Botany 11-11L, Biology 21-21L, or Zoology 11-11L. Laboratory to go along with Botany 115. *Three laboratory hours per week, fall.* Koch, McGinnis.
- 116 BRYOPHYTES (5). Prerequisite, Botany 51. The morphology, systematics and ecology of mosses, liverworts and hornworts. *Two lecture and six laboratory hours a week, spring.* (Alternate years.) Staff.
- 117 PTERIDOPHYTES (5). Prerequisite, Botany 51. The morphology, systematics, and ecology of ferns and fern allies. *Two lecture and six laboratory hours a week, summers.* Staff or visiting staff.
- 120 BIOCHEMISTRY FOR STUDENTS OF BIOLOGY AND CHEMISTRY (BIO-CHEM 100) (3). Prerequisites, Chemistry 61 and one course in biology. Lectures on the mechanism and regulation of reactions in living organisms, with emphasis on general principles. Protein structure and enzyme function; central pathways in intermediary metabolism; metabolic control; expression of genetic information, molecular disease. *Three lecture hours a week, fall and spring.* Wolfenden and others.

- 120L BIOCHEMISTRY LABORATORY (BIOCHEM 100L) (2). Prerequisite or corequisite, Biochemistry 100. Includes experiments on cell growth, subcellular fractionation, isolation and kinetic studies on enzymes, intermediary metabolism preparation and biosynthesis of macromolecules, fractionation of lipids, including modern research techniques in biochemistry. *Four laboratory hours a week, fall.* Chae, Marushige.
- 123 COMPARATIVE AND EVOLUTIONARY BIOCHEMISTRY (Biochemistry 103) (3). Prerequisite, Biochemistry 100 (or equivalent—consent of instructor). Lectures and discussions dealing with various evolutionary solutions. *Spring.* Domnas, Humm, Morell.
- 124 PLANT BIOCHEMISTRY (Biochemistry 124) (3). Prerequisite, Chemistry 61. Study of carbohydrates, lipids, N fixation, NO₂, and NO₃ reduction, pigments, photosynthesis and respiration in plants, *Spring.* Domnas.
- 132 EVOLUTIONARY MECHANISMS (3). Prerequisite, General Botany, Biology, or Zoology. A broad survey of the biological interactions and mechanisms of organic evolution with special emphasis on the evolutionary effect of environmental changes, and genetic variations contributing to evolution. *Spring.* Bell.
- 133 FLORISTICS (4). Prerequisite, Botany 103 or equivalent. Primarily field and laboratory identification of special groups; aquatic and marsh plants, trees and shrubs, grasses and sedges, composites, ferns and fern allies, seasonal flora. *One lecture and six laboratory hours a week, fall.* Radford.
- 134 TAXONOMY OF SPECIAL GROUPS OF NONVASCULAR PLANTS (2-6). Prerequisite, Botany 51 or permission of the instructor. Field and laboratory identification and classification of special groups of nonvascular plants: 134a Aquatic Phycomycetes; 134b Marine fungi; 134c Fleshy fungi, 134d Mycetozoans; 134e Marine algae; 134f Freshwater algae. *Nine laboratory hours a week, fall, spring, and summer.* Staff.
- 137 FIELD TRAINING IN NATURAL DIVERSITY (6). Prerequisites, Botany 43, 102, Geology 11. An interdisciplinary course in field analysis of habitat, inventory of ecological diversity, and determination of site-species relationships. *Six lecture and twenty-six field and laboratory hours per week; fall. (Alternate years.)* Radford.
- 142 PLANT ECOLOGY (4). Prerequisite, Botany 102 (Biology 102, Ecology 102, Zoology 102) or consent of the instructor. Consideration of terrestrial, vascular plant ecology including environmental physiology, population dynamics, community structure, and the vegetation of North America. Laboratory stresses collection and interpretation of field data. *Three lecture and three laboratory hours a week, fall.* Peet.
- 143 ECOLOGICAL PLANT GEOGRAPHY (Geography 143) (3). Prerequisite, Botany 11 or Geography 38. Description of the major vegetation types of the world including their distribution, structure, and dynamics. The principle causes for the distribution of plant species and communities, such as climate, soils, and history will be discussed. *Fall.* Peet.
- 151 COMPARATIVE MORPHOLOGY OF VASCULAR PLANTS (5). Prerequisite, Botany 51. Comparative morphology and evolutionary relationships of the Tracheophyta. Both living and fossil forms will be considered. *Three lecture and four laboratory hours a week, spring.* Dickison, Gensel.
- 152 PLANT ANATOMY (5). Prerequisite, Botany 51 or permission of the instructor. Introduction to the development and comparative anatomy of vascular plants. Practice in methods of anatomical microtechnique. *Three lecture and four laboratory hours a week, fall.* Dickison.
- 161 CYTOLOGY (5). Prerequisite, Botany 11-11L or permission of the instructor. Introduction to the methods of cytological analysis and study of cell structure in relation to function. A survey of cytoplasmic and extracellular constituents of the Monera, Protista, Fungi, and Plantae. *Three lecture and four laboratory hours a week, fall.* Brown.

- 172 CYTOGENETICS (Genetics 172) (3). Prerequisite, Botany 101 (Biology 101, Genetics 113, Zoology 101) or equivalent. Critical study of research papers concerned with the behavior and organization of chromosomes. (Alternate years.) *Spring*. Barry.
- 173 PLANT GENETICS AND SPECIATION (3). Prerequisite, Botany 101 or permission of the instructor. Mendelian genetics of vascular plants, with emphasis on genetic phenomena characteristic of vascular plants and the role of heredity in biosystematics. *Spring*. (Alternate years.) Parks.
- 181 PALEOBOTANY (Geology 197) (4). Prerequisites, Botany 11-11L or Biology 21-21L and permission of the instructor. An introduction to the morphology, stratigraphic occurrence, and evolutionary relationships of fossil plants. Both macrofossils and microfossils will be considered. *Three lecture and three laboratory hours a week, fall*. (Alternate years.) Gensel.
- 192 MEDICAL MYCOLOGY (BACT. 192, PALP. 192) (4). Prerequisites, General Microbiology or Botany. Isolation, identification, epidemiology, mycoserology, and clinical importance of medically significant fungi. Identification of hyphomycetes and yeasts will be stressed. *Two lecture and four laboratory hours a week, spring*. McGinnis.

Courses for Graduates

- 210 ASCOMYCETES AND BASIDIOMYCETES (3). Prerequisite, Botany 115. Taxonomy, life cycles, and genetics of the Ascomycetes and Basidiomycetes. (Alternate years.) *Three lecture hours a week, fall*. Olive.
- 210L ASCOMYCETES AND BASIDIOMYCETES (2). Pre- or corequisite, Botany 210. Taxonomy, life cycles, and genetics of the Ascomycetes and Basidiomycetes. *Four laboratory hours a week*. Olive.
- 211 LOWER FUNGI (5). Prerequisite, Botany 115. Collection, identification, culture, development, and biology of the lower fungi. *Two lecture and six laboratory hours a week, spring*. (Alternate years.) Koch.
- 212 THE MYCETOZOANS AND THEIR ALLIES (3). Prerequisite, any course in general biology, botany, or zoology. Developmental biology, life cycles, taxonomy, and phylogeny of mycetozoans (protostelids, cellular slime molds, myxomycetes) and allied groups. *Two lecture hours and six laboratory hours a week, fall*. (Alternate years.) Olive.
- 212L THE MYCETOZOANS AND THEIR ALLIES (2). Pre- or corequisite, Botany 212. Developmental biology, life cycles, taxonomy, and phylogeny of mycetozoans (protostelids, cellular slime molds, myxomycetes) and allied groups. *Four laboratory hours a week*. Olive.
- 215 MARINE MYCOLOGY (MASC 215) (6). Prerequisite, Botany 115, or equivalent. Structure, development, systematics and ecology of marine fungi. *Seven and one-half lecture and fifteen laboratory or field hours a week, given on demand at the Institute of Marine Sciences, Morehead City*. Kohlmeyer.
- 216 MARINE PHYCOLOGY (MASC 216) (5). Prerequisite, Botany 114. Structure, reproduction, systematics and ecology of marine algae. The laboratory will include field studies and culture techniques. *Three lecture and six laboratory hours a week, fall*. (Alternate years.) Hommersand.
- 219 ALGAL PHYSIOLOGY (3). Prerequisite, Botany 121 or equivalent. Photosynthesis, respiration, light dependent and developmental processes in algae. *Three lecture hours a week, fall*. (Alternate years.) Hommersand.
- 219L ALGAL PHYSIOLOGY LABORATORY (3). Laboratory exercises in photosynthesis, respiration and other aspects of algal physiology with emphasis on methods and instrumentation. *Six laboratory hours per week, fall* (Alternate years.) Hommersand.

- 222 MOLECULAR BIOLOGY OF PLANTS AND THEIR INTERACTION WITH MICROORGANISMS (3). Prerequisite, consent of the instructor. A study of the properties of macromolecules, their synthesis and regulation in plants including changes during differentiation. Biochemical aspects of parasitic and symbiotic interactions. *Fall. (Alternate years.)* Matthyse.
- 223 PLANT GROWTH AND DEVELOPMENT (3). Prerequisite, Botany 105. Dynamics of plant growth, plant growth substances, influences of environment on growth, germination and dormancy, plant movements. *Three lecture or report hours per week, fall. (Alternate years.)* Scott.
- 231 PRINCIPLES OF ANGIOSPERM SYSTEMATICS AND PHYLOGENY (3). Prerequisite, Botany 103. A survey of the history, literature and basic principles of systematics including revisionary studies and the phylogeny and classification of flowering plants. *Spring. (Alternate years.)* Radford.
- 231L PRINCIPLES OF ANGIOSPERM SYSTEMATICS AND PHYLOGENY LABORATORY (2). Prerequisite, Botany 103. Application of various types of evidence relating to the description, classification, and nomenclature of selected groups of phylogenetic significance. Individual and group term projects required. *Spring. (Alternate years.)* Radford.
- 232 VARIATION AND EVOLUTION IN PLANTS (5). Prerequisite, Botany 132 or equivalent. Analysis of variation in specific plant species in relation to their reproductive biology and evolutionary potentials. Field and laboratory study supplemented by reading and discussion. *Three lecture and four laboratory hours a week, fall. (Alternate years.)* Bell.
- 233 PHYLOGENY AND CLASSIFICATION OF FLOWERING PLANTS (3). Prerequisite, Botany 105. Comparative study of modern systems of classification based upon morphological and phylogenetic considerations. *Three lecture or report hours a week, spring (1981-1982 and alternate years.)* Dickison.
- 234 CHEMOTAXONOMY (4). Prerequisites, Botany 103, Chemistry 41, 61 or equivalent. Survey of chemical-systematic studies. Laboratories will involve methods of analysis of plant extracts. *Two lecture and six laboratory hours a week, spring. (Alternate years.)* Parks.
- 235 PLANT ECOSYSTEMATICS (4 or 6). Prerequisites, Botany 131 and 142 or permission of instructor. The systematics of ecological diversity—includes the classification, identification, nomenclature, description of components and elements of ecological diversity; the study of the relationships between biotic and abiotic diversity; and the determination of the significance of those relationships. The major emphasis of the course is plant population and community—abiotic diversity relationships. *Two lecture and eight laboratory hours a week, fall.* Radford.
- 236 SPECIES BIOLOGY METHODS & TECHNIQUES (3). Prerequisite, permission of the instructor. Three week summer short course of intensive field study and analysis of selected populations and their habitat support systems with emphasis on rare, endangered and threatened species. *One hour lecture and six hours laboratory a week.* Staff.
- 242 ECOSYSTEM STRUCTURE AND FUNCTION (4). Prerequisites, Ecology, Limnology, or Geochemistry and permission of instructor. Patterns and mechanisms of productivity and mineral cycling in natural ecosystems. Forests are emphasized, but other biomes and global-scale processes are included. *Three lecture and three laboratory hours a week.* Vitousek.
- 243 POPULATION AND COMMUNITY ECOLOGY (3). Prerequisite, Botany 102 (Biology 102, Ecology 102, Zoology 102) or consent of instructor. An in-depth study of research approaches to and literature of plant population and community ecology. *Spring. (Alternate years.)* Peet.

- 245 ECOLOGY OF PHYTOPLANKTON (Environmental Sciences 235, Marine Science 245) (4). Prerequisite, Environmental Sciences 232 or general ecology or aquatic biology. The relationships of freshwater and marine phytoplankton to their environment, with special reference to primary productivity and nutrition. *Two lecture and four laboratory hours a week, fall.* Kuenzler.
- 247 FIELD PLANT GEOGRAPHY (2). Prerequisites, Botany 142 or 143 and permission of instructor. Intensive literature and field study of the plant geography and ecology of a selected region. Weekly seminar-style discussion followed by approximately 9 days field experience. May be repeated for credit. *One seminar and two laboratory hours a week, spring.* Peet.
- 261 CYTOLOGICAL METHODS I—INSTRUMENTATION (5). Prerequisites, Botany 161 and permission of the instructor. Intensive instruction and training in the theory and operation of light and electron microscopes, high vacuum equipment, microtomes, and photographic equipment. Proficiency in high resolution image processing will be emphasized. *Two lecture and six laboratory hours a week, spring.* Brown.
- 262 CYTOLOGICAL METHODS II—SPECIMEN PREPARATION AND METHODOLOGY (5). Prerequisites, Botany 261 and permission of the instructor. Intensive training in chemical fixation, shadowing, negative staining, freeze etching, electron diffraction, cytochemistry, and autoradiography. Proficiency in interpretation emphasized. Student's research materials used in addition to selected cells and tissues. *Two lecture and six laboratory hours a week, fall.* Brown.
- 275 GENETICS SYSTEMS (Genetics 275, Bacteriology 275, Pathology 275, Zoology 275) (3). Prerequisite, two previous courses in genetics or permission of the instructor. An advanced course open to students in genetics and required for trainees in genetics. Each member of the Curriculum in Genetics will present information and problems in the areas of his or her specialization. *Fall.* (Alternate years.) Staff of the Genetics Curriculum.
- 282 PALYNOLOGY (5). Prerequisite, consent of the instructor. A consideration of various aspects of palynology, including the morphology, structure, development, systematics, evolution, preparation techniques and analysis of living and fossil pollen grains, spores and other palynomorphs. *Two lecture and six laboratory hours a week, fall or spring.* (Alternate years.) Gensel.
- SEMINARS (1). Prerequisite, permission of the instructor, 316—Phycology: Brown and Hommersand, *Fall*; 317 — Phycology: Hommersand and Brown, *Spring*; 318 — Mycology: Koch, Olive, or McGinnis, *Fall*; 319 — Mycology: Koch, Olive, or McGinnis, *Spring*; 325 — Plant Physiology: Scott, Hommersand, and Matthyse, *Fall*; 326 — Plant Physiology: Scott, Hommersand, and Matthyse, *Spring*; 328 — Cell Biology and Biochemistry: Domnas, *Fall*; 329 — Cell Biology and Biochemistry: Domnas, *Spring*; 338 — Systematics: Radford, Bell, Parks, Dickison, and Gensel, *Fall*; 339 — Systematics: Radford, Bell, Parks, Dickison, Gensel, and Massey, *Spring*; 348 — Ecology (Zoology 255): Peet, Stiven, Reice, Kuenzler, and Vitousek, *Fall*; 349 — Ecology (Zoology 255): Peet, Stiven, Reice, Kuenzler, and Vitousek, *Spring*; 358 — Morphology: Dickison and Gensel, *Spring*; 368 — Cytology: Brown, *Spring*.
- SPECIAL TOPICS IN BOTANY (2 to 6). Prerequisite, permission of the instructor. Directed reading in selected areas of botany. Laboratory practice in related research methods may be included. *Individually supervised work, hours per week and credit to be arranged, each semester.* Staff, as follows: 311, Couch, Koch, Olive, or McGinnis (Mycology); 312, Hommersand or Brown (Phycology); 321, Hommersand, Scott, or Matthyse (Physiology); 323, Domnas (Plant Biochemistry); 331, Radford, Bell and Massey (Taxonomy); 341, Peet, Vitousek (Plant Ecology); 351, Dickison or Gensel (Morphology and Anatomy); 361, Bell (Cytology and Cytotaxonomy) and Brown (Cytology and Ultrastructure); 371, Barry, Olive, Parks or Mangelsdorf (Genetics); 381, Gensel (Paleobotany).

- 393 MASTER'S THESIS (3 or more). Prerequisite, permission of the staff. *Each semester.* Staff.
- 394 DOCTORAL DISSERTATION (3 or more). Prerequisite, permission of the staff. *Each semester.* Staff.
- 400 GENERAL REGISTRATION (0).

GRADUATE SCHOOL OF BUSINESS ADMINISTRATION

JOHN PARKHILL EVANS, *Dean*

Professors

JOHN PARKHILL EVANS	(20)	Operations Research, Mathematical Programming
J. STACY ADAMS	(1)	Organizational and Social Psychology
JACK NEWTON BEHRMAN	(6)	International Business, Comparative Management, Ethics in Business
GERALD DEAN BELL	(7)	Organizational Development, Leadership and Personality
R. LEE BRUMMET	(10)	Management Accounting, Social Accounting, Financial Accounting
WILLARD TRACY CARLETON	(12)	Corporate Finance, Statistics, Money and Banking
DEWITT CLINTON DEARBORN	(16)	Business Finance, Financial Policy
ROBERT A. EISENBEIS	(65)	Financial Institutions, Financial Markets, Statistics
ROBERT SPEIR HEADEN	(23)	Corporate Strategic Planning, International Business, Marketing Management
G. DAVID HUGHES	(24)	Strategic Planning, Marketing/Sales Management, Microcomputers
THOMAS HARLAN JERDEE	(25)	Individual Behavior in Organizations, Personnel Management
HAROLD QUENTIN LANGENDERFER	(31)	Financial Accounting, Income Tax, Management Accounting
J. FINLEY LEE, JR.	(33)	Risk Management
MAURICE WENTWORTH LEE	(34)	Macroeconomics, Social Responsibility of Business, Economic Fluctuations
RICHARD IVOR LEVIN	(35)	Business Policy, Strategic Long Range Planning, New Venture Management
JAMES EDWARD LITTERFIELD	(36)	Advertising, Health Marketing, International Business
RICHARD WOLCOTT MCENALLY	(38)	Investments, Business Finance
CURTIS PERRY McLAUGHLIN	(39)	Production of Professional Services, Not-for-Profit Management, Productivity
WILLIAM DANIEL PERREAULT, JR.	(62)	Industrial Marketing, Marketing Research Methods, Marketing Strategy
JOHN JULIUS PRINGLE	(43)	Financial Management
ISAAC NEWTON REYNOLDS	(44)	Financial Accounting Theory and Principles, Governmental Accounting
BENSON ROSEN	(46)	Industrial and Organizational Psychology, Personnel Administration
DAVID STEPHEN RUBIN	(47)	Operations Research, Integer Programming, Networks
FREDERICK ANSLEY RUSS	(48)	Public Policy Research, Marketing Strategy, Buyer Decision Processes
WILLIAM S. STEWART	(49)	Legal Studies

JUNIUS HEWITT TERRELL	(50)	Auditing, Financial Accounting, Internal Control
ROLLIE TILLMAN, JR.	(51)	Marketing Management, Corporate Strategy
HARVEY M. WAGNER	(64)	Management, Strategic Thinking, Modeling

Associate Professors

CARL ROBERT ANDERSON	(80)	Organizational Design, Strategic Management, Organizational Decision Making
GARY M. ARMSTRONG	(2)	Public Policy, Deception in Advertising, Sales Force Management
WILLIAM J. BIGONESS	(60)	Organizational Behavior, Labor-Man- agement Relations, Personnel Administration
HAROLD ALONZA BLACK	(72)	Financial Markets and Institutions, Money and Banking
EDWARD JOSEPH BLOCHER	(61)	Auditing, Management Accounting
LINDA CAROLYN BOWEN	(9)	Financial Accounting, Taxation, Auditing
LEWIS FRANKLIN DAVIDSON	(55)	Behavioral Implications of Accounting Information, Financial Accounting Theory
ROBERT BIGELOW DESJARDINS	(17)	Computer and Information Systems, Occupational Health Information Systems
MARK ROBBE EAKER	(14)	Economics, International Finance
DOUGLAS ALLEN ELVERS	(18)	Production/Operations Management, Scheduling, Project Management
WILLIAM ARTHUR FISCHER	(66)	Production/Operations Management, Management of Technology, Materials Management
JOHN S. HEKMAN	(22)	Real Property, Microeconomics
DAVID EDWIN HOFFMAN	(53)	Federal Taxation
C L KENDALL	(26)	Marketing Research, Public Policy, Executive Education
JAY EDWARD KLONPMAKER	(29)	Marketing Management, Marketing Control and Research, Advertising Management and Research
RICHARD ALLAN MANN	(37)	Legal Studies
MIKE EDWARD MILES	(59)	Real Estate Development, Integrative Management
ALAN WILLIAM NEEBE	(41)	Resource Allocation, Integer Program- ming, Facility Location
BARRY STUART ROBERTS	(63)	Legal Studies, Business and Society, Government Regulation
HOWARD OMAR ROCKNESS	(45)	Management Planning and Control Systems, Management Accounting
ROBERT WALTER ZMUD	(58)	Computer-Based Information Systems Organizational Theory, Management of Technology

Assistant Professors

RICHARD STANLEY BLACKBURN	(81)	Organizational Behavior, Organizational Research Methods, Philosophy of Organizational Science
JOSEPH HENRY BYLINSKI	(83)	Quantitative Methods, Auditing
JOHN ANTHONY COLE	(13)	Corporate Finance, Investments, Capital Markets
NICHOLAS MICHAEL DIDOW	(15)	Consumer Behavior, Longitudinal Quasiexperimental Design
ARTHUR SHEPHERD ESTEY	(69)	Investments, Investment Banking, Corporate and Institutional Finance
ROBERT SHIELDS HARRIS	(73)	Corporate Finance, Microeconomics
ANN ELIZABETH MARUCHECK	(21)	Production/Operations Management, Facility Location
JOSEPH BENEDICT MAZZOLA	(27)	Operations Management, Integer Programming
LOUIS ROBERT MOORE III	(76)	Optimization of Stochastic Systems, Simulation, Computational Statistics
ELLEN RUST PEIRCE	(4)	Legal Studies, Labor Law, Government Regulations
PAUL H. SCHURR	(52)	Sales Management, Organizational Buying
MICHAEL DONN SHIELDS	(77)	Management Accounting, Effects of Accounting Information on Human Behavior

Instructors

LESLIE GARNER	(71)	Business Policy
MERRIE LYNN BRUCKS	(78)	Consumer Behavior, Advertising, Human Information Processing Theory
ROGER A. CHOPE	(74)	Financial Accounting, Properties of Accounting Numbers, Accounting Policy

Lecturers

ROY WALTER HOLSTEN	(54)	Business Communication
HANS ERNST KRUSA	(70)	Marketing

Visiting Associate Professors

DAVID LAURENCE KELLY	(28)	Resource Allocation Models, Shop Scheduling, Logistics
JOSEF LAKONISHOK	(56)	Investments, Capital Markets and Information
ROBERT WILSON ROUSE	(40)	Financial Accounting, Auditing

Visiting Assistant Professors

RICHARD EHRHARDT	(30)	Operations Management, Inventory Theory, Stochastic Models
HAROLDENE F. WUNDER	(67)	Income Taxation

Emeritus Professors

GERALD ALAN BARRETT
RICHARD PERCIVAL CALHOON
CLYDE CASS CARTER
CLAUDE SWANSON GEORGE, JR.
CHARLES ATKINSON KIRKPATRICK
CLIFTON HOLLAND KREPS, JR.
HENRY ALLEN LATANÉ
CLARENCE HENRY MCGREGOR
DANNIE JOSEPH MOFFIE

The Graduate School of Business Administration offers programs of graduate study leading to the degrees of Master of Business Administration and Doctor of Philosophy.

The School of Business Administration is located in Carroll Hall, near the center of campus. Superior physical facilities for graduate study are provided in New Carroll, the school's modern graduate center.

Computer terminals in New Carroll connect with the University's IBM System/370, model 155 II located in the Computation Center in Phillips Hall, adjacent to the School. Graduate students and faculty members use this computer for batch and time-sharing operations and as a remote input/output terminal to gain access to the IBM System/370, model 165 and the Amdahl V-6 at the Triangle Universities Computation Center in Research Triangle Park.

The 2.8-million-volume Wilson Library includes substantial collections in business administration for both research and instructional purposes. The Business Administration and Social Sciences Division maintains an extensive collection of reference materials, including business and economic journals, newspapers and all the major business services. It offers on-line computer searches of bibliographies and indexes that include all presently available business data bases. The Wilson Library is a depository of the publications of the federal government and the United Nations, and it maintains an extensive collection of state publications.

Master of Business Administration

The professional graduate program leading to the degree of Master of Business Administration is designed for graduate students who plan careers as managers. Most M.B.A.'s plan careers in private-sector organizations. For others, the M.B.A. Program is valuable preparation for management careers in non-profit organizations, including government, education, and health care delivery systems.

In structure and content, the M.B.A. Program reflects the principle that effective management requires the ability to view the organization as an

integrated whole, operating within a larger economic, political, and social environment. The curriculum emphasizes the analysis of business and organizational problems, the determination of policy, and the cultivation of the skills and judgment required for responsible management. The Program gives conscious attention to the personal development of the student through structured and informal contacts with the faculty.

The M.B.A. Program is designed for persons with bachelor's degrees in liberal arts, social and natural sciences, engineering, business, and related fields. The curriculum requires two academic years (late August through May). M.B.A.'s follow an integrated curriculum during the first year. During the second year, they may use eight elective courses to develop a concentration in one or two areas of special interest, or they may continue to develop their backgrounds as generalists. A concentration in professional accounting is offered in the second year and a joint M.B.A./J.D. Program is available.

The first year is composed of 15 interlocking modules of varying length. Students develop competence in each of the functional areas of business—finance, marketing, and production, as well as a basic understanding of accounting, quantitative decision tools, organizational behavior, theory of the firm, and macroeconomics. A unique feature of the program is the year-long course in integrative management. Taught by the case method, this weekly seminar provides an introduction to the decision-making process that helps the student to integrate information from the various disciplines of business administration and to articulate his or her analysis in oral presentations and periodic written reports.

Upon the successful completion of the first year, M.B.A.'s receive credits in the following courses: BA 200 and 201, Quantitative Methods I and II; BA 230, Production Management; BA 250, Human Behavior in Management; BA 260, Marketing Management; BA 270, Management and Financial Accounting; BA 280, Financial Management; BA 297, Laboratory in Integrative Management; Economics 288, Managerial Economics; and Economics 289, Stabilization and Economic Growth.

Second-year students in the regular M.B.A. track take ten courses, eight of which are electives. Required courses in the second year are: BA 294, Business and Society, and BA 295, Business Policy. Electives available include field projects which enable the student to apply developing expertise to the solution of an actual management problem. Where appropriate to the student's program, permission may be granted to take graduate electives from other divisions of the University.

There is no foreign language requirement and no thesis. Candidates for the M.B.A. degree are normally expected to seek work experience in management during the summer between the first and second years of the Program, and the School offers assistance in obtaining suitable positions.

Professional Accounting Concentration. M.B.A.'s who have completed the first-year curriculum may elect the professional accounting concentration in the second year. This option combines a comprehensive foundation in general management with intensive study of accounting at a high professional level. It is designed for students who plan management careers in public accounting or careers as financial executives in business or not-for-profit organizations.

Prerequisites are an undergraduate major in accounting or the completion of four special summer courses in accounting. Accounting concentrators take BA 294, Business and Society; BA 295, Business Policy; BA 240A and 240B, Integrative Accounting. They can use their remaining courses to develop a program of study that reflects their individual career objectives and backgrounds. Their programs may include electives outside accounting, selected in consultation with an accounting advisor. These may include courses in business, law, behavioral sciences, computer science, and statistics.

Courses currently offered in the professional accounting concentration include: Business Administration 240A and 240B, 241, 242, 243, 245, and 246; Business Administration 272M, 273M, 275M, 276M, and 277M. These are described in the listing of courses at the end of this section.

Joint M.B.A./J.D. Program. An opportunity exists for a select number of M.B.A. candidates to earn both a Master of Business Administration Degree and a Juris Doctor Degree in four years. Selection for this program requires separate application to and admission by both the M.B.A. Program and the School of Law.

Admission. Admission is based on demonstrated potential for responsible leadership, the quality of the student's academic transcripts, and the applicant's test scores. The Admission Committee believes strongly that several years of productive work after graduation from college helps to develop necessary management qualities and increases the value of graduate study in management. Some applicants give outstanding evidence of these qualities during their undergraduate careers and are admitted to the M.B.A. Program directly from college. In recent years, ten to fifteen percent of the class have been admitted directly from college. There are no prerequisite courses for admission, although M.B.A. candidates will find previous exposure to accounting, economics, and statistics helpful.

Applicants must submit (1) a completed application form; (2) transcripts of all college work showing satisfactory completion of a bachelor's degree at an accredited college or university; (3) scores on the Graduate Management Admission Test administered by the Educational Testing Service of Princeton, N.J.; and (4) three recommendations from professors and employers. Foreign students must submit scores on the Test of English as a Foreign Language (TOEFL).

Application forms and a brochure containing detailed information about M.B.A. Program may be obtained by writing the Director of M.B.A. Admissions, The Graduate School of Business Administration, Carroll Hall 012-A, The University of North Carolina at Chapel Hill, Chapel Hill, N.C. 27514.

Doctor of Philosophy

The doctoral program is designed for men and women who plan careers in teaching and research. The following work at the undergraduate or graduate level should be completed prior to admission to the Doctoral Program in Business Administration, or completed by course work while in residence: elementary accounting; intermediate economic theory, both microeconomics and macroeconomics; elementary statistics; elementary calculus.

The requirements for course work for the doctorate in Business Administration are:

Management Fundamentals. All doctoral students are expected to possess or to acquire basic knowledge of finance, accounting, marketing, organizational behavior, and production. This requirement is interpreted to mean a level of competence roughly equivalent to the first year of the School's M.B.A. Program. Most entering students with strong M.B.A. or equivalent degree do not need additional courses of this type. As an aid to the advisory committee, a diagnostic test in management fundamentals is administered to each student prior to entry in the program. For students who require additional preparation, the advisory committee may prescribe Business Administration 391 and 392, Fundamentals in Management I and II (directed readings courses), introductory or elective courses in the M.B.A. Program, or other means.

During the first year of study, students take the following courses unless competence is exhibited by written examination: BA 300, Quantitative Methods in Management I; Economics 188, Microeconomic Theory; Economics 189, Macroeconomic Theory; and six (6) hours of statistics in two courses chosen with the guidance of the advisory committee. Frequent choices are Statistics 101-102, Psychology 131-132, or Economics 273-274. There is no foreign language requirement.

The Area of Concentration. Nine to fifteen hours are required in one of the following areas of concentration:

Accounting	Operations Management
Finance	Organizational Behavior
Marketing	Quantitative Methods

In addition, students may develop specializations in other subject areas, including business and society, business policy, risk management, legal studies, international business, management of not-for-profit organizations, small business management, and real property economics.

Programs in each of these areas are outlined in the booklet "The Doctoral Program," which is available from the Graduate School of Business Administration.

Supporting Courses. Eighteen semester hours of supporting coursework are required of each candidate as approved by the advisory committee.

The Written Doctoral Examination. The written doctoral examination consists of two parts: a comprehensive written examination covering the courses and required work outlined above under "The Fundamentals of Business Administration," including management fundamentals, economics, statistics, and quantitative methods; and a comprehensive written examination involving the areas of concentration and supporting courses to be taken at completion of all course work.

The Dissertation. The dissertation represents a thorough investigation of a definite problem and derives its value from the scholarly and workmanlike manner in which it is organized and presented, from its contribution to learning, and from the development of mental power displayed by the writer. A written prospectus of the dissertation must be presented and approved on the basis of an oral examination by the student's dissertation committee before any substantial amount of work on the dissertation is done.

Experience in Research and Teaching. As part of the requirement for the degree each candidate is expected to perform for one semester of service in teaching and one semester in research.

In addition to the above, the student must fulfill the requirements for the degree as presented on pages 101-5.

Scholarships and Fellowships

Available to doctoral students in business administration are a number of assistantships, each of a value of \$4,600 for the academic year, and a limited number of non-service awards ranging from \$4,600 to \$6,300 for the academic year. The School provides summer assistantships for doctoral students who receive awards from the University or the School during the academic year. These assistantships carry stipends of \$1,450 for the summer. Once a doctoral student is awarded financial aid, it is the policy of the School to provide support for six semesters provided the student is making satisfactory academic progress. Other awards include the Julian Price Fellowship, the Haskins and Sells Faculty Assistance

Fellowship, and the North Carolina Motor Carriers Association Graduate Research Fellowships in the field of transportation.

A number of Business Foundation Scholarships in varying amounts for M.B.A. and doctoral candidates are made available through the Business Foundation of North Carolina, Inc. Four Maurice W. Lee M.B.A. Fellowships carry annual stipends of \$1,500. Three John Motley Morehead M.B.A. Fellowships which provide tuition and fees and a living allowance of \$4,000 are awarded annually by the John Motley Morehead Foundation. Other M.B.A. fellowships include the Allied Chemical Foundation Fellowship, Burlington Industries Fellowships, the Central Carolina Bank Fellowship, the Collier Cobb & Associates Fellowship, the Evelyn N. Bost M.B.A. Fellowship, the Executive Program Scholarship, the Kodak Fellowship, the Levi Strauss Fellowship, the Manulife Insurance Scholarships, the R. J. Reynolds Industries Fellowships, the Ryan Homes Fellowship and the Wachovia Bank and Trust Company Fellowship. A Business Foundation loan fund is available to M.B.A. students.

The Graduate School of Business Administration is a member of the Consortium for Graduate Study in Management, which provides approximately 100 fellowships for minority men and women for the M.B.A. Programs of the six member universities. Consortium fellowships are awarded in national competition and pay tuition and a living allowance of \$3,000 for the first year of the M.B.A. Program and \$1,500 for the second year.

Detailed information regarding these fellowships, assistantships, and scholarships may be obtained from the Dean of the Graduate School, the Director of M.B.A. Admissions, or the Director of the Doctoral Program in Business Administration.

Courses for Graduates and Advanced Undergraduates

The following courses are prerequisite for 100-level Business Administration courses: BUSI 24; BUSI 71, and BUSI 72, ECON 10 and ECON 100 or 101. See the *Undergraduate Bulletin*.

- 110 DETERMINISTIC MODELS FOR DECISION PROBLEMS (3). Prerequisite, Business Administration 24 or equivalent. The use of quantitative tools for formulating, solving, and analyzing deterministic decision problems. Topics include matrix algebra, linear programming, network models, and dynamic programming. *Fall and spring*. Moore, Neebe, Rubin.
- 111 PROBABILISTIC MODELS FOR DECISION PROBLEMS (3). Prerequisite, Business administration 24 or equivalent. The use of quantitative tools for formulating, solving, and analyzing probabilistic decision problems. Topics include decision analysis, simulation, queuing, inventory control, and reliability. *Spring*. Moore, Neebe, Rubin.

- 120 RISK MANAGEMENT (3). Analysis of the financial problems inherent in the multitude of static risks which confront the business enterprise, and evaluation of the alternative methods of dealing with such problems utilized in modern scientific risk management. *Fall and spring*. J. F. Lee.
- 121 LIFE INSURANCE AND ESTATE PLANNING (3). Basic life insurance, corporate employee benefits and estate planning. Includes wills, trusts, taxation, and business insurance. *Fall and spring*. J. F. Lee, Peirce.
- 122 ADVANCED RISK MANAGEMENT AND INSURANCE (3). Prerequisite, Business Administration 120 or equivalent. An analysis of risk measurement and a study of insurance devices to combat risk in the business firm. *Fall and spring*. J. F. Lee.
- 126 INTRODUCTION TO REAL PROPERTY (3). An introduction to the social, political, economic, and investment aspects of real property. *Fall or spring*. Black, Hekman.
- 130 OPERATIONS MANAGEMENT (3). Analysis of the production/operations function in both manufacturing and non-manufacturing organizations. Developing production policies which support total organizational goals under varying constraints. *Fall and spring*. Staff.
- 131 OPERATIONS MANAGEMENT ANALYSIS (3). Prerequisite, Business Administration 130 or equivalent. A case analysis course in which the principles of operations management are applied to the solution of selected problems considering the total objectives of the organization. *Fall and spring*. Elvers, McLaughlin.
- 133 DESIGN AND OPERATION OF PRODUCTION SYSTEMS (3). Prerequisite, Business Administration 130 or equivalent. Analysis of the problems of planning and scheduling and production-operating function of a business enterprise. Topics include forecasting, job-shop scheduling, assembly-line balancing, project management. *Fall* Elvers, Fischer, Mazzola.
- 137 OPERATIONS LOGISTICS MANAGEMENT (3). Prerequisite, Business Administration 130 or equivalent. The integration of various managerial activities, e.g., purchasing, inventory control, which deal with the flow of materials into, through, and out of an organization. *Fall and spring*. Fischer, Maruchek, Mazzola.
- 140 LEGAL ENVIRONMENT OF BUSINESS (3). An introduction to the legal system with special emphasis upon its relationship to business. Topics covered include an introduction to the judicial system, torts, and contracts. *Fall and spring*. Mann, Roberts.
- 141 COMMERCIAL LAW (3). Prerequisite, Business Administration 140 or equivalent. Not open to students who have taken Business Administration 144. A detailed examination of commercial law topics including sales, commercial paper, bank deposits and collections, secured transactions, suretyship, bank regulations, and bankruptcy. *Fall*. Stewart.
- 142 MANAGERIAL LAW (3). Prerequisite, Business Administration 140 or equivalent. Not open to students who have taken Business Administration 144. A detailed examination of the legal aspects of business organizations, including agency, joint ventures, partnerships, limited partnerships, corporations, and securities regulation. *Spring*. Mann.
- 143 ANTITRUST LAW (3). Prerequisite, Business Administration 140, or equivalent. A detailed examination of the federal regulation of competition, including monopolies, oligopolies, horizontal and vertical restraints of trade and price discrimination. *Fall and spring*. Mann, Roberts, Stewart.
- 144 BUSINESS LAW (3). Prerequisite, Business Administration 140 or equivalent. Not open to students who have taken either Business Administration 141 or Business Administration 142. A survey of commercial paper, secured transactions, sales, agency, partnerships, limited partnerships, corporations and securities regulation. *Fall and spring*. Staff.

- 150 ORGANIZATIONAL BEHAVIOR (3). An introduction to the study of human behavior in organizations. Examines from a managerial perspective the impact of individual, group, and organizational variables on organizational performance and employee satisfaction. *Fall and spring*. Blackburn.
- 152 SOCIAL PSYCHOLOGY OF ORGANIZATIONS (3). Prerequisite, Business Administration 150 or equivalent. Systems analysis of behavior in organizations and its application to the management of human resources. *Fall and spring*. Adams.
- 153 SOCIAL-TECHNICAL SYSTEMS (3). Prerequisite, Business Administration 152 or equivalent. Advanced readings and intensive analysis and discussion of cases and problems in socio-technical systems. *Spring*. Adams.
- 154 PERSONNEL DEVELOPMENT (3). Prerequisite, Business Administration 150 or equivalent. Analysis of problems, methods, and incentives in the development of personnel. Emphasis is on the development of supervisors and executives. *Spring*. Bell.
- 157 PERSONNEL MANAGEMENT (3). Prerequisite, Business Administration 150 or equivalent. Problems, policies, and procedures in the management of personnel, including topics such as staffing, performance appraisal, training, compensation, benefits and services, safety and health, equal employment, discipline, justice. *Fall and spring*. Jerdee, Rosen.
- 158 INTRODUCTION TO LABOR-MANAGEMENT RELATIONS (3). An introduction to labor-management relations with particular emphasis on the collective bargaining process. *Spring*. Bigoness.
- 160 PRINCIPLES OF MARKETING (3). Marketing organization and methods with emphasis on the social and economic aspects of distribution, consumer problems, marketing functions and institutions, marketing methods and policies. *Fall and spring*. Staff.
- 161 ADVERTISING (3). Prerequisite, Business Administration 160 or equivalent. The organization and functions of advertising from the point of view of the business executive. Topics include economic and social aspects; types of advertising and purposes; media types, selection and evaluation; advertising research. *Fall and spring*. Armstrong, Didow, Littlefield.
- 163 SALES MANAGEMENT (3). Prerequisite, Business Administration 160 or equivalent. An overview of the sales management process, including sales force planning, budgeting, recruiting, selection, training, compensation, supervision, and control. *Fall and spring*. Hughes, Perreault, Schurr.
- 164 CONSUMER BEHAVIOR (3). Prerequisite, Business Administration 160 or equivalent. Review of conceptual models and empirical research in consumer behavior. Topics include decision processes, social and cultural influences, information processing, and ethical issues. *Fall and spring*. Didow.
- 165 RETAILING (3). Prerequisite, Business Administration 160 or equivalent. A study of the place of retailing in the economy. Topics include development of the present retail structure, functions performed, principles governing effective operations, modern store policies and practices, and managerial problems. *Fall or spring*. Krusa.
- 166 DISTRIBUTION MANAGEMENT (3). Prerequisite, Business Administration 160 or equivalent. The area of distribution in business, including retailing, wholesaling, marketing logistics, and distribution analysis. *Fall or spring*. Staff.
- 168 INTRODUCTION TO MARKETING RESEARCH (3). Prerequisites, Business Administration 24 and 160 or equivalents. An introduction to research methodology with emphasis upon the compilation, analysis and interpretation of data used in the planning and control of marketing operations. *Fall or spring*. Russ, staff.
- 169 MARKETING POLICIES (3). Prerequisites, Business Administration 160 or equivalent, and senior standing. A problem method course dealing with specialized marketing functions and policies; includes product and line, brands, channels of

distribution, prices and pricing, promotion, and diagnosis and control. *Fall and spring*. Krusa, Perreault, Schurr.

NOTE: During the academic year registration in BUSI 170 through BUSI 179 is limited to students who have been admitted into the accounting concentration or by permission of the Undergraduate Program.

- 170 INTERMEDIATE ACCOUNTING I (3). Review of accounting cycle; income measurement and valuation issues related to assets, current liabilities, and long-term liabilities. *Fall and spring*. Bowen, Davidson, Reynolds.
- 171 INTERMEDIATE ACCOUNTING II (3). Prerequisite, Business Administration 170. Income measurement and valuation issues related to stockholders' equity; price-level and fair value issues; special sales methods; accounting changes; pensions; leases; income tax allocation. *Fall and spring*. Bowen, Davidson, Reynolds.
- 172 ADVANCED ACCOUNTING (3). Prerequisite, Business Administration 171. Advanced problems involving foreign exchange, business combinations, home office and branches, consolidations, segment accounting statement interpretation and analysis, and partnership accounting. *Fall and spring*. Davidson, Reynolds.
- 173 COST ACCOUNTING (3). Study of cost accounting systems, including cost accumulation, cost measurement and choice of costs to be included in the measurement. *Fall and spring*. Blocher, Rockness.
- 174 MANAGEMENT ANALYSIS, REPORTING AND CONTROL (3). Prerequisite, Business Administration 73 or 173. Development of systems, concepts and analytical methods to serve the information needs of management in decision-making and control. *Fall and spring*. Staff.
- 175 AUDITING (3). A course in auditing theory and practice. Auditing standards, procedures, rules or professional conduct, and related materials of professional importance are studied. *Fall and spring*. Terrell.
- 176 ADVANCED MANAGEMENT ACCOUNTING (3). Prerequisite, Business Administration 173. Use of quantitative methods in management accounting applications. Design and implementation of management control systems. *Fall and spring*. Shields.
- 177 PRINCIPLES OF FEDERAL INCOME TAXATION (3). Underlying principles of the Federal income tax law; problem recognition and tax planning emphasis. *Fall and spring*. Bowen, Hoffman, Lagenderfer.
- 178 STRUCTURE AND ENVIRONMENTAL ISSUES OF ACCOUNTING (3). Prerequisite, Business Administration 171. Not-for-profit accounting issues; structure of accounting theory, and accounting environmental issues. *Fall and spring*. Bowen, Davidson, Langenderfer, Reynolds.
- 179 CERTIFIED PUBLIC ACCOUNTING PROBLEMS (3). Prerequisites, major in accounting and permission of the professor. A review of the general and specialized accounting problems which constitute the subject matter of CPA examinations. *Summer*. Langenderfer.
- 180 PRINCIPLES OF FINANCIAL MANAGEMENT (3). Theoretical foundations of optimal financial policy. Problems and cases provide application of theory to financial decisions involving cash flow, capital structure, capital budgeting. *Fall and spring*. Harris, Dearborn.
- 182 THEORY AND APPLICATION OF FINANCIAL MANAGEMENT (3). Prerequisite, Business Administration 180 or equivalent. A follow-on course to Business Administration 180 which goes more deeply into the theory and application of financial management. Emphasis is placed on investment, financing, and dividend decisions. *Fall and spring*. Carleton, Pringle.

- 185 FINANCIAL INSTITUTIONS AND MARKETS (3). Prerequisite, Business Administration 180 or equivalent. Analysis of the operating policies of financial institutions and the effect of such policies upon the structure of the capital markets. *Fall and spring*. Black, Carleton.
- 186 INVESTMENTS (3). Prerequisite, Business Administration 180 or equivalent. A survey of investment principles and practice. Emphasis is given to the problems of security analysis and portfolio management with special attention to the investment problems of the individual investor. *Fall and spring*. Cole, Estey.
- 190 ADMINISTRATIVE POLICY (3). Prerequisites, Business Administration 130, 140, 150, 160, 180, English 32 and speech requirement. Open only to seniors majoring in business administration. Comprehensive analysis of administrative policy-making from a total organization point of view, use of case analysis and written reports to develop integrative decision skills. *Fall and spring*. Black, Dearborn, Didow, Elvers, F. Lee, Levin, Russ, Terrell, Wagner.
- 191 INTRODUCTION TO INTERNATIONAL BUSINESS (3). Prerequisite, senior standing. Problems in operating overseas, including analysis of differences in country settings, legal and financial systems, and governmental policies affecting operations. *Fall or spring*. Headen.
- 192 INTRODUCTION TO MANAGEMENT INFORMATION SYSTEMS (3). Prerequisite, senior standing. A survey of the elements and functions of management information systems and an introduction to the principles underlying the design of effective systems. *Fall*. DesJardins, Zmud.
- 193 ECONOMIC FLUCTUATIONS (Economics 185) (3). An overview of economic stabilization effects in a fluctuating economy. Interaction between stabilization policies, the economy and its financial institutions. An applied macroeconomics course. *Fall*. M. W. Lee.
- 194 BUSINESS AND SOCIETY (3). A focus on the relationship between business, government, citizens' and social institutions in a democracy with a market economy. *Fall*. Garner.
- 199 MANAGEMENT SIMULATION (3). Prerequisite, Business Administration 130, 140, 150, 160, 180, English 32 and speech elective. Open only to seniors majoring in business administration. A seminar simulating the operation of a more complex business enterprise. Student teams operating competing firms in an industrial environment simulated by a computer. *Fall and spring*. Elvers, Fischer.

Courses for Graduates

- 200 QUANTITATIVE METHODS I (3). Prerequisite, graduate standing in business administration. An introduction to basic mathematical concepts and their application to decision models in management situations. *Fall*. Staff.
- 201 QUANTITATIVE METHODS II (3). A continuation of Business Administration 200. *Spring*. Staff.
- 206 DECISION THEORY (Operations Research/Systems Analysis 245) (3). Axiomatic development of subjective probability and utility theory; introduction of decision analysis, statistical decision theory, and game theory. *Fall*. Moore.
- 207 HISTORY OF MANAGEMENT THOUGHT (3). A comparative study and evaluation of the development of management thought. *Fall*. Staff.
- 210 DETERMINISTIC METHODS IN OPERATIONS RESEARCH I (Operations Research/System Analysis 210) (3). Prerequisite, calculus of several variables, linear or matrix algebra. A study of the basic principles of linear programming, including the simplex algorithm, duality, and post-optimality and analysis, and an introduction to non-linear programming. *Fall*. Neebe, Rubin.

- 211 DETERMINISTIC METHODS IN OPERATIONS RESEARCH II (Operations Research/Systems Analysis 211) (3). Prerequisite, Business Administration 210 or consent of the instructor. Modeling and solution techniques for problems in integer programming, networks, and dynamic programming. *Spring*. Neebe, Rubin, Wagner.
- 212 NONLINEAR OPTIMIZATION (Operations Research/Systems Analysis 212) (3). Prerequisite, Business Administration 210 and advanced calculus or consent of the instructor. Convexity, necessary and sufficient conditions for optimality, sensitivity analysis, and algorithms for unconstrained and constrained problems. *Spring*. Staff.
- 213 ADVANCED LINEAR PROGRAMMING (Operations Research/Systems Analysis 213) (3). Prerequisite, Business Administration 210 or equivalent. Topics in linear programming including large scale problems, special structures, computational considerations, and quadratic programming. *Fall*. (Alternate years.) Rubin.
- 214 TOPICS IN INTEGER PROGRAMMING (Operations Research/Systems Analysis 214) (3). Prerequisite, Business Administration 211. Possible topics include Lagrangian relaxation, Benders' decomposition, group theoretic approaches, location models, and matching and covering models. *Fall*. (Alternate years.) Neebe, Rubin.
- 215 RISK MANAGEMENT (3). Evaluation and management of insurable risks faced by a business firm. *Fall and spring*. J. F. Lee.
- 216 REAL PROPERTY DECISIONS (3). Introduction to theoretical framework and analytical techniques common to real property decision making. *Fall*. Miles.
- 217 DEVELOPMENT FEASIBILITY AND LAND USE POLICY (3). Prerequisites, graduate standing in business administration, law, economics, or city and regional planning. Analyses of the public-private interface in real estate development. Lectures and readings support student projects which attempt to match entrepreneurial goals with public policy objectives. *Fall or spring*. Hekman.
- 220 COMPARATIVE MANAGEMENT (3). Comparison of different managerial styles, methods and settings among the major countries and regions in the world, for the purpose of understanding the problems of doing business in a foreign environment and the different roles of enterprise. *Fall*. Behrman.
- 221 CONTRACT PRINCIPLES AND ANTITRUST ANALYSIS (3). Prerequisite, graduate standing in business administration. To introduce the student to legal process and institutions, general principles of contract law, and antitrust policy and its applications. *Fall or spring*. Stewart.
- 222 BUSINESS ASSOCIATIONS AND SECURITIES REGULATION (3). Prerequisite, graduate standing in business administration. Topics include the law of agency, partnerships, limited partnerships, closely-held corporations, public corporations, and federal securities regulation. *Fall*. Mann.
- 225 STUDIES IN INTERNATIONAL BUSINESS (3). Prerequisite, graduate standing in business administration. Individual analysis of problems on a functional or an industrial basis. Analysis will also be required of a geographic region, including its attractiveness to U.S. business, its competitive situations and government policies. *Fall or spring*. Headen.
- 230 PRODUCTION MANAGEMENT (3). Prerequisite, graduate standing in business administration. Analysis and solution of production problems in the total firm environment. The development of production policies and controls under varying objectives and constraints. *Spring*. Elvers, Fischer, Mazzola, McLaughlin.
- 231 OPERATIONS MANAGEMENT POLICY (3). Prerequisite, Business Administration 230 or equivalent. Operations management policy formation and administration by case analysis in selected industries emphasizing integration of operations management with the major goals of the organization. *Spring*. McLaughlin.
- 232 MANAGEMENT INFORMATION SYSTEMS (3). A study of the theory, design and use of man-machine information systems for decision-making in a management

- context. Analysis of the computer and communications equipment supporting such systems. *Fall*. DesJardins, Zmud.
- 233 FUNDAMENTALS OF ORGANIZATION (2). An intensive examination of the process of organization and its application to managerial endeavors. *Spring*. Bell.
- 234 APPLICATIONS IN OPERATIONS MANAGEMENT (3). Prerequisite, Business Administration 230 or equivalent. Use of quantitative procedures to generate operational solutions to operations management problems drawn from area enterprises. *Fall*. Staff.
- 235 OPERATIONS SYSTEMS (3). Prerequisite, Business Administration 230 or equivalent. Intensive study of approaches to designing efficient operating systems including forecasting; output planning; scheduling and control; inventory control; physical distribution planning and facilities location. *Fall*. Elvers, Fischer, Maruchek, Mazzola.
- 240A INTEGRATIVE ACCOUNTING (3). Prerequisite, Business Administration 270, 271M, 272M, 273M, and 275M, or equivalents. Integration of concepts and tools from accounting and related disciplines; applications to professional accounting problems; emphasis on formulation and communication of professional judgments. *Fall*. Brummet, Langenderfer.
- 240B INTEGRATIVE ACCOUNTING (3). Prerequisite, Business Administration 240A. Continuation of 240A. *Spring*. Brummet, Langenderfer.
- 241 FINANCIAL ACCOUNTING THEORY AND METHODOLOGY (3). Prerequisite, Business Administration 272M or equivalent. Analysis of structure of accounting theory; income measurement theory; conceptual framework issues; methodology issues relating to revenue and expense recognition, multinational and not-for-profit accounting issues. *Fall*. Bowen, Reynolds.
- 242 CONTEMPORARY ISSUES IN FINANCIAL ACCOUNTING AND REPORTING (3). Prerequisite, Business Administration 270 or equivalent. An analysis of the current accounting issues considered or being considered by the Financial Accounting Standards Board, the SEC, and by other professional accounting organizations. *Spring*. Bowen, Langenderfer, Reynolds.
- 243 ADVANCED MANAGEMENT ACCOUNTING (3). Prerequisite, Business Administration 273M or equivalent. Advanced coverage of techniques for providing information to management for decision analysis and control. *Fall*. Blocher, Rockness.
- 245 AUDITING THEORY AND METHODOLOGY (3). Prerequisite, Business Administration 275M or equivalent. Emphasis on the theory and methodology of auditing; professional ethics, legal liability, auditing standards, audit interrelationships reporting problems, specialized services and new trends are considered. *Spring*. Bylinski, Terrell.
- 246 TAX RESEARCH (3). Prerequisite, Business Administration 277M or equivalent. A study of the techniques of research in taxation applied to routine and complex tax problems. Concentration on locating and assessing authority, and formal communication. *Fall*. Hoffman.
- 247 FEDERAL INCOME TAXATION OF CORPORATIONS AND SHAREHOLDERS (3). Prerequisite, Business Administration 246 or permission of instructor. An advanced study of corporate taxation with emphasis on Subchapter C: corporate organization, distributions, liquidation, reorganizations, tax option corporations; and special corporate problems. *Spring*. Bowen, Hoffman.
- 248 FEDERAL INCOME TAXATION OF CONTROLLED CORPORATIONS AND TAXATION OF PARTNERSHIPS (3). Prerequisite, Business Administration 246 or permission of instructor. A study of the tax implications of consolidated tax returns; intercompany transactions; and change of group members. Advanced partnership taxation; organization, operations, and termination. *Spring*. Hoffman

- 249 SPECIAL TOPICS IN FEDERAL INCOME TAXATION (3). Prerequisite, Business Administration 246 or permission of instructor. A study of selected topics in taxation including: policy; tax accounting; tax aspects of compensation; taxation of multinational businesses; and tax administration and procedure. *Spring*. Hoffman.
- 250 HUMAN BEHAVIOR IN MANAGEMENT (3). Prerequisite, graduate standing in business administration. The analysis of individual and group behavior in organizations and applications to organizational relations. *Fall*. Anderson, Bigoness.
- 252 CONFLICT IN ORGANIZATIONS (3). An understanding of the factors in conflict and conflict resolution within management and between management and employees. *Spring*. Bigoness.
- 254 ORGANIZATIONAL DEVELOPMENT (3). Methods for changing and developing individuals, groups, and organizations. Analysis of different individual therapy techniques; group growth techniques such as T-groups and encounter groups; organization design strategy. *Fall*. Bell.
- 257 PERSONNEL ADMINISTRATION (3). Prerequisite, Business Administration 250 or equivalent. A study of the factors contributing to the building and maintaining of an effective work force. Analysis of problems by case study. *Fall*. Rosen.
- 260 MARKETING MANAGEMENT (3). Prerequisite, graduate standing in business administration. A course to develop an understanding of marketing problems and to survey policies and procedures for the formulation, execution, and appraisal of marketing programs. *Spring*. Klompmaker, Littlefield, Perreault.
- 261 MARKETING RESEARCH (3). Prerequisite, Business Administration 260. An examination of research methodology for marketing decision-making. Emphasizes issues in research design, data collection, and the use of statistical analysis. Lecture and cases or project. *Fall or spring*. Russ.
- 262 INDUSTRIAL MARKETING (3). Prerequisite, Business Administration 260. An analysis of the marketing of industrial goods and services. Lecture and case analyses are used. *Fall or spring*. Klompmaker.
- 263 ADVERTISING MANAGEMENT (3). Prerequisite, Business Administration 260. Management aspects of advertising and sales promotion, including development of advertising strategy and media allocation. Lecture, cases and projects. *Fall or spring*. Kendall.
- 269 SALES MANAGEMENT (3). Prerequisite, Business Administration 260. Management of sales personnel, including recruiting, training, assignment, and control. Lectures and cases. *Spring*. Hughes.
- 270 FINANCIAL AND MANAGEMENT ACCOUNTING (4). Prerequisite, graduate standing in business administration. Concepts underlying financial reporting. Analysis of cost and quantitative data for managerial purposes. Provides understanding of accounting measurements and appreciation of use of accounting data. *Fall*. Bowen, Brummet, Langenderfer.
- 271 ADVANCED FINANCIAL ACCOUNTING PROBLEMS (3). Prerequisite, Business Administration 270 or equivalent. An advanced problems survey course covering sources and uses of capital; valuation and income determination; reporting issues; analysis of data; consolidated statements; and other topics. *Fall*. Langenderfer, Reynolds.
- 272 ADVANCED FINANCIAL ACCOUNTING THEORY (3). Critical examination of accounting concepts and standards. Emphasis on income determination, particularly controversial issues. Study of current problems and contemporary development reflected in research bulletins, monographs, journals, textbooks, and reports. *Spring*. Davidson, Langenderfer.
- 272M FINANCIAL ACCOUNTING (3) Prerequisite, Business Administration 270 or equivalent. Income measurement and valuation issues related to assets, liabilities and stockholders' equity. *First summer session*. Staff.

- 273 MANAGEMENT ACCOUNTING THEORY AND PRACTICE (3). Prerequisite, Business Administration 270 or equivalent. The role of accounting and the information function within organizations. Management decision models, analysis, and financial controls are considered. *Fall*. Brummet, Rockness.
- 273M COST AND FINANCIAL ACCOUNTING TOPICS (3). Prerequisite, Business Administration 272M. A study of cost systems, managerial use of cost information; accounting changes, changes in financial position, statement analysis, price level issues, and replacement cost. *First summer session*. Staff.
- 274 ACCOUNTING SYSTEMS (3). Prerequisites, Business Administration 171 and 173 or equivalents. Study of the design, operation, and control of accounting information systems and their integration with other information systems. *Spring*. Staff.
- 275M AUDITING AND CONSOLIDATED STATEMENTS (3). Prerequisite, Business administration 272M. Concepts and procedures involved in auditing; professional ethics, auditing standards, procedures, disclosure problems and various audit opinions on financial statements are studied; and consolidated statements. *First summer session*. Staff.
- 276 MANAGEMENT CONTROL SYSTEMS (3). Prerequisite, Business administration 270 or equivalent. Design, installation and evaluation of financially-based management control systems. *Spring*. Blocher, Rockness, Shields.
- 277 TAX FACTORS IN BUSINESS DECISIONS (3). Prerequisite, Business Administration 270 or equivalent. Significance of taxes relevant to business decisions; sets in perspective tax factors and other considerations influencing the decision process. *Spring*. Hoffman.
- 277M FEDERAL INCOME TAXATION AND PARTNERSHIP ACCOUNTING (3). Prerequisite, Business Administration 270 or equivalent. Concepts and principles of Federal income taxation of individuals and corporations; partnership accounting. *First summer session*. Staff.
- 280 FINANCIAL MANAGEMENT (3). Prerequisite, graduate standing in business administration. Analysis of financial problems and policies of nonfinancial firms including working capital management, capital rationing and cost of capital, and capital structures. *Spring*. Dearborn, Cole, Estey.
- 282 ADVANCED TOPICS IN FINANCIAL MANAGEMENT (3). Prerequisite, Business Administration 280 or equivalent. Analysis of specific financial problems of interest to financial managers. *Fall or spring*. Pringle.
- 283 CORPORATE FINANCING (3). Prerequisite, Business Administration 280 or equivalent. Topics include information relations with financial markets, dividend policy, sources of external capital, marketing of securities instruments, and mergers and acquisitions. *Fall or spring*. Estey, McEnally.
- 285 FINANCIAL INSTITUTIONS AND MARKETS (3). Prerequisite, Business Administration 280 or equivalent. Financial institutions as suppliers of funds to the money and capital markets. Comparative financial policies of institutions considered in the context of their market environments. *Fall or spring*. Black, Carleton.
- 286 INVESTMENT POLICIES (3). Prerequisite, Business Administration 280 or equivalent. A basic treatment of investment policies with emphasis upon long-run values. Portfolio policies of financial institutions are examined. *Fall or spring*. Estey, McEnally.
- 287 THEORY OF FINANCIAL MANAGEMENT (3). Prerequisite, Business Administration 280 or equivalent. Conceptual foundations of theory of financial management; the structure of major areas of formalized techniques for improving decision-making in these areas. *Fall*. Cole.
- 288 PORTFOLIO MANAGEMENT (3). Prerequisite, Business Administration 286 or equivalent. Policy formulation and actual management for the Reynolds Student Investment Trust of The University of North Carolina at Chapel Hill. *Spring*. Estey.

- 291 MANAGEMENT OF NOT-FOR-PROFIT ORGANIZATIONS (Human Services Administration 291) (3). An analysis of the problems of managing not-for-profit organizations, including resource allocation, control, marketing, operations, professionalism, evaluation and organization. *Spring*. McLaughlin.
- 292 LABOR-MANAGEMENT RELATIONS (Economics 292) (3). An advanced study of the procedure, subject matter and legal framework of collective bargaining. *Spring*. Bigoness.
- 294 BUSINESS AND SOCIETY (3). Prerequisite, graduate standing in business administration. An analysis of the external environment of which management must be cognizant and of those external factors which may influence management decisions. *Spring*. Behrman, Roberts.
- 295 BUSINESS POLICY (3). Prerequisite, graduate standing in business administration. Integrating and building upon the business administration core, this course approaches policy-making and administration in an organization from the point of view of top management. *Fall*. Anderson, Dearborn, Levin, Pringle.
- 296 NEW ENTERPRISE DEVELOPMENT (3). Prerequisite, second-year MBA standing. Starting new ventures. Securing venture capital (banks, individuals, SBIC's); legal and tax considerations; preparing and using the business plan; mergers and acquisitions; the new issues market. *Spring*. Levin.
- 297 INTEGRATIVE MANAGEMENT AND BUSINESS COMMUNICATION (3). Prerequisite, graduate standing in business administration. Two-semester course beginning Fall Semester only. Integration of the functional and tool courses and their application to a variety of business problems; emphasis on problem identification and oral and written communication of analysis and recommendations. *Fall and Spring*. Levin, Miles, Tillman.
- 298 MANAGEMENT SIMULATION (3). Prerequisite, graduate standing in business administration and permission of the instructor. A seminar in the application of analytical techniques and managerial principles to policy formulation and implementation in a complex computer-simulated environment. *Fall*. Elvers, Mazzola.
- 300 QUANTITATIVE METHODS IN MANAGEMENT I (3). Prerequisite, graduate standing in business administration or economics. Multivariable deterministic models. Stochastic models, linear equations and matrices, linear systems. *Fall*. Staff.
- 301 QUANTITATIVE METHODS IN MANAGEMENT II (3). Prerequisite, Business Administration 300 or equivalent. Statistical inference, analysis of variance, regression and correlation, time series analysis, multiple regression, design of experiments, statistical decision theory. *Spring*. Staff.
- 302 CURRENT RESEARCH IN MANAGEMENT SCIENCE (0 to 1). Prerequisite, permission of the professor. Survey of the current literature in management science and operations research. *Fall and Spring*. Staff.
- 303 ADVANCED TOPICS IN MANAGEMENT SCIENCE (3). Prerequisite, permission of the instructor. In-depth study of a specific area of contemporary research in management science. *Spring*. Staff.
- 307 SEMINAR IN THE HISTORY OF MANAGEMENT THOUGHT (3). An advanced course dealing with the evolution of management thought. *Spring*. Staff.
- 309 INTRODUCTION TO INVENTORY THEORY (Operations Research/Systems Analysis 225) (3). Prerequisite, permission of the instructor. Introduction of the techniques of constructing and analyzing mathematical models of inventory systems. *Fall*. Staff.
- 310 NETWORK FLOWS (Operations Research/Systems Analysis 215). Prerequisite, permission of the instructor. Network flow problems and solution algorithms; maximum flow, shortest route, assignment, and minimal cost flow problems; Hungarian and out-of-kilter algorithms; combinatorial and scheduling (CPM and PERT) applications. *Spring*. Neebe, Rubin.

- 330 THEORY OF OPERATIONS MANAGEMENT I (3). Prerequisite, permission of the instructor. Rigorous study of traditional and modern issues, problems and approaches in operations management. *Fall*. Elvers, Fischer, Maruchek, Mazzola, McLaughlin.
- 331 THEORY OF OPERATIONS MANAGEMENT II (3). Prerequisite, Business Administration 330 or equivalent. A continuation of Business Administration 330. *Spring*. Elvers, Fischer, Maruchek, Mazzola, McLaughlin.
- 334 APPLICATIONS IN OPERATIONS MANAGEMENT (3). Prerequisite, permission of the instructor. Intensive study of the problems of applying the theory of operations management in actual situations; problems of formulation, model building, data collection and experimentation. *Spring*. Elvers.
- 337 ADVANCED TOPICS IN OPERATIONS MANAGEMENT (3). Prerequisite, permission of the instructor. Intensive study of a specific area in operations management. *Fall*. Staff.
- 338 SEMINAR IN OPERATIONS MANAGEMENT (3). Prerequisite, permission of the instructor. Intensive study of a specific area in operations management. *Spring*. Staff.
- 351 INDIVIDUAL BEHAVIOR IN ORGANIZATIONS (3). Analysis of individual behavior, adjustment, and effectiveness. Examination of perception, learning, problem-solving, decision-making, motivation, and personality. Applications to management of human resources. *Fall*. Jerdee.
- 352 INTERPERSONAL AND INTERGROUP BEHAVIOR IN BUSINESS ORGANIZATIONS (3). Intensive critical examination of interpersonal and intergroup behavior, including decision processes, communication, conflict, and conflict resolution in large organizations. Case studies are used to illustrate applications in business. *Spring*. Rosen.
- 354 ORGANIZATIONAL DESIGN AND DEVELOPMENT (3). The development of understanding and skills in changing and evolving organizational design, interpersonal relationships and people, in order to achieve desired organizational goals. *Spring*. Bell.
- 355 METHODS IN ORGANIZATIONAL BEHAVIOR RESEARCH (3). Research in organizational behavior with consideration of establishing experimental designs, data collection, and application of appropriate methods in the analysis of data. *Fall*. Blackburn.
- 356 SEMINAR IN ORGANIZATIONAL BEHAVIOR (3). Prerequisite, permission of the instructor. Intensive study of important current theory and research in organizational behavior. *Fall*. Adams.
- 357 SEMINAR IN PERSONNEL MANAGEMENT (3). Prerequisite, Business Administration 250 or equivalent. Individual research in depth in particular phases of industrial relations: manpower planning, acquisition, control, training, and development; labor relations. *Spring*. Rosen.
- 360 SEMINAR IN MARKETING I (3). Prerequisite, permission of the instructor. Intensive study of problems in establishing marketing goals, consumer demand, product selection and identification, pricing policies and decisions. *Fall*. Littlefield.
- 361 SEMINAR IN MARKETING II (3). Prerequisite, Business Administration 360. Intensive study of problems in design of distribution channels, marketing logistics, promotional decisions and evaluations, sales forecasting, and analysis. *Spring*. Didow.
- 363 SEMINAR IN MARKET COMMUNICATION AND STIMULATION (3). Prerequisite, permission of the instructor. Individual research on marketing problems involving communication and stimulation. Typical problems: communication processes of marketers; communication media; objectives and techniques; evaluation of communication effectiveness; promotional programs. *Fall or spring*. Staff.

- 365 SEMINAR IN CURRENT MARKETING TOPICS (1). Prerequisite, permission of the instructor. Advanced research in marketing. A seminar to discuss current research of doctoral candidates, faculty and invited guests. *Fall and spring*. Kendall, Klompmaker.
- 366 SEMINAR IN DISTRIBUTION MANAGEMENT (3). Prerequisite, permission of the instructor. Advanced study in the area of marketing, logistics, institutions, distribution cost fundamentals, and related problems. *Fall or spring*. Staff.
- 368 SEMINAR IN MARKETING RESEARCH METHODOLOGY (3). Prerequisite, permission of the instructor. Study of research design, methods of data collection and analysis, sample design, and problems of measurement in research in marketing. *Spring*. Perreault, Russ.
- 372 SEMINAR IN CURRENT ACCOUNTING ISSUES (3). Prerequisite, permission of the instructor. Analysis of current accounting issues through readings, discussion, and individual research assignments. Typical problems include pensions, leases, price-level, and other controversial issues. *Fall*. Reynolds.
- 374 SEMINAR IN CONCEPTS OF BUSINESS INCOME (3). Prerequisite, permission of the instructor. Concepts of income which have evolved in various disciplines. Degree of interdependence of such concepts. Extent concepts have influenced or been influenced by other concepts. *Fall*. Davidson, Langenderfer.
- 376 SEMINAR IN RESEARCH IN ACCOUNTING (1). Prerequisite, permission of the instructor. An informal seminar to discuss current research in accounting. *Fall and spring*. Staff.
- 377 SEMINAR IN TAXATION (3). Prerequisite, permission of the instructor. Analysis of selected topics for taxable entities. Nature and significance of taxation affecting business decisions. Development of tax laws and critical appraisal of current law. *Spring*. Hoffman.
- 380 THEORY OF FINANCIAL MANAGEMENT (3). Prerequisite, permission of the instructor. Review of the theory of financial management. *Fall*. Harris.
- 381 THEORY OF FINANCIAL MANAGEMENT II (3). Prerequisite, Business Administration 380 or equivalent and permission of the instructor. Review of tests of various aspects of the theory of financial management, and critical evaluation of the theory's usefulness to financial managers. *Spring*. Carleton.
- 385 SEMINAR IN RESEARCH IN FINANCE (0 to 1). Prerequisite, permission of the instructor. Advanced research in business finance and investment. An informal seminar to discuss current research of doctoral candidates, faculty, and others. *Fall and spring*. Staff.
- 386 SEMINAR IN PORTFOLIO MANAGEMENT (Economics 386) (3). Prerequisite, permission of the instructor. Development, testing, and economic effects of models for determining the selection of assets. *Fall or spring*. McEnally.
- 387 QUANTITATIVE METHODS IN FINANCE (3). Prerequisite, permission of the instructor. Review of information generating and optimizing models, and their applicability to decision making in finance. *Fall or spring*. Staff.
- 388 SEMINAR IN FINANCIAL MARKETS (Economics 388) (3). Prerequisite, permission of the instructor. Intensive study of market characteristics and interrelationships, market price and yield determination, impact of monetary and regulatory policies, and effect of market structure on performance. *Spring*. Staff.
- 391 MANAGEMENT I (3). An integrated course in the process of management. *Fall*. Staff.
- 392 MANAGEMENT II (3). An integrated course in the process of management. *Spring*. Staff.
- 394 DOCTORAL DISSERTATION (3 or more). *Fall and spring*. Staff.

- 399 SEMINAR (3). Prerequisite, permission of the instructor. Individual research in a special field under direction of a member of the department. *Fall and spring*. Staff.
- 400 GENERAL REGISTRATION (0).

DEPARTMENT OF CHEMISTRY

ROYCE W. MURRAY, *Chairman*

Professors

TOMAS BAER	(1)	Physical Chemistry
MAURICE S. BROOKHART	(2)	Organometallic and Physical Organic Chemistry
RICHARD P. BUCK	(3)	Analytical Chemistry
MAURICE M. BURSEY	(4)	Analytical Chemistry
JAMES L. COKE	(5)	Organic Chemistry
FRANCIS N. COLLIER, JR.	(6)	Inorganic Chemistry
HENRY H. DEARMAN	(7)	Physical and Biological Chemistry
ERNEST L. ELIEL	(8)	Organic Chemistry
JOHN H. HARRISON	(10)	Biological Chemistry
WILLIAM E. HATFIELD	(11)	Inorganic Chemistry
RICHARD G. HISKEY	(13)	Organic and Biological Chemistry
DEREK J. HODGSON	(14)	Inorganic and Physical Chemistry
THOMAS L. ISENHOUR	(15)	Analytical Chemistry
RICHARD C. JARNAGIN	(16)	Physical Chemistry
CHARLES S. JOHNSON, JR.	(18)	Physical Chemistry
PAUL J. KROPP	(20)	Organic Chemistry
WILLIAM F. LITTLE	(21)	Organic Chemistry
THOMAS J. MEYER	(23)	Inorganic Chemistry
J. CHARLES MORROW, III	(24)	Physical Chemistry
ROYCE W. MURRAY	(25)	Analytical Chemistry
ROBERT G. PARR	(34)	Physical Chemistry
LEE G. PEDERSEN	(26)	Physical Chemistry
DAVID G. WHITTEN	(33)	Organic Chemistry

Associate Professors

SLAYTON A. EVANS, JR.	(9)	Organic Chemistry
DONALD C. JICHA	(17)	Inorganic Chemistry
THOMAS M. MAYER	(43)	Microelectronics
LINDA L. SPREMULLI	(28)	Biological Chemistry
JOSEPH L. TEMPLETON	(31)	Inorganic Chemistry

Assistant Professors

MICHAEL T. CRIMMINS	(39)	Organic Chemistry
ANDREW E. DEPRISTO	(30)	Physical Chemistry
BEVERLY J. ERREDE	(32)	Biological Chemistry
GRAHAM W. HILLS	(37)	Physical Chemistry
JAMES W. JORGENSON	(36)	Analytical Chemistry
RICHARD W. LINTON	(27)	Analytical Chemistry
THOMAS N. SORRELL	(35)	Organic Chemistry

Emeritus Professors

JAN J. HERMANS
SAMUEL B. KNIGHT
ROBERT L. MCKEE
HENRY C. THOMAS

The Department of Chemistry offers graduate programs leading to the degrees of Master of Arts, Master of Science (non-thesis), and Doctor of Philosophy in the fields of analytical, biological, inorganic, organic, and physical chemistry, and, jointly with the Department of Physics, in chemical physics. Courses are offered both in our Department and the Biochemistry Department which are useful to a student pursuing a degree in Chemistry with interest in the general area of biological systems.

Doctor of Philosophy

The Ph.D. degree in Chemistry is a research degree and students normally begin research during the first year in graduate school. As soon as the entering student has selected a research advisor, an advisory committee (SAC) is established in order that an appropriate course of study, designed to meet individual needs, can be developed. The Ph.D. degree consists of completion of a suitable program of study, teaching experience, a preliminary doctoral oral exam, a written comprehensive examination which is satisfied by cumulative examinations, an original research project culminating in a dissertation, and a final oral examination.

Master of Arts

The Master of Arts degree requires a minimum of 30 semester hours. Courses are determined by the student's advisory committee. Twelve of the 30 hours may be earned through registration for research and seminar. However, not more than 6 hours of the 12 may be earned through thesis registration (393). Also required is a written examination which may be satisfied by cumulative examinations, a thesis, and a final oral examination. Admission to the Ph.D. program after completing the M.A. degree in our Department requires approval of the Chemistry Graduate Studies Committee.

Master of Science (non-thesis)

The Master of Science (non-thesis) degree requires a minimum of 30 semester hours. The candidate must earn at least 24 hours of graduate credit in chemistry and applied subjects, which may include graduate seminars numbered 200 or higher, but does not include Chem 331, 341,

351, 361, and 381 (referred to collectively as 3X1). As a substitute for the thesis the candidate must earn a minimum of 6 hours of Chem 3X1 (a research methodology and seminar course). The student's program of study is determined by the student's advisory committee. Also required is a written examination which may be satisfied by cumulative examinations, and a written report submitted to the student's research director describing work done while registered for Chem 3X1. Admission to the Ph.D. program after completing the M.S. degree in our Department requires approval by the Chemistry Graduate Studies Committee.

Research Interests

(1) *Analytical. Separation methods*: theory and application of chromatography; GC/IR/mass spectrometry; liquid chromatography in capillary column; electrophoresis; electroosmotic flow applied to liquid chromatography; chemically modified chromatographic supports; *spectroscopic methods*: spectrophotometric study of various metal complexes; ion and electron microprobe techniques; Fourier transform infrared and photoacoustic studies; chemical analysis of surfaces (X-ray photoelectron spectroscopy, Auger electron spectrometry, UV photoelectron spectroscopy, secondary ion mass spectrometry); nuclear magnetic resonance studies; mass spectrometry of biological, organic, and inorganic compounds, especially chemical ionization, field desorption, secondary and field ionization methods; ion structures by electron-impact and ion-molecule collision phenomena; ion cyclotron resonance; laser Raman spectroscopy; *electrochemical methods*: electroanalytical and spectroelectrochemical techniques; surface absorption; chemically modified electrodes; electrochemical synthesis; electrocatalysis; nonaqueous chemistry; coordination chemistry; kinetics and mechanism of electrode processes, ionic transport in solids; membrane electrochemistry including digital simulation of transient and equilibrium properties, stopped-flow kinetic methods; *methods of data interpretation*: analog and digital computer optimization of experiments; computerized learning machines; pattern recognition, information retrieval and modeling, microcomputer applications in chemistry.

(2) *Biological*. Physicochemical investigations of the mechanism of action and subunit structure of pyridine nucleotide dependent dehydrogenases; energy transduction in biological membranes; kinetics in complex biochemical systems; molecular biology and molecular genetics; mechanism of protein biosynthesis; metabolic regulation; gene organization and regulation of gene expression; transport of proteins across organellar membranes; synthesis of sulfur-containing polypeptides; chemical modification of proteins; structural studies of macromolecules and polymers; interaction of small molecules and DNA; characterization of proteins by laser light scattering.

(3) *Inorganic*. Chemistry of transition metal elements; spectral and magnetic properties of transition metal compounds, crystal field theory and molecular orbital theory; reactions of coordinated ligands; coordination compounds involving Group IV donors; kinetics and mechanisms of inorganic reactions; the synthesis of transition and post-transition metal compounds; X-ray crystallography; structural investigations of transition metal complexes and organometallic compounds; nuclear magnetic and electron paramagnetic resonance; electrochemistry and photochemistry of metal complexes; metal catalyzed organic reactions; the preparation and conductivity properties of semiconducting and potentially superconducting materials; magnetic interactions in extended systems; cooperative phenomena; metalloporphyrin chemistry; metal peptide complexes; metal complexes of nucleic acid constituents.

(4) *Organic*. Stereochemistry and conformational analysis; photochemistry and photobiology; synthesis and biological reactions of natural products; peptide synthesis and function; chemical modification of proteins; mechanistic and synthetic studies in organometallic chemistry; chemistry of heterocyclic systems; nuclear magnetic resonance; kinetics; organosulfur and organophosphorus chemistry; chemistry of metalloporphyrins; reactions of organic molecules in micelles, monolayers, and membranes; carbanion and free radical chemistry; new synthetic methods including asymmetric synthesis; chemical models of solar energy conversion.

(5) *Physical Chemistry: Surface Science*: electron and optical spectroscopies of surface complexes, thermal desorption and isotopic tracer measurement on species of submonolayer coverage, surface etching and deposition initiated by electric discharges, ion beams and laser beams, mechanisms of reactive etching; *molecular dynamics*; photoionization mass spectroscopy and ion molecule reactions, molecular motion and reaction rates in solutions examined by photon correlation spectroscopy and forced Rayleigh scattering; *biophysical chemistry*: membrane phenomena, physical chemistry of DNA complexes, nonlinear kinetics and cell differentiation, laser light scattering applied to protein aggregation and the determination of mechanical properties of biological gels, the study of molecular motion inside cells by means of pulsed field gradient NMR; *photochemistry*: photoelectron spectroscopy of molecules, photolytic charge separation and transport in organic solids and liquids, multiphoton ionization and fragmentation; *molecular spectroscopy*: laser spectroscopy of transient species using laser magnetic resonance and MODR techniques, optogalvanic spectroscopy, development of spectroscopic techniques, double resonance spectroscopy; *theoretical chemistry*: quantum chemistry, density functional theory, quantum biology of neurotransmitters and pharmacological agents, statistical mechanics of correlated motions, mechanical properties of polymers, state to state chemistry,

liquid state energy transfer processes, reactions and energy transfer at solid surfaces.

(6) *Chemical Microelectronics*. Fundamental chemistry of materials relevant to the fabrication of microelectronics devices such as integrated circuit chips; techniques (plasma, ion beam, laser beam, photochemical, electrochemical) for the preparation of thin films of organic and inorganic materials; new and highly conductive organic and inorganic materials including their synthesis and structural characterization; spatially resolved chemical analysis of surfaces, thin films, and microstructures; phenomena initiated by optical energy (or ion plasmas) which are driven by it, store it, or respond to it in a spatial pattern.

Attention is drawn to the possibility of arranging, through consultations with staff of the Departments of Chemistry and Physics, a program combining course work in the two departments with thesis research in either department in such a way as to provide training in the borderline area in which methods of theoretical and experimental physics are applied to chemical problems. A similar program may be arranged between the Departments of Chemistry and Biochemistry.

Facilities and Equipment

Research in chemistry is carried on in the William Rand Kenan, Jr., Laboratory, a modern facility of 130,000 square feet completed in 1971. Additional research space is utilized in the Venable Laboratory of approximately the same size. Most facilities necessary for modern research in chemistry are available. Included are NMR, EPR, NQR, IR, and UV-visible spectrometers, mass spectrometers, magnetic susceptibility equipment, automatic X-ray facilities, and a variety of other specialized instruments. The Department has recently established a laboratory for chemical applications of lasers. Numerous laboratory computers are available for on-line data acquisition, and the Department has recently installed a VAX 780 computer. Direct access to the University's excellent large computer facility also is available.

To back up the active and growing research programs, the Department provides a number of services. Machine, glass, and electronics shops are provided to construct and maintain specialized equipment.

The chemistry library and reading room, housed in Venable Hall, contains complete sets of the most important chemical periodicals, many books of reference, and a collection of books of historical value and interest, amounting to more than 32,000 volumes.

Financial Aid and Admission

On the basis of academic and research attainments, the Department awards a number of industrial fellowships and predoctoral research and

teaching appointments. All outstanding prospective graduate students who apply for admission/support will be automatically considered for the Morehead and other University fellowships.

There are approximately 150 graduate students in our Department. More than 60 teaching assistantships are open to graduate students. The duties of the assistants include the preparation for and supervision of laboratory classes in the larger elementary courses and examination of laboratory reports.

Applications for assistantships and fellowships should be made by February 1, although applicants for assistantships will be considered after that date. All applicants (foreign and U.S.) must take the Graduate Record Examination. All foreign students whose native language is not English must take the TOEFL examination in addition to the Graduate Record Examination. Both the TOEFL and GRE should be taken as early as possible, preferably in October or December.

Application forms for admission/support, as well as information about the Department, may be obtained from the Director of Graduate Studies in Chemistry.

Courses for Graduates and Advanced Undergraduates

- 101 SPECIAL PROBLEMS IN CHEMISTRY (1 to 3). Prerequisite and permission to register, to be determined by consultation with Director of Graduate Studies. *Fall and spring*. Faculty.
- 107 BIOCHEMISTRY FOR STUDENTS OF BIOLOGY AND CHEMISTRY (Biochemistry 100, Zoology 107) (3). Prerequisites, Chemistry 61 and one course in Biology. Lectures on the chemistry and metabolism of carbohydrates, lipids, amino acids, proteins and nucleic acids, elementary enzyme kinetics, biochemical genetics, regulatory mechanisms; bioenergetics. *Fall and spring*. Chemistry and Biochemistry Faculty.
- 130 PROTEIN CHEMISTRY (Biochemistry 130) (3). Prerequisites, Chemistry 107, or consent of instructor. Topics will include: structural properties of proteins; active site chemistry; chemical modification of proteins; metalloproteins; coenzyme-enzyme interactions; organization of enzyme systems. *Spring*. Biological Chemistry Faculty.
- 131 NUCLEIC ACID CHEMISTRY (Biochemistry 131) (3). Prerequisites, Chemistry 62, Chemistry 107 or equivalent or permission of instructor. Study of the reactions and chemical properties basic to nucleic acids; chemical synthesis as well as biosynthesis; nucleic acids in protein biosynthesis. *Spring*. Biological Chemistry Faculty.
- 132 ENZYME MECHANISMS AND KINETICS (3). Prerequisites, Chemistry 130, or consent of instructor. A detailed discussion of enzyme catalysis; principles of catalysis; enzyme kinetics; the active site of enzymes; allosteric interactions between subunits; the mechanism of coenzyme catalyzed reactions. *Fall*. Biological Chemistry Faculty.
- 135 PHYSICAL CHEMISTRY OF MACROMOLECULES (3). Prerequisites, Chemistry 181-182 or equivalent. Kinetics of polymerization molecular weight distribution and molecular weight measurements, solution properties, solid state properties of macromolecules. *Spring*. Physical Chemistry Faculty.
- 136L LABORATORY TECHNIQUES FOR BIOPOLYMERS (3). Prerequisites, Chemistry 62, 107, 170L. Pre or corequisite Chemistry 180 or 181 or 182. Introduction to the most important analytical techniques and research procedures which are currently in

- use in the fields of protein and nucleic acid chemistry. *Two 3-hour laboratories a week, spring.* Biological Chemistry Faculty.
- 137 MEMBRANE CHEMISTRY (Biochemistry 137) (3). Prerequisites, Chemistry 62, Zoology 11 and Chemistry 107 or equivalents; corequisite or prerequisite Chemistry 180, 181, or 183 or equivalent; or permission of instructor. Structure and properties of synthetic membranes and naturally-occurring biological membranes; discussion of relation between properties of synthetic membranes and functioning of natural membranes. *Spring.* Biochemistry and Chemistry Faculty.
- 138 CHEMISTRY OF METABOLIC REGULATION (3). Prerequisite, Chemistry 107 and 180 or equivalent. Energy metabolism and its regulation, nitrogen metabolism, biosynthesis of amino acids, fatty acid metabolism. *Fall.* Biological Chemistry Faculty.
- 141L LABORATORY IN ANALYTICAL RESEARCH TECHNIQUES I (1-2). Prerequisite, Chemistry 42, and Chemistry 180 or 182, or permission of instructor. Separation techniques, nuclear magnetic resonance, mass spectrometry, visible-ultraviolet and infrared spectrophotometry, atomic absorption and flame emission, ESCA, and other special techniques; basic electroanalytical techniques. (Credit to be determined by number of topics selected by a student in conjunction with the instructor.) *One 3-hour laboratory and one 1-hour lecture a week, fall.* Analytical Chemistry Faculty.
- 142L LABORATORY IN ANALYTICAL RESEARCH TECHNIQUES II (1-2). Prerequisite, Chemistry 42, and Chemistry 180 or 182, or permission of instructor. Computer programming, numerical analysis, basic analog and digital electronics and applications to chemical data acquisition and control systems. (Credit to be determined by number of topics selected by a student in conjunction with the instructor.) *One 3-hour laboratory and one 1-hour lecture a week, spring.* Analytical Chemistry Faculty.
- 143 MECHANISTIC ANALYSIS (2). Prerequisite, Chemistry 42, and Chemistry 180 or 182, or permission of instructor. Discussion of reaction mechanism and equilibria importance in analytical solution chemistry, structure-reactivity relationships, metal complex and redox equilibria and kinetics, analysis by reaction kinetics, kinetic enzymatic analysis, mechanisms important in quantitative organic reactions. *Spring.* Analytical Chemistry Faculty.
- 144 SEPARATIONS (2). Prerequisite, Chemistry 42, and Chemistry 180 or 182, or permission of instructor. Theory and applications of equilibrium and non-equilibrium separations techniques. Extraction, countercurrent distribution, gas chromatography, column and plane chromatographic techniques, electrophoresis, ultracentrifugation, and other separation methods. *Two lecture hours a week, spring.* Analytical Chemistry Faculty.
- 145 ELECTROANALYTICAL CHEMISTRY (2). Prerequisite, Chemistry 42, and Chemistry 180 or 182 or permission of instructor. Transform analysis of passive networks, analog electronics, kinetics principles related to electrochemical processes, types of electrode reactions, large and small amplitude electroanalytical techniques, electroanalysis. *Fall.* Analytical Chemistry Faculty.
- 146 ANALYTICAL SPECTROSCOPY I (2). Prerequisite, Chemistry 42, and Chemistry 180 or 181, or permission of instructor. Spectroscopic fundamentals and principles of modern measurement. Visible, ultraviolet, infrared, nuclear magnetic resonance, and mass spectrometry. Basic spectroanalysis. *Fall.* Analytical Chemistry Faculty.
- 147 ANALYTICAL SPECTROSCOPY II (2). Prerequisite, Chemistry 42, and Chemistry 180 or 181, or permission of instructor. Principles and applications of X-ray absorption and emission, photoelectron, Raman, gamma ray, Mossbauer and internal reflection spectroscopy, electron spin resonance, fluorescence, optical rotatory dispersion and circular dichroism, secondary emission methods. *Spring.* Analytical Chemistry Faculty.

- 150 INTERMEDIATE INORGANIC CHEMISTRY (3). Prerequisite, Chemistry 181. A survey course which considers both physical and synthetic inorganic chemistry, with major emphasis on transition metal chemistry. Treatment of individual topics stresses those aspects which are in keeping with present-day trends in inorganic chemistry as well as those aspects necessary for a solid foundation in more advanced inorganic courses. *Fall*. Inorganic Chemistry Faculty.
- 151 THEORETICAL INORGANIC CHEMISTRY (1 or 3). Prerequisite or corequisite, physical chemistry. Chemical applications of group theory, which constitutes the first one-third of the course, can be taken separately for one hour credit. *Three lecture hours a week, fall*. Inorganic Chemistry Faculty.
- 153 PHYSICAL METHODS IN INORGANIC CHEMISTRY (3). Prerequisite, Chemistry 151. Introduction to the physical techniques used for the characterization and study of inorganic compounds. Topics include electronic and vibrational spectroscopy, electron and nuclear magnetic resonance, static magnetic susceptibilities, and X-ray diffraction. *Spring*. Inorganic Chemistry Faculty.
- 160 INTERMEDIATE ORGANIC CHEMISTRY (3). Prerequisite, Chemistry 62. Prerequisite or corequisite Chemistry 42. Organic reaction mechanisms and organic synthesis. *Fall*. Organic Chemistry Faculty.
- 166 ADVANCED ORGANIC CHEMISTRY (1 or 3). Prerequisite, Chemistry 160 or equivalent. Basic concepts of stereochemistry and conformational analysis. Spectroscopic methods of analysis with emphasis on elucidation of the structure of organic molecules. An elementary knowledge of chemical thermodynamics is assumed. *Three lecture hours a week, fall*. Organic Chemistry Faculty.
- 168 SYNTHETIC ASPECTS OF ORGANIC CHEMISTRY (3). Prerequisites, Chemistry 166, 175, or permission of instructor. Modern synthetic methods and their application to the synthesis of complicated molecules. *Spring*. Organic Chemistry Faculty.
- 170L SYNTHETIC CHEMISTRY LABORATORY (2). Prerequisites, Chemistry 62, 42L. An integrated treatment of both organic and inorganic synthesis. *One 4-hour laboratory and one 1-hour lecture a week, fall and spring*. Staff.
- 171L SYNTHETIC CHEMISTRY LABORATORY (2). Prerequisite, Chemistry 170L; prerequisites or corequisites, Chemistry 51 or 150. An integrated treatment of both organic and inorganic synthesis. *One four-hour laboratory and one 1-hour lecture a week, spring*. Staff.
- 175 MECHANISMS OF ORGANIC AND INORGANIC REACTIONS (4). Prerequisites Chemistry 150 and 160 or equivalent. Kinetics, thermodynamics, acid-base relationships and structure-reactivity correlations and their applications to reaction mechanisms are discussed. An integrated treatment of organic, inorganic and organometallic mechanisms is offered. *Four lecture hours each week, fall*. Inorganic and Organic Chemistry Faculty.
- 176 CHEMICAL BONDING (3). Prerequisite, Chemistry 181 or equivalent. Qualitative and quantitative aspects of chemical bonding, including quantum mechanical background, molecular orbital theory, ligand field theory, orbital symmetry, with applications to organic and inorganic chemistry. *Three lecture hours a week, spring*. Chemistry Faculty.
- 180 INTRODUCTION TO BIOPHYSICAL CHEMISTRY (3). Prerequisites, Chemistry 61, Physics 25, and Math 32. Does not carry credit toward graduate work in chemistry or credit toward B.S. degree in chemistry. Application of thermodynamics to biochemical processes; enzyme kinetics; properties of biopolymers in solution. *Spring*. Physical Chemistry Faculty.
- 181 PHYSICAL CHEMISTRY (3). Prerequisites, Chemistry 21, Math 34; Physics 27 or one of Physics 58 and 61. Introduction to quantum mechanics, atomic and molecular structure, and spectroscopy. *Fall*. Physical Chemistry Faculty.

- 181L PHYSICAL CHEMISTRY LABORATORY (2). Corequisite or prerequisite, Chemistry 181. Experiments in physical chemistry. *One four-hour laboratory a week, fall.* Staff.
- 182 PHYSICAL CHEMISTRY (3). Prerequisites, Chemistry 21, Math 34; Physics 27 or one of physics 58 and 61. Thermodynamics, kinetic theory, chemical kinetics, statistical mechanics. *Spring.* Physical Chemistry Faculty.
- 182L PHYSICAL CHEMISTRY LABORATORY (2). Corequisite or prerequisite, Chemistry 182. Experiments in physical chemistry. *One four-hour laboratory a week, spring.* Staff.
- 184 INTRODUCTION TO STATISTICAL THERMODYNAMICS (3). Prerequisites, Chemistry 181 and 182 or equivalent. Review of thermodynamics; classical and quantum statistics of independent particles; polyatomic gases; kinetic theory; the canonical ensemble. *Fall.* Physical Chemistry Faculty.
- 185 CHEMICAL DYNAMICS (3). Prerequisites, Chemistry 181 and 182. Experimental and theoretical aspects of atomic and molecular reaction dynamics. *Spring.* Physical Chemistry Faculty.
- 186 INTRODUCTION TO QUANTUM CHEMISTRY (3). Prerequisites, Chemistry 181 and 182 or equivalent. Introduction to the principles of quantum mechanics. Approximation methods; angular momentum; simple atoms and molecules. *Fall.* Physical Chemistry Faculty.
- 187 INTRODUCTION TO MOLECULAR SPECTROSCOPY (3). Prerequisite, Chemistry 186 or equivalent. Interaction of radiation with matter; selection rules; rotational, vibrational and electronic spectra of molecules; laser based spectroscopy and non-linear optical effects. *Spring.* Physical Chemistry Faculty.
- 188 QUANTUM CHEMISTRY (3). Prerequisite, Chemistry 186. Applications of quantum mechanics to chemistry. Molecular structure; time-dependent perturbation theory; interaction of radiation with matter. *Spring.* Physical Chemistry Faculty.
- 189 STATISTICAL MECHANICS (3). Prerequisite, Chemistry 184 or permission of instructor. Applications of statistical mechanics to chemistry. Ensemble formalism; condensed phases; nonequilibrium processes. *Spring.* Physical Chemistry Faculty.
- 191 MATHEMATICAL TECHNIQUES FOR CHEMISTS (3). Prerequisite, knowledge of differential and integral calculus. Chemical applications of higher mathematics. *Fall.* Chemistry Faculty.

Courses for Graduates

- 231 SEMINAR IN BIOLOGICAL CHEMISTRY (2 each). Prerequisite, graduate standing. Literature survey dealing with topics in protein chemistry and nucleic acid chemistry. *Fall and spring.* Biological Chemistry Faculty.
- 232
- 233 SPECIAL TOPICS IN BIOLOGICAL CHEMISTRY (1-3). Modern topics in biological chemistry. *Fall and spring.* Biological Chemistry Faculty.
- 242 LITERATURE SEMINAR IN ANALYTICAL CHEMISTRY (2 each). 242 given in even-numbered years; 243 given in odd-numbered years. *Spring.* Analytical Chemistry Faculty.
- 243
- 244 SPECIAL TOPICS IN ANALYTICAL CHEMISTRY (1-2). Modern topics in analytical chemistry, including advanced electroanalytical chemistry, advanced mass spectrometry, chemical instrumentation, and other subjects of recent significance. *Two lecture hours a week, fall and spring.* Analytical Chemistry Faculty.
- 245
- 252 SPECIAL TOPICS IN INORGANIC CHEMISTRY (1-3). Prerequisite, permission of instructor. Research level survey of topics in inorganic chemistry and related areas. *Fall and spring.* Inorganic Chemistry Faculty.
- 254 LITERATURE SEMINAR IN INORGANIC CHEMISTRY (2). Prerequisite, graduate status. *Fall and spring.* Inorganic Chemistry Faculty.

- 258 X-RAY STRUCTURE DETERMINATION (3). Prerequisites, permission of instructor; a knowledge of elementary and differential calculus will be assumed. This course is designed to introduce students to the techniques used in solving crystal structures by X-ray diffraction. *Three lecture hours a week, fall.* Inorganic Chemistry Faculty.
- 261 SEMINAR IN ORGANIC CHEMISTRY (2 each). Prerequisite, graduate standing.
- 262 One afternoon meeting a week and individual consultation with the professor in charge. *Fall and spring.* Organic Chemistry Faculty.
- 264 SPECIAL TOPICS IN ORGANIC CHEMISTRY (1-3 each). *Two lecture hours a week, fall and spring.* Organic Chemistry Faculty.
- 265 ORGANIC CHEMISTRY (2 to 6). Prerequisite, to be determined by consultation with professor in charge. *Three to six hours a week, fall and spring.* Organic Chemistry Faculty.
- 267 ORGANIC CHEMISTRY (2 to 6). Prerequisite, to be determined by consultation with professor in charge. *Three to six hours a week, fall and spring.* Organic Chemistry Faculty.
- 281 SEMINAR IN PHYSICAL CHEMISTRY (2 each). Prerequisite, graduate standing.
- 282 *Two hours a week, fall and spring.* Physical Chemistry Faculty.
- 283 SPECIAL TOPICS IN PHYSICAL CHEMISTRY (1-3 each). Prerequisite, permission of instructor. Modern topics in physical chemistry, chemical physics, or biophysical chemistry. *One to three lecture hours a week, fall and/or spring.* Physical Chemistry Faculty.
- 284 PHYSICAL CHEMISTRY (1-3 each). Prerequisite, permission of instructor. Modern topics in physical chemistry, chemical physics, or biophysical chemistry. *One to three lecture hours a week, fall and/or spring.* Physical Chemistry Faculty.
- 288 PRINCIPLES OF CHEMICAL PHYSICS (3 each). Prerequisite, Chemistry 281 or
- 289 Physics 160 or permission of the instructor. The quantum mechanics of molecules and their aggregates. Atomic orbitals, Hartree-Fock methods for atoms and molecules. Theory of diatomic molecules. Molecular orbital and valence bond approach. Coupling between vibrational rotational, and electronic motions in molecules. Interaction of radiation with matter. Special topics of interest to the instructor and research students. *Three lecture hours a week, fall and spring.* Physical Chemistry Faculty.

Research Courses

- 331 RESEARCH METHODOLOGY AND SEMINAR IN BIOLOGICAL CHEMISTRY (1 or more). Seminar and directed study on research methods of biological chemistry. This course provides a foundation for master's thesis or doctoral dissertation research. *Fall and spring.* Biological Chemistry Faculty.
- 341 RESEARCH METHODOLOGY AND SEMINAR IN ANALYTICAL CHEMISTRY (1 or more). Seminar and directed study on research methods of analytical chemistry. The course provides a foundation for master's thesis or doctoral dissertation research. *Fall and spring.* Analytical Chemistry Faculty.
- 351 RESEARCH METHODOLOGY AND SEMINAR IN INORGANIC CHEMISTRY (1 or more). Seminar and directed study on research methods of inorganic chemistry. The course provides a foundation for master's thesis or doctoral dissertation research. *Fall and spring.* Inorganic Chemistry Faculty.
- 361 RESEARCH METHODOLOGY AND SEMINAR IN ORGANIC CHEMISTRY (1 or more). Seminar and directed study on research methods of organic chemistry. The course provides a foundation for master's thesis or doctoral dissertation research. *Fall and spring.* Organic Chemistry Faculty.
- 381 RESEARCH METHODOLOGY AND SEMINAR IN PHYSICAL CHEMISTRY (1 or more). Seminar and directed study on research methods of physical chemistry. The course provides a foundation for master's thesis or doctoral dissertation research. *Fall and spring.* Physical Chemistry Faculty.
- 393 MASTER'S THESIS (Hours vary). Prerequisites, Chemistry 331, 341, 351, 361, or 381. *Fall and spring.* Graduate Faculty.
- 394 DOCTORAL DISSERTATION (Hours vary). Prerequisites, Chemistry 331, 341, 351, 361, or 381. *Fall and spring.* Graduate Faculty.
- 400 GENERAL REGISTRATION (0).

DEPARTMENT OF CITY AND REGIONAL PLANNING

DAVID R. GODSCHALK, *Chairman*

Professors

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|----------------------|------|--|
| DAVID R. GODSCHALK | (11) | Land Use Policy, Public Participation, Growth Management |
| PHILIP P. GREEN, JR. | | Public Law and Government |
| MILTON S. HEATH, JR. | | Natural Resource Law |
| EDWARD J. KAISER | (5) | Urban Development Processes, Land Use Planning, Planning Methodology |
| DAVID H. MOREAU | (10) | Environmental Planning, Water Resources Planning, Systems Analysis |
| CONRAD SEIPP | (4) | Planning Theory, Health Services Planning |
| MICHAEL A. STEGMAN | (6) | Housing and Public Policy |
| SHIRLEY F. WEISS | (7) | Central City Revitalization, New Community Development, Land Use Decisions |

Associate Professors

- | | | |
|-------------------|------|--|
| EDWARD M. BERGMAN | (14) | Planning Theory, Local Economic Planning and Development |
| C. GORMAN GILBERT | (16) | Transportation Planning |
| EMIL E. MALIZIA | (12) | Regional Economic Development Planning, Planning Theory |

Assistant Professors

- | | | |
|------------------|------|---|
| WILLIAM W. HILL | (20) | Environmental Planning, Water Resources Planning, Energy Planning |
| LINDA LACEY | (32) | Planning Methods, Demographic Analysis, Urban and Regional Theory |
| WILLIAM M. ROHE | (22) | Social/Behavioral Aspects of Urban Development, Neighborhood Planning and Development |
| DALE WHITTINGTON | (29) | Public Investment, Environmental Planning, Water Resources |

Visiting Professors

MICHAEL SMITH
WILBUR THOMPSON

Visiting Associate Professors

RACHELLE ALTERMAN
LINDA JEWELL

Visiting Lecturers

DAVID BROWER
JONATHAN HOWES
DAVID KING
TERRY LATHROP
TAKUYA NAKAMOTO

Emeritus Professors

F. STUART CHAPIN, JR.
MAYNARD M. HUFSCHMIDT
JOHN A. PARKER
JAMES M. WEBB

The Department of City and Regional Planning offers two degree programs, each at the graduate level. A two-year program preparing for professional practice in city and regional planning leads to the degree of Master of Regional Planning. A program leading to the degree of Doctor of Philosophy prepares for careers in teaching and research. *These two programs, opportunities in the field of city and regional planning, and application procedures are described in detail in a separate bulletin of the Department of City and Regional Planning which may be obtained by addressing a request to the Department.*

A bachelor's degree from an institution of recognized standing is required for admission. While the design professions, the social sciences, and engineering are the most clearly relevant undergraduate backgrounds in preparation for graduate work in planning, there is increasing need in the field for people prepared in the humanities and physical sciences, and many opportunities for students in other fields. Applications for admission are considered in view of the student's past record and interest in planning.

Certain courses in the Department are open (with permission of the instructor) to advanced undergraduates at the University. These include Planning 106, 107, 108, 110, 111, 127, 174, 176, 181, and 199. Undergraduates reading for honors, or those certified by their departments as eligible for honors study, may enroll in an honors program in urban and regional studies. The undergraduate honors program is described in the Undergraduate Bulletin as well as in the separate bulletin of the Department. Undergraduates may also enroll in the Interdisciplinary Studies B.A. degree program in the College of Arts and Sciences, with a focus in urban studies. Interested students should consult with the Faculty Sponsor in the Department of City and Regional Planning, preferably in the spring semester of their sophomore year.

Since the Department enrollment is limited, applicants are advised to apply for admission as early as possible thereby insuring adequate time for

assembling records and recommendations. Applicants are required to take the Graduate Record Examination. While not required, it is useful to arrange interviews with the faculty, especially for applicants to the doctoral program.

Alumni of the Department are employed by public and private planning agencies at the local, state, regional, and national levels in all parts of the United States and in other countries. Others serve as consultants to business, industry, and government. Still others are engaged in teaching and research in academic institutions.

Master of Regional Planning

The program leading to the degree of Master of Regional Planning prepares the candidate for professional planning practice. The curriculum covers social and institutional problems and settings, and planning and management skills. Coursework emphasizes planning as a way of marshaling public and private resources to achieve desirable development patterns and processes, in terms of efficiency, equity, and quality of life.

Satisfactory completion of the degree requires completion of a minimum of 48 credit hours, including 24 credits constituting an area of concentration, and a Departmental paper. The normal course load is 12 credit hours per semester. Thirty of the required 48 credits must be taken in the Planning Department. A minimum of 6 credits must be taken outside the Department.

Entering students are strongly advised to complete courses in microeconomics and statistics prior to starting the program. Other introductory courses in sociology, political science, urban history, mathematics, economics, logic, design, and American civilization, while not prerequisite, are recommended as valuable preparation for students in planning. Students without previous experience in planning are urged to seek employment in planning before entering the Department or during the summer between the first and second year of the program.

Course work for the degree is divided into 1) general requirements, 2) area of concentration, and 3) electives. Students are assisted in the design of their educational programs by faculty adviser teams, who help to select courses appropriate for the students' educational interests and goals.

General Course Requirements

All Master's degree students are expected to meet certain general course requirements. These presently consist of four courses covering planning theory, planning law, quantitative analytical methods, and statistics. (A fifth course in urban and regional theory is expected to be proposed for addition to the general course requirements during 1982-1983.) These

basic course topics constitute a core of knowledge and skills prerequisite to completion of the Master's degree program.

The planning theory requirement is met by completing Planning 215. Students select a planning law course (from among Planning 230, 233, 263, or another course approved by the faculty) that is appropriate for their concentration. The quantitative methods requirement is met by completing Planning 231. Students who need background preparation in statistics before taking other methodology courses in the Department will be required to take a basic statistics course (Planning 105).

Areas of Concentration

Each student develops an area of concentration in planning in consultation with faculty advisers. The area of concentration identifies the field of professional practice in which the student expects to develop competence and begin a professional career.

Areas of concentration offered by the Department represent a combination of available faculty resources, current practice employment opportunities, and longer term societal needs. As these factors change, concentration content is adjusted. Various concentrations offer different blends of technical knowledge, planning and management skills, and varying philosophies about the role of the planner.

Primary areas of concentration and their coverage include:

Housing and Community Development. The housing market, low and moderate income housing policy, real estate investment, and housing project development. Housing and community development law. Neighborhood planning, conservation, and revitalization. Community economic development. Central city revitalization programs, policies, and legislation, urban revival strategies, urban entrepreneurial decisions, and urban development projects.

Land Use and Physical Development. Urban spatial structure, activity patterns, and the land development process. Methods of urban and regional land use planning and implementation. Planning law. Urban development guidance systems and regional growth management programs. Large scale developments and new communities. Social aspects of urban development. Site planning. Institutional bases for land use planning, including organizations, public policies, and related programs.

Environmental Management. Environmental quality and natural resource policy, particularly related to water resources and water and air quality. Methods of planning for residuals management. Water resources planning and management strategies. Renewable and traditional energy systems. Models of environmental analysis. Theory and techniques of public investment. Natural resource law and policy.

Transportation. The urban transportation system as a component of urban structure. Public transportation programs, including mass transit, innovative transit services, and paratransit. Models for describing and evaluating transportation systems and predicting demand. Analysis of urban and regional transportation issues. Railroad planning and operations.

Economic Development. Urban and regional development theories, models, and strategies. Economic, fiscal, and employment planning techniques. Urban and community economic development strategies for accumulating productive and social capital. Development finance.

In addition to focusing on these primary areas of concentration, it is possible for students to pursue other fields of planning as their concentration within the Department's curriculum. For example, a concentration might combine two areas, such as land use and environmental planning or transportation and economic development planning. Or a student might desire to focus in depth on a narrower portion of a particular specialization, such as neighborhood planning or water resource planning. A concentration might be built around a set of skills, such as quantitative analysis or development administration, or around a practice context, such as metropolitan areas or small towns. Finally, a student might elect to seek to develop generalist planning knowledge and skills by selecting courses from a variety of areas, including housing and community development, land use, and transportation, for example.

The objective of defining primary areas of concentration is to identify the subject areas where there exists a critical mass of courses sufficient to allow both breadth and depth of coverage. The intent is not to limit students in their choice of concentration but to provide them with information about the particular educational strengths and resources of the Department and the University. Our goal is to offer each student the optimum combination of structure and flexibility to develop his or her talents and knowledge as fully as possible.

In order to provide structure without curtailing flexibility, students are asked to design their areas of concentration around a distributional system based on four types of courses: theory, method, application and problem solving, and practice-related. An area of concentration requires a minimum of 24 credit hours of coursework (equivalent to eight standard three-hour courses), of which 18 credit hours must be taken within the Department. The 24 credits must be distributed as follows:

Theory: 3 credits, must be in Planning. Courses serving this function provide conceptual models of the primary systems within the field of practice. These models provide the student with a picture of the

world upon which planning is to have some impact. Examples would be urban spatial structure, a housing market, a transportation system, or a local economy.

Planning Methods: 6 credits, 3 must be in Planning. Courses serving this function include the broad range of techniques and procedures used in all aspects of planning including the design and programming of activities to achieve some objective, as well as the quantitative and qualitative techniques used for modeling states of the system upon which planning is being done, and for evaluating plans regarding changes in those system states. Some courses cover methods applicable to many functional concentrations in planning, such as program evaluation, and some courses are specific to one or two concentrations.

Planning Applications and Problem Solving: 6 credits, 3 must be in Planning. Courses serving this function consist of experiential learning based on problem-solving in a real world context using theories and methods as discussed above. Such courses include applications courses, studios, fieldwork, supervised independent study, and research seminars devoted to a particular policy problem. They may be method-based applications of a particular planning and management technique, or involve client-based problem solving fieldwork.

Planning Practice Related: 9 credits, 3 must be in Planning. These courses must be clearly related to the professional practice focus of the student's area of concentration. They include courses dealing with political and value constraints, existing institutions, and programs and procedures within which a given field of planning practice operates.

Courses within the Department are classified according to this framework. Courses from outside the Department are reviewed and approved by the student's advisers.

General Electives

An additional 18 credits beyond the two required courses and the 24 credits in an area of concentration are required. If Planning 105 and Planning 231 are taken, they are counted as general electives. The general electives may be used to develop a supporting area in another aspect of professional planning, develop a supporting area in a discipline (economics, sociology, etc.) or another professional program represented on campus (public administration, health administration, environmental engineering, etc.), or develop analytic skills and general competence for

professional practice through a grouping of methodology and theory courses selected both within the Department and from the regular offerings of the University. Nine of the 18 credits may be taken outside the Department.

Doctor of Philosophy

In comparison with the master's degree, which signifies preparation for professional planning practice, the degree of Doctor of Philosophy in City and Regional Planning is conferred only upon those who have completed, with high distinction, a rigorous program of preparation for research and teaching in planning. Candidates must demonstrate mastery of the materials in a substantive field of planning, of the concepts of planning theory, and of the methods of advanced research, and illustrate this mastery through a dissertation resulting from independent research.

Requirements for admission to the doctoral program are those prescribed for admission to the Graduate School. The degree requires a minimum of 51 credits, not including dissertation. Of these, 45 credits must be completed before the doctoral examinations may be taken. At least 24 of the 51 credits must be taken in Departments other than City and Regional Planning.

The professional master's degree in planning is not required of persons wishing to qualify for the doctorate. However, prior to admission to candidacy, the student undertaking study of the degree of Doctor of Philosophy in the Department of City and Regional Planning must demonstrate a knowledge of the professional practice of planning. Such knowledge is usually acquired through selected graduate courses offered at The University of North Carolina at Chapel Hill, or at other institutions offering acceptable programs; or through some equivalent preparation acceptable to the student's committee.

Doctoral candidates must prepare to be examined in three areas: (1) planning theory, (2) an area of specialization related to city and regional planning, and (3) research methods.

Areas of specialization and appropriate coursework for doctoral students are jointly determined by the students and their program advisers. Particular efforts are made to develop programs which meet student needs, build on their prior academic training, and for which substantial Departmental and University-wide faculty resources are available. Areas of specialization ordinarily include at least 18 credits of coursework. While the substantive focus of these areas may vary from student to student, each set of courses designated as an area of specialization must be mutually reinforcing and coherent; must prepare the student for expertise in some body of knowledge, methodology, or problem area; and must provide the student with adequate skills and knowledge to do research.

The requirement of a supporting program (15 credits minimum) may be satisfied in two ways. The student may develop a supporting program related to his or her major program and made up of courses drawn from Planning and a number of other disciplines such as: Anthropology, Economics, Engineering, Environmental Sciences, Epidemiology, Geography, Computer Science, Mathematics, Political Science, Physical Sciences, Psychology, Sociology, or Statistics. Or a student may take a formal minor in another discipline with the consultation and approval of the appropriate department. The supporting area or minor emphasizes the achievement of methodological and related skills necessary to extend the student's research capabilities within a chosen area of specialization. Supportive complementary relationships between the two program components must be demonstrated.

Because a Ph.D. program is built around the particular interests of the doctoral student, it is important that the Ph.D. Admissions Committee be able to identify an applicant's program interests from application materials submitted for review to the Graduate School and the Department. In addition to any supplemental material the applicant may wish to submit in support of his or her application, the biographical essay or statement called for in the Department's supplemental application should include a statement of specific program coursework and research interests, and information on relevant prior academic and professional training. The admissions process consists of two related phases. First, the Admissions Committee renders judgment about the academic qualifications of the Ph.D. applicant. Second, assuming academic qualifications are met, the Committee attempts to identify the applicant's program interests and the stage of development of those interests, and then considers the extent to which Departmental and University-wide resources may be marshalled in support of those stated interests. Thus, academic qualifications are a necessary but not sufficient basis for admission into the doctoral program. Applicant interests and University resources must be mutually supportive to ensure the development of a strong Ph.D. Program.

Doctoral candidates who hold master's degrees in planning require generally a minimum of three semesters in residence before beginning the dissertation. Other candidates may require six or more semesters, depending on their preparation.

Persons wishing to be considered for admission to the doctoral program and for fellowships and assistantships that may be available to doctoral candidates are advised to communicate with the Department as far in advance as possible of the date they wish to enter. The deadline for applications for certain fellowships available to Ph.D. candidates is in October preceding the August in which the applicant plans to begin the doctoral program. It is beneficial for an applicant to visit the Department

to discuss doctoral program requirements and to describe his or her interests prior to making formal application for admission.

Further information about the doctoral program may be obtained from the program director, Professor Edward Kaiser.

Combined Program in Law and Planning

Under a program sponsored jointly by the School of Law and the Department of City and Regional Planning, students enrolled in both curricula may receive both the J.D. and Master of Regional Planning degrees in four years rather than the five years ordinarily required. The program draws upon the resources of the two curricula with a view to developing professionals capable of dealing with both the legal and planning aspects of urban and regional policy problems. The combined degree program is designed to prepare for a variety of professional roles in which a knowledge of planning methodology and process, coupled with the analytical skills and professional expertise of the lawyer, are essential. These may include administrators and staff of public agencies and consulting firms in the fields of planning, housing, development, and environmental protection, research analysts, staff members of governmental commissions and agencies, or executive assistants to elected and appointed officials.

To enter this program, students must apply separately to both the School of Law and the Department of City and Regional Planning, and must be accepted independently by both. Students entering the program spend their entire first year in either the Planning Department or the Law School, and the student must make this choice at the time of admission. The second year is normally spent full-time in the program not selected in the first year. After the first two years the student has an additional 43 semester credits to complete in the Law School and 12 semester credits to complete in Planning.

Combined Program in Planning and Transportation Engineering

A combined program leading to graduate degrees in city and regional planning and transportation engineering is offered in collaboration with the Department of Civil Engineering of North Carolina State University at Raleigh. The combined program, which calls for 60 semester credit hours, leads to the degrees of: Master of Regional Planning and Master of Science in Civil Engineering or Master of Civil Engineering. This program is open to students with undergraduate degrees in civil engineering. For other students, coursework in transportation is available at NCSU with approval of the instructor. For further information write to the Chairman of the Department of City and Regional Planning, The University of North

Carolina at Chapel Hill, and to the Chairman of the Department of Civil Engineering, North Carolina State University at Raleigh.

Research Programs in Urban and Regional Studies

Through the Center for Urban and Regional Studies, the Institute for Research in Social Science, the Water Resources Research Institute, the Institute for Environmental Studies and the Triangle Universities Consortium on Air Pollution, members of the faculty and graduate students in the Department of City and Regional Planning and in related departments collaborate on research in a wide range of subject areas concerning planning, human behavior, and the environment.

Established in 1953 and later expanded under a grant from the Ford Foundation, the program of the Center for Urban and Regional Studies is concerned with theoretical and empirical research in urban processes and area development. With continuing State funding inaugurated by the 1969 North Carolina General Assembly, the Center now has a permanent staff for planning and administration of its program and for the development of a research-oriented program of services to local and state governments in North Carolina and elsewhere. The Department's faculty utilizes the Center to pursue research interests and collaborates with faculty members of other departments in the University on research projects.

The Institute for Environmental Studies, established in 1965, provides within the University a means for furthering research and teaching the various fields of environmental quality on an interdisciplinary basis. Members of the Department's faculty and graduate students use the Institute to participate with other departments in seminars and discussions on broad aspects of environmental quality in the natural and social sciences, engineering, and in public health.

In 1964 the Water Resources Research Institute was established to support research on all aspects of water resources including the planning, programming, and analysis of urban and regional systems for development and control of water quantity and quality. The Institute serves as a focal point for faculty and student research and interdisciplinary seminars relating to water resources.

The Triangle Universities Consortium on Air Pollution is an association of The University of North Carolina at Chapel Hill, Duke University, and North Carolina State University formed in 1970 to advance joint and cooperative action in education, research, and public service related to air quality management. The Consortium serves as a focal point for faculty and students in cooperative research and teaching related to air resources and their management.

Courses for Graduates and Advanced Undergraduates

- 105 INTRODUCTION TO PLANNING STATISTICS (3). Foundation course in statistical concepts and methods primarily for professional master's degree candidates in this Department. Elements of probability theory, estimation and hypothesis testing, simple correlation and regression, and simple analysis of variance. *Fall*. Kaiser, Rohe, Lacey.
- 106 INTRODUCTION TO URBANISM AND PLANNING (3). Discussion and analysis of current urban problems and of forces responsible for urban and regional growth. Historical perspective on the planning profession and the planning approach to urban phenomena. Evaluation of current proposals dealing with aspects of the urban situation in the United States. *Fall*. Lacey, Rohe.
- 107 ENTREPRENEURIAL DECISIONS FOR URBAN DEVELOPMENT (3). A seminar and field experience in balanced new communities, retirement communities, planned unit developments (PUDs), regional and community shopping centers, industrial/research parks, and recreation-theme parks. Focus on the decision-making process, entrepreneurial risk in building the urban environment, and uncertainties in long-range planning and development. *Fall*. Weiss.
- 108 URBAN REVIVAL: COMPREHENSIVE APPROACHES (3). Prerequisites, PLAN 106 for undergraduates and permission of instructor. Seminar designed to array and assess the urban revival tools and strategies developed by American cities over the past thirty years to solve problems of economic social and physical decline. *Spring*. Weiss.
- 110 SELECTED TOPICS IN URBAN STUDIES (3). An introduction to the functioning of the urban area as a complex system, and to the analysis of policies aimed at development and change. *This course is taught as Planning 110 in the fall and as Planning 111 in the spring*. Faculty.
- 111
- 127 URBAN TRANSPORTATION PLANNING (3). Fundamental characteristics of the urban transportation system, as a component of urban structure. Methodologies for the analysis and planning of urban transportation. Techniques for the analysis of problems and the evaluation of plans. *Fall*. Gilbert.
- 174 URBAN ECONOMICS (ECON 122) (3). Prerequisite, Economics 100 or 101 or equivalent. Urban problems facing us today; unorganized growth, disparate land uses, fiscal crisis, the ghetto, poverty, employment, housing and transportation inadequacies, and crime. *Fall or spring*. Akin, Witte.
- 176 LOCATION AND SPACE ECONOMY (ECON 120) (3). Prerequisite, ECON 100 or 101 or permission of instructor. The effects of space on economic and social activity. *Fall*. Witte.
- 181 RENEWABLE ENERGY SYSTEMS (3) Prerequisite, PLAN 200 or permission of instructor. Implementation of energy systems based on renewable energy sources (including solar, biomass, hydro, and wind). Planning techniques for evaluating merits, costs, engineering feasibility, and implementation of such systems within the institutional context of communities and regions. *Fall*. Faculty.
- 199 HONORS SEMINAR IN URBAN AND REGIONAL STUDIES (3). An overview of the subject matter and methods of investigation of the several disciplines as these relate to the study of cities and regions. Discussions supplemented by presentations of original papers prepared by the students. *Spring*. Weiss.

Courses for Graduates

- 200 SPECIAL TOPICS IN PLANNING AND URBANISM (3). Readings and discussions to provide opportunity to develop new concepts and topics in various aspects of city and regional planning. See Departmental Catalogue for listing of topics by
- 201

- section. *This course is taught as Planning 200 in the fall and as Planning 201 in the spring.* Faculty.
- 203 RAILROAD PLANNING (3). Prerequisite, PLAN 127 or permission of instructor. A seminar focusing on the emerging public role in railroad planning and operations. The fundamental railroad problems are examined and recent public attempts to resolve these problems are reviewed. *Spring.* Gilbert.
- 205 PUBLIC TRANSPORTATION (3). A seminar investigating alternative public urban transportation systems including mass transit, innovative transit services, and para-transit schemes. The system will be examined from economic, land use, social, technical, and policy perspectives. *Spring.* Gilbert.
- 207 TRANSPORTATION PLANNING MODELS (3). Techniques for predicting transportation demand. The transportation planning process: data collection, trip generation, modal choice, trip distribution and assignment. System evaluation techniques; social, economic, and environmental impacts of transportation; investigation of innovative modeling techniques. *Spring.* Gilbert.
- 209 PLANNING AND GOVERNMENT (Poli. 209) (3). Seminar on the nature and scope of the planning function in government, with particular emphasis on planning and domestic policymaking in the federal executive branch, and its legislative and intergovernmental relationships. *Spring.* Howes.
- 215 THEORY OF PLANNING I (3). Concepts and logic of planning as a professional activity. Critical overview of current theories leading students to development of a personal philosophy applicable to their work as planners. *Fall.* Faculty.
- 216 THEORY OF PLANNING II (3). Construction of methodologies for evaluating various theories of planning and intensive analysis of the North American planning theory literature. Doctoral-level introduction to the area. *Spring.* Faculty.
- 219 ENVIRONMENTAL SYSTEMS ANALYSIS (ENVR 219) (3). Principles of model construction for complex urban and environmental resource systems. Includes a review of selected models of urban and regional growth, water quantity and quality, air quality, and other environmental impacts. *Fall.* Moreau.
- 221 SITE PLANNING AND DESIGN (3). Principles and techniques of site utilization and design applied to actual field assignments and problems. Instruction covers basic design considerations in current land planning and development practice in relation to problems of varying urban scale and complexity. *Spring.* Faculty.
- 223 PLANNING PROBLEMS (3). A study of depth which may be concerned with one or more types of problems such as urban analysis, land use planning, regional planning, urban design, urban simulation, manpower planning or regional economic development. Students are advised to select the section which most closely relates to their career interests. See Departmental Catalogue for listing of topics by section. *Fall or spring.* Faculty.
- 226 REGIONAL DEVELOPMENT PLANNING (3). A study in depth of development theories, models, and strategies applicable to open, underdeveloped regions within developed nations, especially ones which describe the morphogenesis of political economy and social classes. *Fall.* Malizia.
- 230 PLANNING LAW (3). Governmental organization and enabling legislation for planning; eminent domain, dedication, official map, and other property-acquisition techniques; land use regulations, including nuisance ordinances, deed restrictions, building regulations, subdivision regulations, and zoning. *Spring.* Brower.
- 231 QUANTITATIVE METHODS IN PLANNING (3). Fundamental quantitative methods as aids in prediction and decision analysis in planning, including demographic, economic, and spatial analysis. Introduction to computer programming and simulation. *Spring.* Faculty.

- 232 PUBLIC INVESTMENT THEORY AND TECHNIQUES (ENVR 282) (3). Prerequisite, Econ. 131 or equivalent. The basic theory, process, and techniques of public investment and planning and decision-making, involving synthesis of economic, political and technologic aspects, Presents the theory underlying benefit-cost analysis, cost effectiveness, and PPBS, and adapts it, in both descriptive and normative terms, for application to a model that transforms broad community objectives into specific standards and criteria for planning public projects and programs. *Spring*. Whittington.
- 233 NATURAL RESOURCE LAW AND POLICY (ENVR 283) (3). An examination of the law of resource use and development, its administration and underlying policies. Particular attention is given to water resources law, regulatory law, and natural resource administration, *Fall, spring*. Heath, Campbell.
- 234 WATER RESOURCES PLANNING AND POLICY ANALYSIS (ENVR 284) (3). Introduction to water resources planning and management. Emphasis on federal and state water resources policies, and the development of analytical skills for identification of environmental problems associated with urban water resources development. *Fall*. Faculty.
- 235 LAND USE PLANNING (3). An introduction to land use planning methodology. Techniques of carrying out basic surveys and analyses of population, activity systems, and land use are evaluated; the land use design process and the land use policy analysis process are examined; land use modeling systems are introduced. Concepts of urban spatial structure and land development are discussed as outcomes of urban activities accommodating to economic, social, political and physical constraints. *Spring*. Kaiser.
- 236 DEVELOPMENT AND EMPLOYMENT PLANNING TECHNIQUES (3). Descriptive techniques of regional economic accounting, social and spatial indicators, and shift-share analysis; analytic and planning uses of regional input-output models; employment programming including social benefit-cost analysis. *Spring*. Malizia.
- 237 URBAN SPATIAL STRUCTURE (3). An introduction to the study of urban spatial structure and urban planning. The course has a dual focus on concepts useful in understanding individual and household behavior in urban areas, particularly on understanding how households make location, travel and activity decisions; and on using these concepts in planning for urban growth and change. *Fall*. Staff.
- 238 NEW TOWNS SEMINAR (3). Review of issues and problems in new town development; comparative evaluation of new town development processes and projects in public and private sectors; independent research on planning process, public policy, implementation, and social concerns. *Spring*. Weiss.
- 239 REVITALIZING THE CENTRAL CITIES: PROCESS, PRODUCT, AND POTENTIAL (3). Critical examination of processes of urban redevelopment, renewal, conservation, preservation, adaptive re-use, new towns-in-town as they have evolved in the older cities of the USA. Key legislation, public policies, and revitalization programs in the public and private sectors are reviewed through an extensive reading list and consideration of a broad range of city studies. *Fall*. Weiss.
- 241 ENVIRONMENTAL PLANNING (3). Problems, issues, and policy options of environmental quality planning at local, metropolitan, and regional scales. Emphasis on air and water quality, waste management, and land use relationship. Study of a comprehensive analysis framework. *Fall*. Moreau.
- 242 REGIONAL LAND PLANNING METHODS (3). Prerequisite, permission of instructor. Methods for substate regional land planning, including land capability analysis, land classification mapping, critical areas identification, regional impact analysis, and area-wide capital facilities programming, Institutional and legal determinants of regional land management practice. *Fall*. Godschalk.

- 244 URBAN DEVELOPMENT GUIDANCE SYSTEMS (3). Prerequisites or corequisites, PLAN 230 or 233, and PLAN 235 or 242. Seminar on local government actions to guide urban growth and development. Regulatory, public investment, incentive and policy instruments are reviewed, along with ways of coordinating these tools into effective systems. *Fall*. Kaiser.
- 246 HOUSING AND PUBLIC POLICY (3). The housing market as the setting within which the low-income housing problem is studied; housing and the subsidy, conflicting goals and contradictory efforts; housing market analysis, problems of production, financing and rationalizing public policies and efforts to increase the supply of low and moderate income housing units. *Fall*. Stegman.
- 247 ISSUES IN HOUSING MARKET DYNAMICS (3). Prerequisite, PLAN 246 or consent of instructor. Detailed inquiry into a number of theoretical issues relating to market dynamics; the formulation, execution and evaluation of housing policy. Among the possible subjects of investigation are the structure of the housing market, filtering, housing costs, the nature and efficiency of the construction industry, the economics of slums. *Spring*. Stegman.
- 248 TRANSPORTATION PLANNING SEMINAR (3). Original research on significant technical, economic, social and administrative aspects of urban and regional transportation leading to a better understanding of the nature and problems of transportation and the methods of planning for it. *Fall or spring*. Gilbert.
- 249 INVESTMENT AND LOW-INCOME HOUSING (3). Prerequisite, PLAN 246 or consent of instructor. The fundamentals of real estate investment analysis and taxation, with particular reference to the development of subsidized low and moderate income housing projects; responsibilities include problem sets and an independent project. *Spring*. Stegman.
- 252 SOCIAL DIMENSIONS OF URBAN DEVELOPMENT (3). Interrelation of physical and social aspects of urban development, including social theories of urban spatial structure and neighborhood change. Study of residential segregation, activity systems, mobility, land use and crime, and other topics. *Spring*. Rohe.
- 260 URBAN ECONOMIC DEVELOPMENT PLANNING (3). Political-economic study of city economies as sub-national entities with increasingly unstable economic structures. Planned strategies to accumulate and share productive and social capital. *Spring*. Bergman.
- 263 HOUSING AND COMMUNITY DEVELOPMENT (LAW 255) (3). The supply and use of public and private urban housing, exclusive of residential subdivisions. Public housing, low and moderate income housing programs, housing subsidies. Urban renewal, model cities, and metropolitan development. The rights and duties of indigent tenants against public and private landlords. Racial discrimination in housing. *Fall*. Faculty.
- 265 SOCIAL POLICY PLANNING (3). This course deals specifically with public policy influencing social planning. The overall objective is the development of a model to analyze social policies and the force field surrounding policy evolution. *Spring*. Faculty.
- 266 DESIGN OF POLICY ORIENTED RESEARCH (3). The purpose of this course is to develop understanding and skill in the design of social research as used in the analysis of planning problems and policy formulation. The course will emphasize the logic underlying research methodology in the social sciences, rather than specific techniques in data collection and analysis. The elements of research design will be examined in terms of three different methods of social inquiry: (1) participant observation, (2) the social survey, and (3) the demonstration experiment. *Spring*. Faculty.
- 267 PARTICIPATORY PLANNING (3). Analysis of theory, methods, and experience in planning that involves citizens participation, emphasizing effects of participation in

- governmental programs on conflict, innovation, plan-making, and plan implementation. *Spring*. Godschalk.
- 269 EMPLOYMENT AND LABOR MARKET PLANNING (3). The study of how employment planning contributes to an overall understanding of planned interventions which seek to improve the conditions of employment, the size distribution of work-derived income, and the equitable access of economically active populations to such work and earnings. *Spring*. Bergman
- 270 PLANNING OF SERVICE DELIVERY SYSTEMS (3). Analysis of various service delivery systems with specific focus on human resources planning. Examination of various models in the context of organizational theory, staffing, financing and evaluation. *Fall*. Faculty.
- 275 PROGRAM EVALUATION IN THE HUMAN SERVICES (3). The purpose of this course is to develop understanding and skill in the conduct of program evaluation. Issues covered include: rationale, design, criteria, measurement, utilization. *Spring*. Faculty.
- 280 NEIGHBORHOOD PLANNING (3). Introduction to the rationale and practice of neighborhood planning, including neighborhood level sociological and political concepts, of design and conservation, organizational structures for planning, community organizing approaches, government programs and funding and recent experience. *Spring*. Rohe.
- 310 PLANNING SEMINARY (Var.) Original research, fieldwork, readings or discussion of selected planning issues under guidance of a member of the faculty. *Fall or spring*. Faculty.
- 311 INDEPENDENT STUDY (3). This course permits full-time graduate students enrolled in the Department of City and Regional Planning who wish to pursue independent study of a research or project nature, to do so under the direction of a member of the Department Faculty. *Fall or spring*. Faculty.
- 394 DOCTORAL DISSERTATION (credits variable). Faculty.
- 400 GENERAL REGISTRATION (0).

DEPARTMENT OF CLASSICS

PHILIP A. STADTER, *Chairman*

Professors

- | | | |
|---------------------|------|---|
| EDWIN L. BROWN | (1) | Classical Didactic Poetry, Hellenistic Civilization, Virgil |
| GEORGE A. KENNEDY | (6) | Greek and Latin Rhetoric and Oratory, Literary Criticism |
| JERZY LINDERSKI | (27) | Cicero, Roman Law, Roman History |
| KENNETH J. RECKFORD | (11) | Greek and Roman Comedy, Roman Satire |
| PHILIP A. STADTER | (16) | Greek Historiography, Plutarch, Renaissance Latin |
| MÁRIA TSIAPERA | (36) | Historical Linguistics, Modern Greek |
| WILLIAM C. WEST III | (17) | Classical Greek Prose, Greek History, Latin Literature |

Associate Professors

- | | | |
|-------------------|------|---|
| H. PHELPS GATES | (3) | Linguistics, Sanskrit |
| GEORGE W. HOUSTON | (4) | Latin Literature, Roman History, Epigraphy |
| GERHARD KOEPEL | (7) | Roman Art and Architecture |
| SARA MACK | (24) | Virgil, Augustan Poetry, Homer |
| G. KENNETH SAMS | (13) | Greek Archaeology, Near Eastern Archaeology |
| CECIL W. WOOTEN | (35) | Greek and Latin Prose, Rhetoric, Greek and Latin Language |

Assistant Professors

- | | | |
|-----------------------|------|--|
| JAY DAVID BOLTER | (30) | Greek Literature, Computer Application |
| MARIE-HENRIETTE GATES | (28) | Near-Eastern Archaeology |
| PETER M. SMITH | (26) | Greek Philosophical Literature, Greek Tragedy, Homer |
| H. KENNETH SNIPES | (23) | Byzantine Greek Literature and Historiography |

Visiting Assistant Professor

- | | | |
|---------------|------|------------------------------|
| DAVID M. GANZ | (32) | Medieval Latin, Palaeography |
|---------------|------|------------------------------|

Emeritus Professors

WALTER ALLEN, JR.
T. ROBERT S. BROUGHTON
PRESTON H. EPPS
HENRY R. IMMERWAHR
BERTHE M. MARTI
EMELINE H. RICHARDSON

Graduate work in the Department of Classics is primarily designed to meet the needs of students who intend by intensive study and research to specialize in the classics and who are preparing to teach.

The Department also cooperates with the other language departments in the University in making available the great literatures of the world. To this end there are offered courses in Greek and Latin literature which do not require ability to read either language in the original. Such courses are designed to place emphasis on aspects of the Greek and Latin genius, forms of literature created and perpetuated, and their permanent contribution to Western civilization. These may be elected as part of a major for the Curriculum in Comparative Literature and as a minor, or part of a major, in other departments.

Another feature of the Department's program are courses in classical and medieval Latin for students of medieval studies in other departments.

The University is a contributing member of the American Academy in Rome, the American School of Classical Studies at Athens, the American Research Institute in Turkey, and the American Institute of Nautical Archaeology.

Requirements for Advanced Degrees

The degree of Master of Arts is offered with a concentration in Greek, Latin, or Classical Archaeology. The degree of Doctor of Philosophy is offered with a concentration in Greek and Latin, Classics (with historical emphasis), Classical Archaeology or Classical Latin and Medieval Studies. A minor in related departments may be permitted on application. Students are encouraged to broaden their program by taking supporting work in related languages or literatures or in Art, History, Linguistics, or Philosophy.

Teaching assistance or lecture instruction equivalent to at least three contact hours a week for one semester, or until teaching competence is acquired, is required of all doctoral candidates.

Requirements for advanced degrees are stated in general on pages 98-105 of this catalogue, but exact prescription of the courses can be determined only upon a knowledge of the needs of the individual applicant. A brochure describing the various programs in greater detail is available from the Department.

GREEK

Courses for Graduates and Advanced Undergraduates

- 101 ELEMENTARY CLASSICAL GREEK FOR GRADUATE STUDENTS (0-3).
 101X Introduction to grammar and vocabulary. Reading of easy selections from Plato or

- 102 other authors. Graduate students whose major departments permit them to take these
 102X courses for credit should register for 101 and 102. Registration in 101X and 102X
 carries no graduate credit. *Spring and fall.* Staff.
- 106 GREEK DIALECTS (3). Prerequisite, Greek 22. (Alternate years.) Gates.
- 107 GREEK COMPOSITION (3). Prerequisite, Greek 22. (Alternate years.) Gates,
 Kennedy.
- 108 EARLY GREEK POETRY (3). Prerequisite, Greek 22. (Alternate years.) Brown.
- 109 GREEK LITERATURE OF THE FIFTH CENTURY (3). Prerequisite, Greek 22.
 (Alternate years.) Reckford.
- 110 GREEK LITERATURE OF THE FOURTH CENTURY (3). Prerequisite, Greek 22.
 (Alternate years.) Kennedy.
- 121 INTRODUCTORY MODERN GREEK (3). No prerequisite. An introduction to the
 122 grammar, vocabulary, and idiom of the language of modern Greece, intended to give a
 basic reading knowledge, but also useful as an introduction for students who wish,
 after additional practice, to attain fluency in the spoken language. In the second
 semester easy selections from contemporary Greek literature will be read. *Fall and
 spring.* Tsiapera.
- 140 PROBLEMS IN THE HISTORY OF CLASSICAL IDEAS (3). Prerequisite, permis-
 141 sion of the Department. Offered regularly in first and second summer sessions each
 year. For description see Summer School Catalogue.
- 158 GREEK NEW TESTAMENT (Religion 119) (3). Prerequisite, Greek 22. Offered on
 application by five students. Schutz, Stadter.

Courses for Graduates

NOTE: One or two Greek courses numbered in the 200's are offered each semester.

- 201 GREEK EPIGRAPHY (3). West.
- 204 GREEK PALAEOGRAPHY (3). Snipes.
- 211 GREEK LYRIC POETRY (3). Brown.
- 212 GREEK TRAGEDY (3). Smith, Reckford.
- 213 GREEK COMEDY (3). Reckford.
- 214 GREEK PHILOSOPHICAL LITERATURE (3). Smith.
- 215 GREEK RHETORIC AND ORATORY (3). Kennedy.
- 216 GREEK HISTORICAL LITERATURE (3). Stadter, West.
- 217 HELLENISTIC POETRY (3). Brown.
- 218 LATER GREEK PROSE (3). Stadter.
- 251 HOMER (3). Snipes.
- 252 SOPHOCLES (3). Reckford.
- 253 THUCYDIDES (3). Stadter.
- 256 DEMOSTHENES (3). Kennedy.
- 301 GREEK SEMINARS (3). *Topic for 1981-82: Aeschylus.* Brown.
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- 341 SPECIAL READING (3). *Fall and spring.* Staff.
- 393 MASTER'S THESIS (3 or more). *Fall and spring.* Staff.
- 394 DOCTORAL DISSERTATION (3 or more). *Fall and spring.* Staff.
- 400 GENERAL REGISTRATION (0).

LATIN

Courses for Graduates and Advanced Undergraduates

- 101 Section C. ELEMENTARY CLASSICAL LATIN FOR GRADUATE STUDENTS
101X (0-3).
- 102 Section M. ELEMENTARY MEDIEVAL LATIN FOR GRADUATE STUDENTS
102X (0-3).
- These courses are designed as a preparation for the reading knowledge examination for higher degrees. Passing of the examination at the end of 102 (102X) will certify that the requirement has been satisfied. Students whose major departments permit them to take these courses for credit should register for 101, 102. Those not expecting credit should register for 101X, 102X. *One semester each.* Staff.
- 110 INTRODUCTORY LATIN COMPOSITION (3). Prerequisite, Latin 22 or equivalent. Review of Latin grammar and idiom, exercises in composition, introduction to stylistics. (Alternate years.) Wooten.
- 111 LATIN LITERATURE OF THE REPUBLIC (3). Prerequisite, Latin 22. Lectures and discussion of the development of Latin literature to the time of Cicero. Reading of substantial selections from four or five authors such as Plautus, Ennius, Cato, Cicero, Lucretius, Catullus. (Alternate years.) Mack.
- 112 LATIN LITERATURE OF THE AUGUSTAN AGE (3). Prerequisite, Latin 22. Lectures and discussion of Latin literature in the period from 44 B.C., to 14 A.D. Reading in Virgil, Horace, Tibullus, Propertius, Ovid, and Livy. (Alternate years.) Reckford, Mack.
- 113 LATIN LITERATURE OF THE EMPIRE (3). Prerequisite, Latin 22. Lectures and discussion of development of Latin literature from 14 A.D. to the mid-second century. Reading from Petronius, Seneca, Quintilian, Tacitus, Pliny, and other authors. (Alternate years.) Kennedy.
- 114 LATIN LITERATURE OF LATER ANTIQUITY (3). Prerequisite, Latin 22. Lectures and discussion of the development of Latin literature from the mid-second to the mid-fifth century A.D. with special attention to the time of St. Augustine. (Alternate years.) Ganz.
- 130 MEDIEVAL LATIN LITERATURE TO THE END OF THE CAROLINGIAN PERIOD (3). Prerequisite, Latin 14 or 102. *Every year.* Ganz.
- 140 PROBLEMS IN THE HISTORY OF CLASSICAL IDEAS (3). Prerequisite, permission of the Department. *Offered in the first and second summer sessions each year.* For description see Summer School Catalogue.
- 141
- 171 RENAISSANCE HUMANISM AND THE LATIN TRADITION (3). Prerequisite, Latin 21 or equivalent. (Alternate years.) Scaglione.

Courses for Graduates

NOTE: One or two Latin courses numbered in the 200's are offered each semester.

- 202 LATIN EPIGRAPHY (3). Houston.
- 203 LATIN PALAEOGRAPHY (3). Ganz.
- 207 LATIN COMPOSITION AND PROSE STYLES (3). Gates.
- 210 HISTORY OF LATIN AND ITALIC DIALECTS (3). Gates.
- 221 FRAGMENTS OF EARLY LATIN POETRY (3). Mack.
- 222 ROMAN HISTORICAL LITERATURE (3). Study of Sallust, Caesar, Suetonius or the minor historians of the empire. Houston, Linderski.
- 224 ROMAN DRAMATIC LITERATURE (3). Study of the comedies of Plautus and Terence or the tragedies of Seneca. Reckford.

- 225 ROMAN LYRIC AND ELEGIAC POETRY (3). Study of the forms of lyric and elegiac poetry with special attention to Catullus, Horace, Tibullus, or Propertius. Reckford, Mack.
- 226 ROMAN SATIRE (3). Study of the development of satiric forms with special attention to Horace or Juvenal. Reckford.
- 230 LATIN LITERATURE FROM THE 10TH TO THE 13TH CENTURY (3). Reading in selected medieval Latin prose and verse authors. Ganz.
- 261 CICERO: POLITICAL CAREER (3). Kennedy.
- 262 CICERO: LITERARY CAREER (3). Kennedy.
- 263 LUCRETIUS (3). Reckford.
- 264 VIRGIL (3). Mack.
- 265 LIVY (3). Linderski.
- 266 OVID (3). Mack.
- 270 PETRONIUS (3). Reckford.
- 274 TACITUS (3). Houston.
- 301 LATIN SEMINARS (3 each). Topic for 1981-82: Ovid. Mack.
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- 341 SPECIAL READING (3). *Fall and spring*. Staff.
- 393 MASTER'S THESIS (3 or more). *Fall and spring*. Staff.
- 394 DOCTORAL DISSERTATION (3 or more). *Fall and spring*. Staff.

CLASSICAL ARCHAEOLOGY

Courses for Graduates and Advanced Undergraduates

- 140 PROBLEMS IN HISTORY OF CLASSICAL IDEAS (3). Prerequisite, permission of the department. Offered in the first and second summer sessions each year. For description see the Summer School Catalogue.
- 141
- 189 STUDIES IN NEAR EASTERN ARCHAEOLOGY (3). (Alternate years.) Sams, M-H Gates.
- 190 GREEK ARCHITECTURE (3). (Alternate years.) Sams.
- 191 ARCHITECTURE OF ETRURIA AND ROME (3). (Alternate years.) Koepfel.
- 193 GREEK PAINTING (Art 193) (3). *Spring*. Sturgeon.
- 194 ARCHAIC GREEK SCULPTURE (Art 194) (3). (Alternate years.) Sturgeon.
- 195 CLASSICAL GREEK SCULPTURE (Art 195) (3). (Alternate years.) Sturgeon.
- 196 HELLENISTIC GREEK SCULPTURE (Art 196) (3). (Alternate years.) Sturgeon.
- 198 AEGEAN CIVILIZATION AND NEAR EASTERN BACKGROUNDS (Art 198) (3). (Alternate years.) Sturgeon.
- 199 BYZANTINE ART (See Art 199). Folda.

Courses for Graduates

- 201 GREEK EPIGRAPHY (3). See above, courses in Greek.
- 202 LATIN EPIGRAPHY (3). See above, courses in Latin.
- 294 GREEK TOPOGRAPHY (3). Study of chief archaeological sites of Greece and of existing buildings and monuments. Attention to the problems of excavation and the role of the sites in Greek history. (Alternate years.) Sams.
- 296 ROMAN SCULPTURE (3). (Alternate years.) Koepfel.
- 297 ROMAN PAINTING (3). (Alternate years.) Koepfel.

- 298 ROMAN TOPOGRAPHY (3). (Alternate years.) Koepfel.
 299 ETRUSCAN ART (3). (Alternate years.) Staff.
 310 SEMINAR IN ARCHAEOLOGY (3). Topic for spring, 1981: Ara Pacis Augustae. Koepfel.
 341 SPECIAL READING IN ARCHAEOLOGY (3). *Fall and spring*. Gates, Koepfel, Sams.
 358 SEMINAR IN ANCIENT ART (Art 358). (3). *Fall and spring*. Sturgeon.
 393 MASTER'S THESIS (3 or more). *Both semesters*. Brown, Gates, Koepfel, Sams.
 394 DOCTORAL DISSERTATION (3 or more). *Both semesters*. Brown, Gates, Koepfel, Sams.

CLASSICS IN ENGLISH

Courses Not Requiring a Reading Knowledge of the Greek and Latin Language.

The following courses in classical literature and civilization are especially designed to supply the necessary foundation for those who, without a reading knowledge of the ancient languages, wish a broader culture or plan to specialize in modern literature, history, art, etc. When properly approved they will be allowed to count as part of the major requirement in other departments. They may be taken also to satisfy the requirements of a minor in literature. See also under Comparative Literature.

Courses for Graduates and Advanced Undergraduates

- 103 GREEK AND ROMAN EPIC (3). Reading of ancient epics, with emphasis on epic after Homer. Structure of the poems, history of epic as literary form, the poems as expressions of the spirit of their ages. *Spring*. Kennedy.
 107 GREEK DRAMATIC LITERATURE (3). Students will be assumed to have read a few of the plays as taught in Classics 33 or 62. Origin and growth of the Greek theatre and drama; literary quality of the plays; religious, social, and political ideas of the fifth century B.C. *Fall*. Reckford.
 109 GREEK AND ROMAN HISTORICAL LITERATURE (History 109) (3) The study in English translation of selections from Herodotus, Thucydides, Livy, Tacitus, and others with consideration of their literary qualities and their readability as historians. (Alternate years.) Linderski.
 111 THE RHETORIC OF THE SOPHISTS, PLATO, AND ARISTOTLE (Comp. Lit 111) (Speech 111) (3). Detailed study of the conceptualization of rhetoric in Greece, the sophistic movement, Plato's *Gorgias* and *Phaedrus*, and Aristotle's *Rhetoric*. *Fall*. Kennedy.
 112 CLASSICAL, CHRISTIAN AND POST-CLASSICAL RHETORICS (Comp. Lit 112) (Speech 112) (3). Prerequisites, Classics 111, Comparative Literature 111, Speech 111 or permission of instructor. Study of the classical tradition in rhetoric and reactions against it from the fourth century B.C. to the 18th century of the Christian era. Special attention to Cicero, Quintilian, Augustine, the humanists, Ramus, and British rhetoricians of the 18th century. *Spring*. Kennedy.
 114 GREEK AND ROMAN COMEDY (3). A comparative study of the surviving works of Aristophanes, Menander, Plautus, and Terence, with attention to aspects of ancient production and influence of modern comedy. (Alternate years.) Stadter, Reckford.

- 115 ROMAN LAW (3). The course will present an introduction to Roman law, public and private. On the basis of Roman texts in translation (or the original if desired), we will discuss a) the principles of Roman constitutional law and b) the legal logic and social importance of Roman civil law. *Fall*. Linderski.
- 118 INTRODUCTION TO BYZANTINE CIVILIZATION (3). Intellectual and social history of the Byzantine Empire from Justinian to 1453, noting the interaction of classical and Christian culture and Byzantium's influence on neighboring peoples and on the Renaissance. (Alternate years.) Snipes.
- 121 GREEK PHILOSOPHICAL LITERATURE (3). An examination of major Greek philosophers, read in English translation, in the context of Greek intellectual history and civilization. (Alternate years.) Smith.
- 235 CLASSICAL CRITICISM (Comp. Lit. 235) (3). (Alternate years.) Kennedy.

CURRICULUM OF COMPARATIVE LITERATURE

DIANE R. LEONARD, *Chairman*

Professors

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|-------------------|-----|--|
| ALDO D. SCAGLIONE | (3) | Renaissance, Baroque, Literary Criticism to 1700 |
| EUGENE H. FALK | (1) | Modern Novel, Modern Theatre, Literary Theory |

Associate Professor

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| DIANE R. LEONARD | (2) | Realism, Modern Novel, and Twentieth Century Literary Criticism |
|------------------|-----|---|

Assistant Professor

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|---------------|------|---|
| JOEL D. BLACK | (11) | Enlightenment, Romanticism, Literary Criticism 1700 to 1900 |
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Emeritus Professors

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| ALFRED G. ENGSTROM | (6) | Symbolism |
| WERNER P. FRIEDERICH | (8) | Baroque, Classicism and Enlightenment |

The Program in Comparative Literature is based on the concept that the literatures of the West form a broad unity which transcends national boundaries. The Curriculum stresses the systematic exploration of styles, themes, genres, movements, literary theory and literary criticism. Students take many of their courses in the cooperating literature departments, and may choose among their rich offerings in the literatures of England, France, Germany, Ancient Greece and Rome, Italy, Portugal, Spain, Latin America, Russia and the United States.

The special requirements for advanced degrees are as follows: The Master of Arts degree program consists of ten courses and a thesis. Five courses should be elected in Comparative Literature, three courses in a first literature and two courses in a second literature.

Candidates for the Doctor of Philosophy are urged to concentrate on an area of specialization, such as an international period or genre, in three literatures belonging to at least two different linguistic groupings (e.g., they should not all three be Romance literatures). Special arrangements can be made for a program in medieval literature or in one ancient and two modern literatures. All candidates are also expected to demonstrate a knowledge of at least one national literature in its historical scope from the Middle Ages to the present regardless of the area of specialization. Moreover, candidates must show competence in literary theory and criticism, and in the problems and methods special to Comparative Literature.

A reading knowledge of Latin is required of medieval and Renaissance specialists, and French or German of students specializing in post-Renaissance Literature.

Courses for Graduates and Advanced Undergraduates

A. PERIOD AND GENRE COURSES

- 170 THE MIDDLE AGES (3). Study of selected examples of western medieval literature in translation, with particular attention to the development of varieties of sensibility in various genres and at different periods. (Alternate years.) Kane.
- 171 RENAISSANCE HUMANISM AND THE LATIN TRADITION (3). Prerequisite, Latin 21 or equivalent. Topics in the evolution of Humanism from the Twelfth Century School of Chartres through Petrarch to Erasmus, including the transmission and assimilation of ancient texts; reading in Latin from a variety of writers. (Alternate years.) Scaglione.
- 172 LITERATURE OF THE CONTINENTAL RENAISSANCE IN TRANSLATION (3). Discussion of the major works of Petrarch, Boccaccio, Machiavelli, Castiglione, Ariosto, Tasso, Rabelais, Ronsard, Montaigne, Cervantes, and Erasmus. (Alternate years.) Scaglione.
- 173 BAROQUE (3). Comparative analysis of the characteristic themes of Seventeenth Century prose and poetry with sampling of representative texts from Italy, France, Spain, Germany, and England. (Alternate years.) Scaglione.
- 174 ROMANTICISM (3). An exploration of the period concept of Romanticism, using manifestoes and critical writings of the time, modern studies on the subject, and selected literary works. (Alternate years.) Black.
- 175 REALISM (3). An exploration of the period concept of Realism through selected novels and critical writings. Naturalism as an outgrowth of Realism will also be considered. (Alternate years.) Leonard.
- 177 THE ENLIGHTENMENT (3). A study of the European Enlightenment, its regional manifestations, and its relation to Neoclassicism, rationalism, and cults of sensibility. Readings of major literary and philosophical texts, and recent critical assessments. (Alternate years.) Black.
- 180 CONCEPTS AND PERSPECTIVES OF THE TRAGIC (3). Ancient and modern versions of tragic themes, tracing the transformations of the myths in the light of emerging concepts of tragedy. (Alternate years.) Falk.
- 184 THE DRAMA FROM IBSEN TO BECKETT (3). The main currents of European drama from the end of the nineteenth century to the present. (Alternate years.) Falk.
- 185 APPROACHES TO THE NOVEL (3). The narrative techniques of selected works by Proust, Kafka, Mann, Faulkner, Sartre. Camus. (Alternate years.) Falk.

B. SPECIAL TOPICS COURSES

- 190 SYSTEMS OF VERSIFICATION (3). A comparative study of systems of versification in England, France, Germany and Russia. Syllabic, syllabo-tonic, and tonic systems are presented in the light of linguistic exigencies and literary traditions. (Alternate years.) Vickery.
- 191 AUTOBIOGRAPHY AS A LITERARY FORM (3). The rise and evolution of interest in the self in literary forms from St. Augustine's to Rousseau's *Confessions* through Abelard, Dante, Petrarch, Cellini, and Montaigne. (Alternate years.) Scaglione.

- 192 BRECHT'S WORLD OF THE THEATRE (3). A comparative study of Brecht's major plays in conjunction with his literary models and sources from Shakespeare to Shaw. (Alternate years.) Mews.
- 194 KAFKA AND CAMUS (3). A thematic and formal comparison of some of their main works. (Alternate years.) Falk.

Courses for Graduates

- 201 PROBLEMS AND METHODS IN COMPARATIVE LITERATURE (3). The course deals with the history of Comparative Literature, bibliographical materials, with the various orientations in Europe and in America, with problems of methodology, periodization, literary movements, and basic concepts of literary theory. (Alternate years.) Falk.
- 240 READING COURSE (3). Staff.
- 241 HISTORY OF LITERARY CRITICISM, PLATO TO 1700 (3). Major trends in theory of literature, rhetoric, poetics, and practical criticism from Plato to Aristotle, Cicero, Horace, Longinus, Quintilian, the medieval and Renaissance poetics and rhetorics, Boileau and Dryden. (Alternate years.) Scaglione.
- 242 HISTORY OF LITERARY CRITICISM, EIGHTEENTH AND NINETEENTH CENTURIES. A study of the major theoretical and critical writings, with emphasis on Vico, Diderot, Johnson, Lessing, Herder, Kant, Schiller, Schelling, the Schlegels, Coleridge, Taine, Zola, Brunetiere, De Sanctis, and Croce. (Alternate years.) Black.
- 243 HISTORY OF LITERARY CRITICISM, THE TWENTIETH CENTURY (3). An investigation of major trends in modern critical theory, with emphasis on American New Criticism, Saussure, Russian Formalism, the Prague Circle, French Structuralism, Ingarden and German Hermeneutics. (Alternate years.) Leonard.
- 245 ROMAN INGARDEN'S THEORY OF LITERATURE AND THE ARTS (3). A presentation of Ingarden's phenomenological concepts of literary structure, aesthetic focus, and evaluation. (Alternate years.) Falk.
- 310 SEMINAR (3). *Fall or spring*. Staff.
- 393 MASTER'S THESIS (3). *Spring and fall*. Staff.
- 394 DOCTORAL DISSERTATION (3). *Spring and fall*. Staff.
- 395 RESEARCH. Staff.
- 400 GENERAL REGISTRATION (0).

Cross-Listed Courses

- 111 THE RHETORIC OF THE SOPHISTS, PLATO, AND ARISTOTLE (3). Kennedy. (Classics)
- 112 CLASSICAL, CHRISTIAN, AND POST-CLASSICAL RHETORICS (3). Kennedy. (Classics)
- 142 PHILOSOPHY IN LITERATURE (3). Smyth. (Philosophy)
- 153 MEDIEVAL ROMANCE (3). Kennedy. (English)
- 235 CLASSICAL CRITICISM (3). Kennedy. (Classics)

DEPARTMENT OF COMPUTER SCIENCE

FREDERICK P. BROOKS, JR., *Chairman*

Professors

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|--------------------------|-----|---|
| FREDERICK P. BROOKS, JR. | (0) | Graphics, Computer Architecture, Software Engineering |
| PETER CALINGAERT | (4) | Computer Science Education, Programming, Translators |
| DAVID L. PARNAS | (7) | Software Engineering, Operation and Real-Time Systems, Formal Approaches to Programming |
| STEPHEN M. PIZER | (6) | Picture Processing and Display, Medical Applications, Numerical Computing |

Associate Professors

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|------------------|------|---|
| HENRY FUCHS | (11) | Graphics, Computer Architecture, Picture Processing |
| GYULA A. MAGÓ | (2) | Computer Architecture, Programming Languages, Parallel Computation |
| DONALD F. STANAT | (3) | Theory of Computation, Algorithm Analysis, Formal Languages |
| STEPHEN F. WEISS | (10) | Information Storage and Retrieval, Automatic Analysis of Natural Language |

Assistant Professor

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| BHARADWAJ JAYARAMAN | (18) | Parallel Computation, Programming Languages, Operating Systems |
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Instructor

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| RICHARD T. SNODGRASS | (19) | Database Systems, Distributed Systems, Multiprocessors |
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Lecturer

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| ERWIN M. DANZIGER | (12) | Business Data Processing |
|-------------------|------|--------------------------|

Research Associate Professors

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| LYNN F. TENEYCK | (16) | Interactive 3-D Graphics, Non-Linear Optimization, Crystallography, Macromolecular Structure |
| NEIL H. E. WESTE | (17) | VLSI Design, Computer Architecture |

Adjunct Associate Professors

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|--------------------|------|---|
| LELAND H. WILLIAMS | (20) | Numerical Analysis, Nonnumeric Mathematical Computation, Computer Center Management |
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WILLIAM V. WRIGHT

(14) Interactive Computing Systems,
Application Oriented Languages,
Graphics*Adjunct Assistant Professor*

JAMES W. OTT

(1) Programming Systems

The Department of Computer Science was established in the College of Arts and Sciences in 1964 for the purpose of offering graduate-level instruction and pursuing research in computer science.

The teaching program has three objectives:

1. To train teachers and researchers at the Ph.D. level.
2. To train competent and broadly skilled practitioners of computer science via the professional M.S. program and minor programs for graduate students in other fields.
3. To furnish basic instruction in computer use to undergraduates. A Computer Science option in the Mathematical Sciences program is available.

Teaching and Research

The Department of Computer Science does research and conducts graduate and undergraduate teaching. Research particularly emphasizes:

- interactive computer graphics and image processing.
- VLSI design
- software engineering
- the architecture of classical and cellular computers
- natural language processing
- databases and information retrieval
- theoretical studies including algorithm design and analysis.

Two closely related graduate degree programs are offered. One is a Ph.D. program to prepare teachers-researchers for higher education and advanced researchers for universities, government, and industry. The other is a professional M.S. program to prepare highly competent and broadly skilled practitioners. Compared to that of many otherwise similar departments, our curriculum is perhaps more oriented to the design and application of real computer systems, and to that portion of theory which clearly guides and supports practice.

An M.S. candidate must earn 30 semester hours of credit. A thesis is optional; if one is written it counts for 6 hours. Course work in the M.S.

program consists of a core of required courses and a few electives. A modular curriculum provides great flexibility in permitting a student to omit all or part of a required course on material he has already studied. A comprehensive oral examination on courses taken is also required. In addition, the student must have performed the following: (1) programmed and documented a program product; (2) designed an administrative application of computers; and (3) written a significant piece of technical prose. A student who has met any of these requirements before enrolling should bring the associated documents with him. For others, requirements 1 and 2 can be satisfied by course work. Requirement 3 can be satisfied by a special writing course, by the thesis, or by presentation of satisfactory documentation of previous work. Although the M.S. has been earned in as little as 12 months, two academic years are normally required by a student with an assistantship.

A Ph.D. candidate must take several elective courses, typically 15-18 hours, in addition to the courses required in the M.S. program, and must have satisfied the three requirements listed above. Other requirements include passing written and oral comprehensive examinations, and submitting a dissertation which presents an original contribution to knowledge. The normal time needed by a full-time student with an assistantship is from three to five years. Students whose records are strong may bypass the M.S. degree and proceed directly into Ph.D. study.

Close co-operation with the Department of Computer Science at Duke University widens the course, concentration, and advising opportunities available to the students of both institutions. Co-ordinated scheduling, free cross-registration, and the provision of free transportation enables students to select from courses at Duke in addition to those available at UNC. The formal courses are supplemented by an extensive colloquium series.

Microelectronics Program

The Department participates in the newly-established regional microelectronics thrust in several distinct ways.

1. As a participating institution in the new Microelectronics Center of North Carolina (MCNC), we have access to the MCNC chip design and fabrication facilities to support our research projects.

2. The Department has taken, together with Duke computer scientists, special responsibility for technical leadership in the development of the MCNC Design Support Facility.

3. We have independently been assigned six new University faculty positions for computer scientists whose research interests are in broad

basic areas supporting microelectronic logical and geometric design, including man-machine systems, databases, and algorithms.

Facilities

The department operates for research two 1-megabyte DEC VAX 11/780 computers, two 256-kilobyte DEC PDP 11/45 computers, two Vector General vector-graphics display systems, and Ikonas raster-graphics color display system, and numerous CRT-based terminals and microprocessors. The VAX computers, each supported by two 256-megabyte disks, run under the UNIX operating system, one as a graphics host and the other as a multiprogrammed software development tool. The raster-graphics system includes a 6-megabit frame buffer, a 1000-line monitor, fast graphics and arithmetic processors, and a video digitizer. The vector-graphics systems include a large variety of manual input devices and 3-D viewing aids.

Other computing facilities available to students currently include two 2-megabyte IBM systems on the UNC campus, and an 8-megabyte Amdahl 470 V/8 and two IBM 370/165 systems with 26 gigabytes of disk at the Triangle Universities Computation Center. Interactive computing on these computers is provided via the TSO and Wylbur operating systems. Graduate students have access to the extensive holdings of the departmental library.

Admission and Financial Aid

Entering students must have either a strong background in mathematics and the ability to program in some procedure-oriented language, or significant experience in computer use and four semesters of mathematics, including calculus. A baccalaureate degree with at least B average grades is required, not restricted to any specific major subject. For those now planning undergraduate programs, we recommend courses in discrete mathematics, probability theory, linear algebra, modern algebra, elementary linguistics, and foreign language, in preference to computer science courses. High scores on all aptitude tests of the Graduate Record Examination are also required. Although GRE advanced test scores are not required, applicants are encouraged to take the advanced test in computer science, engineering, or mathematics, if appropriate. Each applicant must submit directly to the Department a short statement describing his objectives in pursuing graduate study and his experience with computers. Applicants whose native language is not English must submit TOEFL scores as evidence of ability to use both written and spoken English. Admission is based solely on merit, with no discrimination based on race, religion, national origin, or sex.

Half-time assistantships are available for first-year students. These appointments carry stipends of \$6000 for the academic year 1981-82; stipends do not include tuition and fees but include compensation to offset the increase in tuition rate to those who do not qualify for in-state tuition. To apply for an assistantship, an applicant need only check the appropriate item on the admission application. Applicants for assistantships are automatically considered for all available fellowships. Financial support of students whose work performance and academic progress are satisfactory is normally renewed. Applicants who do not obtain an assistantship are eligible for loans; opportunities also exist for part-time employment elsewhere in the University and in the Research Triangle area. All students who have desired part-time employment have found satisfactory arrangements with little delay.

Applications for admission, with or without financial assistance, starting in either semester, will be considered at any time. For maximum consideration, however, fall semester applications, complete with statement of objectives, and all transcripts and recommendations, should be received by the Graduate School no later than February 1. To ensure meeting that deadline, the Graduate Record Examination should be taken not later than December.

For further information write to the Director of Graduate Admissions, Department of Computer Science, New West Hall 035-A, Chapel Hill, N.C. 27514.

- 14 INTRODUCTION TO PROGRAMMING (3). Introduction to computer use. Approaches to problem solving; algorithms and their design; fundamental programming skills using Pascal. May not be taken for graduate credit. *Fall, spring, and summer.* Staff.
- 112 SCIENTIFIC PROGRAMMING (PHYS 193) (3). Prerequisites, MATH 128 or 129, or PHYS 191 or 192; elementary Fortran or PL/I programming. Structured programming in Fortran; use of secondary storage and program packages; numerical methods for advanced problems, error propagation, and computational efficiency; symbolic mathematics by computer. *Spring.* Thompson.
- 114 SYSTEMATIC PROGRAMMING (4). Prerequisite, COMP 14. May be taken without graduate credit as COMP 114X. May not be taken for credit together with COMP 118 or 119. How to write good programs: top-down programming and documentation, structured programming, control and data structures, use of secondary storage, efficiency, program correctness, and programming style, using Pascal. Exposure to COBOL. *Fall, spring and summer.* Staff.
- 116 NUMERICAL METHODS (3). May be taken without graduate credit as COMP 116X. Prerequisites, differential and integral calculus and COMP 14. A user-oriented survey of common methods for the computer solution of numerical problems. Programming packages. Emphasizes the use of the computer rather than mathematical rigor. *Spring.* Staff.
- 118 DATA PROCESSING TECHNIQUES (3). Prerequisite, COMP 14. May be taken without graduate credit as COMP 118X. May not be taken for credit together with COMP 114 or 119. Data processing as used in the social sciences and business. Advanced PL/I, file processing, JCL, and program packages. *Summer.* Staff.

- 119 INFORMATION SYSTEMS IN LANGUAGE RESEARCH (Library Science 103) (3). May be taken without graduate credit as COMP 119X. May not be taken for credit together with COMP 114 or 118. Prerequisite, COMP 14. Concepts of information and information processing as they relate to language research in the humanities and social sciences. Hardware and software systems for language research. *Fall and spring*. Dillon.
- 120 COMPUTER ORGANIZATION (3). Prerequisite, COMP 14. May not be taken for credit together with COMP 131. Data representation, computer architecture and implementation, assembler language programming. *Fall and spring*. Staff.
- 121 DATA STRUCTURES (3). Prerequisites, MATH 81 and COMP 114. The analysis of data structures and their associated algorithms. Lists, stacks, queues, trees, and graphs. Hashing and overflow techniques. Sorting and searching. *Fall (principally for graduate students in Computer Science), spring (principally for others)*. Staff.
- 131 COMPUTER SYSTEMS (3). Prerequisites, COMP 14, knowledge of elementary data representation and elementary assembler language programming for some machine, and at least six hours of mathematics. May not be taken for credit together with COMP 120. Introduction to the organization and operation of a digital computer system. Basic architecture of several machines, data representation and storage, operations and control, assembler language programming, control programs. *Fall*. Staff.
- 135 BUSINESS DATA PROCESSING LABORATORY (3). Pre- or corequisite, COMP 130 or 230, and permission of instructor (except graduate students in computer science.) Students analyze an existing administrative application or, given such analysis, design a new system; prepare detailed written report and formal presentation. Supporting lectures: system study techniques, business applications and equipment. *Fall*. Danziger.
- 145 SOFTWARE ENGINEERING LABORATORY (3). Prerequisites, COMP 121, one of COMP 120, 131. Organization and scheduling of software engineering projects; structured programming and design. Each team will design, code, and debug program components and synthesize them into a tested, documented program product. *Spring*. Brooks, Parnas.
- 151 NUMERICAL COMPUTING (MATH 171) (3). Prerequisites, COMP 14, and four semesters of mathematics including calculus through MATH 32 and elementary linear algebra. Studies, through mathematical models, the behavior of computers in performing numerical tasks. Efficiency, error generation and propagation, analysis of linear operators, and numerical computing strategies. *Fall and spring*. Pizer, Magó.
- 171 NATURAL LANGUAGE PROCESSING (Library Science 115) (3). Prerequisite, COMP 14. Statistical, syntactic, and semantic models of natural language. Tools and techniques needed to implement language analysis and generation processes on the computer. *Fall*. (1982 and alternate years.) Weiss.
- 172 INFORMATION RETRIEVAL (Library Science 172) (3). Prerequisite, COMP 14. Study of information retrieval and question-answering techniques, including document classification, retrieval, and evaluation techniques, handling of large data collections, and use of feedback. *Fall or spring*. Weiss.
- 181 MODELS OF LANGUAGES AND COMPUTATION (3). Prerequisites, COMP 14 and MATH 81, or permission of instructor. Introduction to the theory of computation. Boolean functions, finite automata, pushdown automata, and Turing machines. Unsolvable problems. The Chomsky hierarchy of formal languages and their acceptors. Parsing. *Fall*. Taught at Duke as CPS 225.
- 190 TOPICS IN COMPUTER SCIENCE (1-3). Prerequisite, permission of the instructor. This course will have variable content. Staff.
- 220 MATHEMATICAL THEORY FOR COMPUTER SCIENCE (Variable, .2-5 each).

- 221 Open to Computer Science graduate students only. Modules of mathematics for use in Computer Science. Includes principles of analysis, probability, linear algebra, modern algebra, logic. *Fall and spring.* Staff.
- 222 PROGRAMMING LANGUAGES AND TECHNIQUES (Variable, .2-5 each). Open
223 to Computer Science graduate students only. Modules presenting programming tools. Includes APL, OS/360 assembler language, and JCL, data representation, data structures, file organizations, searches, sorts. *Fall and spring.* Staff.
- 224 MATHEMATICAL MODELS IN COMPUTER SCIENCE (Variable, .2-5 each).
225 Open to Computer Science graduate students only. Modules developing mathematical models of computers, algorithms, and information in computers. Applications of these models. Includes theories of switching, automata, computability, formal languages, coding, information, numerical analysis. *Fall and spring.* Staff.
- 226 COMPUTER SYSTEMS (Variable, .2-5 each). Open to Computer Science graduate
227 students only. Modules on hardware and software making up computer systems. Includes device technology, computer architecture and implementation, data communications, systems evaluation, language processors, control programs, business data processing, software engineering. *Fall and spring.* Staff.
- 228 ALGORITHM ANALYSIS (3). Prerequisite, COMP 121. The design and analysis of
computer algorithms. Time and space complexity; absolute and asymptotic optimality. Algorithms dealing with searching, sorting, sets, graphs, and pattern-matching. NP-complete problems and provably intractable problems. *Spring.* Stanat.
- 230 FILE MANAGEMENT SYSTEMS (3). Prerequisites, COMP 121, 131. May not be
taken for credit together with COMP 130. Configuration and control of systems of files and processors. Mathematical modeling for the design of such systems. *Spring.* Calingaert, Brooks.
- 233 DISCRETE EVENT SIMULATION I (ORSA 233) (3). Prerequisites, ORSA 180,
STAT 127 or equivalent, and computer programming experience. Introduces student to modeling, programming, and statistical concepts applicable to discrete event simulation on a digital computer. Emphasizes statistical analysis and interpretation of simulation output. Students will model, program, and run simulations. *Fall.* Fishman.
- 234 DISCRETE EVENT SIMULATION II (ORSA 234) (3). Prerequisite, ORSA 233.
Continuation of ORSA 233 (COMP 233). Describes considerations in the design of simulation experiments, random number generation, stochastic variate generation, and list processing. *Spring.* Fishman.
- 236 COMPUTER GRAPHICS (3). Prerequisites, COMP 121 and 131. Study of graphics
hardware, software, and applications. Data structures, graphics languages, surface representations, pen tracking, response time, and control programs. *Spring.* (1981 and alternate years.) Fuchs.
- 238 RASTER GRAPHICS (3). Prerequisite, COMP 236. Hardware, software and algo-
rithms for raster devices such as video displays: frame buffers, multi-processor cellular systems, hidden-line/visible surface processing, anti-rastering techniques, modeling of shadows, curved surfaces, natural textures. *Spring.* (1982 and alternate years.) Fuchs.
- 240 TRANSLATORS (3). Prerequisites, COMP 121, 131. May not be taken for credit
together with COMP 140. Issues and strategies of translation, binding, sequence control, and code generation. Simple, conditional, and macro assemblers; linkers and loaders; compilers, interpreters. *Spring.* Calingaert.
- 241 COMPILER DESIGN (3). Prerequisites, COMP 181, 240. Organization of compil-
ers. Parsing methods; storage allocation; code generation; optimization; error recovery. Compiler performance and testing. Compiler writing systems. *Spring.* Taught at Duke as CPS 232.
- 242 DESIGN OF CONTROL PROGRAMS (3). Prerequisite, COMP 145 and one of
COMP 140, 240. External views of operating systems; operating system families,

- modular structure, and subsettable operating systems; process organization and synchronization; deadlock avoidance. Real-time systems. *Spring*. Snodgrass.
- 244 PROGRAMMING LANGUAGES (3). Prerequisite, COMP 121. Important semantic issues in existing programming languages, and their effect on language implementation. Several widely used or influential programming languages are used as examples. *Fall*. Magó.
- 248 SEMANTICS AND PROGRAM CORRECTNESS (3). Prerequisite, COMP 244. Characterizations of the effect of program execution. Program assertions and models of program semantics. Proofs of program correctness and termination; equivalence of programs. *Offered on demand*. Stanat.
- 254 PICTURE PROCESSING AND PATTERN RECOGNITION (3). Prerequisite, probability, linear algebra, MATH 34 and COMP 14. Theory and practice of picture coding, picture improvement, picture analysis, and statistical pattern recognition as applied to pictures. *Spring*. (1982 and alternate years.) Pizer.
- 260 COMPUTER IMPLEMENTATION AND MICROPROCESSORS (3). Prerequisite, COMP 131. Overview of technology; switching circuits and logical design; mechanisms for arithmetic, input-output and control. Microprocessor architecture, implementation, and realization. *Offered on demand*. Brooks.
- 265 ARCHITECTURE OF COMPUTERS (3). Prerequisite, COMP 145. Introduction to computer architecture, storage accessing, bussing and addressing, arithmetic and logical units; sequential control principles, concurrency; input/output systems and devices. *Fall*. (1981 and alternate years.) Brooks.
- 268 VLSI SYSTEMS DESIGN (3). Prerequisite, COMP 131 and one other COMP course 230 or above. Introduction to the design, implementation and realization of VLSI systems. Each student designs a complete digital circuit which will be fabricated and returned for testing and use. *Fall*. Fuchs.
- 281 AUTOMATA AND FORMAL LANGUAGES (3). Prerequisite, COMP 181. Algebraic characterizations of languages. Abstract families of languages. Ambiguity. Deterministic languages and their grammars. Regulated rewriting systems. *Spring*. (1982 and alternate years.) Offered on demand. Stanat.
- 284 COMPUTABILITY AND UNSOLVABILITY (3). Prerequisite, COMP 181, Formalization of effective calculability: Turing machines, Markov algorithms, recursive functions, Post systems, equivalence of the formalizations. Church's thesis, algorithmically unsolvable problems. Degrees of unsolvability and computational complexity. Taught at Duke at CPS 325.
- 288 INFORMATION THEORY (STATISTICS 252) (3). Prerequisite, STAT 134, prerequisite or corequisite, STAT 212. Transmission of information, entropy, message ensembles, discrete sources, transmission channels, channel encoding and decoding for discrete channels. *Offered on demand*. Chakravarti.
- 289 ERROR-CORRECTING CODES (STATISTICS 253) (3). Prerequisite, STAT 251 or permission of the instructor. Linear codes and their error-correcting capabilities. Hamming codes. Reed-Muller codes. Cyclic codes. Bose-Chaudhuri codes. Burst error correction. Majority logic decoding. *Offered on demand*. Chakravarti.
- 290 TOPICS IN COMPUTER SCIENCE (1-3). Prerequisite, permission of the instructor. This course will have variable content. Staff.
- 291 PROFESSIONAL WRITING IN COMPUTER SCIENCE (3). Prerequisite, major in Computer Science. Analysis of good and bad writing. Exercises in organization and composition. Each student will also write a thesis-quality short technical report on a previously approved project. *Spring*. Calingaert, Weiss.
- 321 TECHNICAL COMMUNICATION IN COMPUTER SCIENCE (1). Prerequisite, major in Computer Science. Seminar on teaching, short oral presentations, and writing in computer science. *Fall*. (1981 and alternate years.) Brooks, Calingaert.

- 322 SEMINAR IN PROFESSIONAL PRACTICE (1). Prerequisites, COMP 135 or 145, major in Computer Science. The role and responsibilities of the computer scientist is a corporate environment and as a consultant. Professional ethics. *Fall*. (1982 and alternate years). Brooks.
- 323 SEMINAR IN RESEARCH (1). Prerequisite, major in Computer Science. The purposes, strategies, and techniques for conducting research in Computer Science and related disciplines. (1982 and alternate years.) Brooks, Parnas.
- 324 COMPUTERS AND SOCIETY (1). Prerequisite, major in Computer Science, Seminar on social and economic effects of computers on such matters as privacy, employment, power shifts, rigidity, dehumanization, dependence, quality of life. *Spring*. (1981 and alternate years.) Pizer, Weiss.
- 390 SEMINAR IN COMPUTER SCIENCE (1-3). Prerequisite, permission of the instructor. Seminars in various topics offered by members of the faculty. Staff.
- 391 READING AND RESEARCH (3). Prerequisite, permission of the instructor. Directed reading and research in selected advanced topics. Staff.
- 393 MASTER'S THESIS (3 or more). Staff.
- 394 DOCTORAL DISSERTATION (3 or more). Staff.

SCHOOL OF DENTISTRY

BEN D. BARKER, *Dean*

Professors

BEN D. BARKER	(801)	Dean
RONALD DALE BAKER	(968)	Chairman, Oral & Maxillofacial Surgery
JAMES W. BAWDEN	(800)	Pedodontics
ERNEST J. BURKES, JR.	(971)	Chairman, Oral Diagnosis
CLIFTON F. CRANDELL	(975)	Oral Diagnosis
JAMES J. CRAWFORD	(822)	Endodontics
MILES A. CRENSHAW	(859)	Pedodontics, Research
DAVID P. DOBSON	(933)	Removable Prosthodontics
JACOB S. HANKER	(869)	Oral & Maxillofacial Surgery, Research
H. GARLAND HERSHEY	(901)	Associate Dean, Director of Graduate Studies
GENE A. HOLLAND	(953)	Fixed Prosthodontics
JOHN T. HUGHES	(876)	Dental Ecology
L. H. HUTCHENS	(912)	Chairman, Periodontics
LEONARD G. JEWSON	(915)	Periodontics
MALCOLM JOHNSTON	(805)	Orthodontics
IRWIN JOEL LEEB	(921)	Chairman, Endodontics
KARL F. LEINFELDER	(942)	Operative
ROY L. LINDAHL	(995)	Pedodontics
ROGER L. LUNDBLAD	(851)	Periodontics, Research
CECIL RHODES LUPTON	(963)	Oral & Maxillofacial Surgery
WALTER T. MCFALL, JR.	(914)	Periodontics
FRANK T. MCIVER	(993)	Pedodontics
JAMES BERNARD MACHEN	(909)	Pedodontics
SANDY COLE MARKS	(992)	Pedodontics
GERALD L. MECHANIC	(855)	Periodontics, Research
HENRY VON MURRAY	(954)	Fixed Prosthodontics
THEODORE RICHARD OLDENBURG	(994)	Chairman, Pedodontics
WILLIAM ROBERT PROFFIT	(906)	Chairman, Orthodontics
ROBERT JACK SHANKLE	(923)	Endodontics
TROY BUNYON SLUDER, JR.	(945)	Operative
ERNEST W. SMALL	(964)	Oral & Maxillofacial Surgery
DUANE FRANCIS TAYLOR	(841)	Operative, Research
BILL C. TERRY	(961)	Oral & Maxillofacial Surgery
SVEIN U. TOVERUD	(813)	Oral Diagnosis
DEREK T. TURNER	(843)	Operative, Research
PETER S. VIG	(904)	Orthodontics
DONALD W. WARREN	(986)	Chairman, Dental Ecology
WILLIAM P. WEBSTER	(987)	Dental Ecology
RAYMOND P. WHITE, JR.	(810)	Oral and Maxillofacial Surgery
MATTHEW THOMAS WOOD	(936)	Chairman, Removable Prosthodontics

Associate Professors

MARVIN J. BLOCK	(989)	Dental Ecology
JAMES C. COFFEY, JR.	(838)	Endodontics
CLAUDE W. DRAKE	(981)	Dental Ecology

DUANE A. DREYER	(937)	Oral & Maxillofacial Surgery
MARY C. GEORGE	(889)	Dental Auxiliary Teacher Education
GEORGE W. GRECO	(910)	Periodontics
KENT W. HEALEY	(935)	Removable Prosthodontics
JOHN R. JACOWAY	(970)	Oral Diagnosis
ROBERT P. KUSY	(874)	Orthodontics, Research
STEPHEN R. MATTESON	(973)	Oral Diagnosis
DOUGLAS R. MCARTHUR	(931)	Removable Prosthodontics
CHARLES L. MILONE	(988)	Dental Ecology
ROBERT MINKOFF	(903)	Orthodontics
ROY PEACH	(801)	Endodontics, Research
DAVID M. SIMPSON	(913)	Periodontics
RONALD P. STRAUSS	(980)	Dental Ecology
TIMOTHY A. TURVEY	(962)	Oral & Maxillofacial Surgery

Assistant Professors

DIANE DILLEY	(999)	Pedodontics
HENRY W. FIELDS, JR.	(992)	Pedodontics
JAMES M. GEORGE	(984)	Dental Ecology
THOMAS M. HASSELL	(820)	Periodontics
JOHN D. MORIARTY	(917)	Periodontics
DOUGLAS MORR	(846)	Dental Ecology
CEIB PHILLIPS	(821)	Orthodontics
DANIEL A. SHUGARS	(940)	Operative
WILLIAM FELIX VANN, JR.	(990)	Pedodontics
KATHERINE VIG	(907)	Orthodontics
KERMIT C. WHALEY	(873)	Oral Diagnosis
JAMES T. WHITE	(934)	Removable Prosthodontics
ALDRIDGE WILDER, JR.	(950)	Operative

Emeritus Professor

MYRON S. SILVERMAN

Clinical Associate Professors

STUART FOUNTAIN		
R. DENBY LEWIS	(925)	Endodontics
HAROLD W. MOHORN		

Clinical Assistant Professors

RICHARD E. ANGLIN, JR.		
DAVID E. BOAZ	(977)	Oral Diagnosis
BENJAMIN W. BROWN		
JOE CAMP		
DEXTER G. CHADWICK		
ALVIN S. GOODMAN		
JOHN HARTNESS		
WILLIAM C. MYERS		
JOHN OLMSTED		

Graduate instruction in the School of Dentistry is offered in oral biology, oral and maxillofacial surgery, orthodontics, pedodontics, periodontology, endodontics, prosthodontics, and dental auxiliary teacher education, and is designed to prepare dentists and auxiliaries for teaching, research, or for the specialty practice in the selected area. Consideration has been given to the requirements as set forth by the Council on Dental Education of the American Dental Association as well as the respective specialty boards.

Graduates who possess an appropriate degree and who meet the requirements of the Graduate School will be considered for admission. Applicants must submit scores on the Graduate Record Examination in order to be considered for admission. The degree of Master of Science is offered in the several subject areas cited.

The student who is interested primarily in the clinical practice of a given specialty may elect to register in the Graduate School to work toward a Certificate in the subject areas offered. The course work is similar to that offered for the several master's degrees, with the exception that the student will not complete a thesis.

Enrollment for study in dental specialty programs will be granted only at the beginning of the fall semester and a minimum period of residency of two academic years (4 semesters) and two summer sessions is usually required. The curricula have been designed to permit maximum flexibility in preparation for practice, teaching, or research, as well as to meet the educational requirements of the Specialty Boards.

In addition to the courses listed herein, there are an appreciable number of elective courses, including research, offered to permit arrangements for a minor in another field and for special interest as in teaching. The Degree and Certificate requirements vary with each program. Detailed curricula requirements may be obtained by writing the Director of Graduate Studies, UNC School of Dentistry.

The degree of Master of Science may be earned upon successful completion of an original research project and thesis. Oral and written comprehensive examinations must be successfully passed before an examining committee for the Master of Science degree.

Tuition and Fees

Residents have a semester tuition fee of \$627.25 while the summer rate is \$280.00. Instruments, books, and laboratory fees are to be determined. Non-residents have a tuition fee of \$1,536.25 per semester and \$616.00 for an eight-week summer term. Tuition and fees are due at the time of registration.

Student Loans are available on the same basis as for undergraduates. For additional information, write Director of Graduate Studies, The University of North Carolina at Chapel Hill, School of Dentistry.

Oral Biology

The admission policy for graduate training in Oral Biology leading to the degree of Master of Science will follow the regular requirements for admission to the Graduate School. Admission for the purpose of completing requirements for this degree will be accomplished only after the proper application, transcripts of prior academic work and other credentials have been reviewed and approved by the Director of Graduate Education for the School of Dentistry, the Director of the Program in Oral Biology, and consultation with members of the working faculty of the Oral Biology Curriculum.

The Curriculum in Oral Biology is a program of research and study which requires instruction over a period of two academic years and one summer session, and is designed to accommodate the interests of the individual students. Considerable emphasis is given to practical research training under the direction of the staff of the Dental Research Center and a thesis must be completed which will meet the highest standards of the University. Designated as a Regional Dental Research Institute by the National Institute of Dental Research, the Center offers excellent facilities for interdisciplinary research involving biochemical, biophysical, neuroanatomical, pharmacological and physiological methods. Current areas of research include neural mechanisms, growth mechanisms, immunological mechanisms, mineral metabolism, hemostasis, and vocalization.

A limited amount of financial support is available for qualified applicants. The program is open to applicants holding the Bachelor of Science in a dentally related field, the D.D.S., or equivalent degree.

Graduate Courses in Oral Biology

- 201 (O.B.) THE BIOCHEMISTRY AND PHYSIOLOGY OF CALCIFIED TISSUES (2). Prerequisite, approval of instructor. The objective of this course is to offer students an opportunity to review and discuss the current state of knowledge of the biology of calcified tissues. Conference thirty hours. Crenshaw; staff.
- 202 (O.B.) BIOLOGICAL ELECTRON MICROSCOPY (2). Prerequisite, approval of ab instructor. The object of the course is to offer students an opportunity to review the fine structural and molecular organization of cells with emphasis on correlative biochemical, physiological and anatomical analysis. Conference thirty hours. Peach; staff.
- 203 (O.B.) MATERIALS FOR BIOLOGICAL APPLICATIONS (1). Prerequisite, approval of instructor. This course summarizes current knowledge of materials commonly used in biological applications. Emphasis is placed on their chemical, mechanical, and structural characteristics, and the relationship between these factors and appropriate clinical applications. Taylor; staff.
- 204 (O.B.) CONGENITAL MALFORMATIONS OF THE OROFACIAL REGION (1). Prerequisite, approval of instructor. Students interested in the etiology, growth mechanism and treatment of congenital clefts and associated anomalies will be acquainted with significant aspects of the deformities. Staff.

- 206 (O.B.) INTRODUCTORY ASPECTS OF PROTEIN CHEMISTRY (1). Prerequi-
ab site, permission of instructor. Consideration of selected aspects of protein chemistry
with special attention given to problems associated with proteins found in hard tissues
and saliva. *One lecture hour a week, fall and spring.* Lundblad.
- 207 (O.B.) SEMINAR IN SPEECH PHYSIOLOGY (2). Prerequisite, permission of
instructor. Evaluation of recent research in areas of anatomy, physiology, growth and
development, genetics and acoustics as they relate to the science of speech. *One lecture
hour a week, fall and spring.* Warren.
- 208 (O.B.) DISCUSSION IN ORAL BIOLOGY (2). Prerequisite, approval of instructor.
ab A series of seminars on topics relevant to research and scientific knowledge in the field
of Oral Biology. Visiting scientists from other Research Centers in the country and
abroad will participate in the discussion series. *One lecture hour a week, fall and
spring.* Staff and visiting lectures.
- 209 (O.B.) RESEARCH TECHNIQUES IN ORAL BIOLOGY (6). Prerequisite,
ab approval of instructor. The course will familiarize participants with a selection of
specialized research techniques employed in interdisciplinary basic science approaches
to problems in oral biology. *Four lecture laboratory hours a week, spring and
summer.* Crenshaw; staff.
- 210 (O.B.) RESEARCH (15-5 per semester). Prerequisite, approval of staff. Student will
ab pursue the literature and select a research project in Oral Biology which will be
planned and conducted under direction of research staff. The project is intended to
lead to a thesis to meet the requirements of a Master of Science degree. *Fifteen hours
research a week, summer, fall and spring.* Staff.
- 212 (O.B.) CYTOCHEMISTRY AND HISTOCHEMISTRY (2). Prerequisite, Zoology
ab 11 or equivalent. The complementary nature of cell-fraction cytochemistry and micro-
scopic histochemical, cytochemical, and immunocytochemical method for demon-
strating the subcellular localization of biomacromolecules and enzymes will be dis-
cussed. *One lecture hour a week, fall and spring.* Hanker; staff.
- 222 (O.B.) SEMINAR IN STRUCTURAL AND HARD TISSUE PROTEINS (1).
Prerequisite, approval of instructor. Significant developments pertaining to the chem-
istry of molecular biology of the structural proteins will be discussed. The biochemis-
try of these proteins will be correlated with their various functions. Critiques of
current literature will be emphasized. *One lecture hour a week, spring semester.*
Mechanic.
- 233 (O.B.) CURRENT TOPICS IN BASIC SCIENCES (3, 3). Prerequisites, none. Signi-
ab ficant developments and trends in basic medical sciences which have applications in
specialized dentistry are discussed. Recent publications taken from medical and dental
scientific literature are discussed. *Three hours a week, fall and spring.* Lundblad; staff.
- 235 (OBIO) IMMUNOLOGY OF THE ORAL CAVITY (1). Lectures and discussion on
the nature of immune responses specifically related to diseases of the oral cavity. *One
lecture hour a week, fall.* Silverman.
- 269 (O.B.) MICROBIOLOGY OF THE ORAL CAVITY (O.P. 269) (1). Prerequisite,
approval of instructors. Study of current research literature and performance of
laboratory exercises relating to taxonomy and methods of studying microorganisms
associated with oral tissues. *Two hours a week, summer.* Crawford.
- 393 (O.B.) MASTER'S THESIS (6). Prerequisite, 210abc (O.B.) Research. *Fifteen hours
ab a week.* Staff.

Oral and Maxillofacial Surgery

The graduate curriculum in Oral and Maxillofacial Surgery consists of a study of the basic biological sciences and they relate to this subject integrated with a progressively graduated four-year sequence of approved hospital experience. This flexible program is designed to: (1) prepare dentists for a career in teaching, research and/or practice in the specialty of Oral and Maxillofacial Surgery; (2) meet the requirements for approval by the Council on Dental Education of the American Dental Association; and (3) prepare candidates for certification by the American Board of Oral and Maxillofacial Surgery.

While the study of the comprehensive biological sciences will be integrated and stressed throughout the four years, the more formally structured courses will be emphasized during the first two years of residency. More time will be spent in seminars and independent study during the junior and senior residency years (third and fourth years). The latter allows flexibility for investigative study, and additional rotations through various hospital services, and for additional elective assignments to provide more indepth experience and knowledge as related to Oral and Maxillofacial Surgery.

All students will be required to complete the full four-year program including the prescribed formal courses, seminars, independent study and original research project; and will be encouraged to earn the degree of Master of Science in Dentistry (Oral and Maxillofacial Surgery) by submission of a thesis.

Optional courses of study for selected individuals in this program may include qualifying for an M.D. degree or a Ph.D. in a biologic science. This involves an extended period of time which is individualized for each qualified student pursuing these additional studies.

Admission to the Graduate School for the Study of Oral and Maxillofacial Surgery is accomplished only after the application, transcripts and other credentials are reviewed and approved by the appropriate committees, including the resident and intern committee.

- 207 (ANAT) REGIONAL ANATOMY (2 or more). Lecture, laboratory. Montgomery, Small.
- 212 (OMSU) ORAL AND MAXILLOFACIAL SURGERY — ADVANCED ORAL AND MAXILLOFACIAL SURGERY (12). Terry; staff (Dent. Sch. and N.C.M.H.).
- 214 (OMSU) ORAL AND MAXILLOFACIAL SURGERY — GENERAL ANESTHESIA (6). (N.C.M.H.) Baker; staff.
- 215 (OMSU) ORAL AND MAXILLOFACIAL SURGERY — PHYSICAL DIAGNOSIS (12). (N.C.M.H.) Terry; staff.
- 230 (OMSU) ORAL AND MAXILLOFACIAL SURGERY — BASIC SURGICAL SKILLS (4). (N.C.M.H.). This course includes an experimental animal surgery laboratory portion as well as lectures and demonstrations of surgical principles and techniques. Terry; staff.

- 240 (OMSU) ORAL AND MAXILLOFACIAL SURGERY RADIOLOGY (1). *Two seminar hours a week. Spring.* Matteson.
- 252 (OMSU) BONE AND CALCIUM PHYSIOLOGY (4) *Summer.* Staff.
- 301 (OMSU) RESEARCH (6). To be arranged.
- 393 (OMSU) THESIS (3 or more).
- 400 (OMSU) GENERAL REGISTRATION (0).

Graduate Courses in Oral Pathology

- 211 (O.P.) PATHOLOGY (Surgical) (5). *Two conference hours and six laboratory hours a week, fall.* Brinkhous.
- 212 (O.P.) PATHOLOGY (Autopsy) (5). *Two conference hours and six laboratory hours a week, summer.* Graham; staff.
- 262 (O.P.) ORAL PATHOLOGY (Histology and Histopathology) (2). *Two conference hours per week, fall.* Burkes.
- 263 (O.P.) ORAL PATHOLOGY (Histology and Histopathology) (2). *Two conference hours per week, spring.* Burkes.
- 264 (O.P.) ORAL PATHOLOGY (Seminar in Oral Pathology) (2). *Two conference hours per week, spring.* Burkes.
- 265 (O.P.) ORAL PATHOLOGY (Pediatric Oral Pathology) (2). *Two conference hours per week, fall.* Burkes.

Oral Radiology

The advanced education program in Oral Radiology begins in late August and extends for twenty-four months, leading to a Master of Science degree. The purpose of the program is to prepare qualified oral radiology specialists to function in institutions of higher dental education, research settings or in the private practice of Oral Radiology. Activities will prepare individuals to participate effectively in maxillofacial radiologic practice, acquire background information on radiation physics, radiation biology and protection, receive teacher training preparation and participate in research.

Each graduate student and his faculty advisor develop an original clinical or basic science project which is an integral part of the graduate program. A written thesis is required. This program meets the eligibility requirements of the American Board of Oral and Maxillofacial Radiology.

Applications should be submitted by October 15th. Interviews, usually scheduled to take place during the first week of November, are required before final acceptance. The Graduate Record Examination is required. Applicants will be notified of their acceptance by January 1st.

Graduate Courses in Oral Radiology

- ORAD ADVANCED ORAL RADIOLOGIC TECHNOLOGY (4). Literature review, seminar, and laboratory sessions to study advanced radiographic procedures and normal radiographic anatomy. *Fall.* Matteson; staff.

- ORAD 202 ADVANCED ORAL RADIOLOGIC TECHNOLOGY (3). Seminars, Laboratory and Clinical sessions to provide experience in advanced radiologic procedures. *Spring*. Matteson; staff.
- ORAD 203 ADVANCED ORAL RADIOGRAPHIC DIAGNOSIS (3). Literature review and seminars to present advanced radiologic diagnosis. *Summer*. Matteson; staff.
- ORAD 204 ADVANCED RADIOLOGIC DIAGNOSIS (3). Literature Review, Seminars, and Clinical experience in advanced radiologic diagnosis. *Fall*. Matteson; staff.
- ORAD 205 ADVANCED RADIOLOGIC DIAGNOSIS (5). Literature review, seminars, and clinical experience in the application of advanced radiologic procedures such as bone scans, cat scans, angiography to the diagnosis of oral and maxillofacial conditions. *Spring*. Matthew; staff.
- ORAD 393 MASTER'S THESIS (3).

Core courses required during first or second years.

- BIOS 105 PRINCIPLES OF STATISTICAL INFERENCE (3). *Fall, spring, summer*. Staff.
- ANAT 207 REGIONAL ANATOMY (3). *Summer*. Montgomery.
- ORPA 262 HISTOLOGY AND HISTOPATHOLOGY (2). *Fall*. Burkes.
- ORPA 263 HISTOLOGY AND HISTOPATHOLOGY (2). *Spring*. Burkes.
- ENVR 161 ELEMENTS OF RADIOLOGICAL HYGIENE (2). *Spring, summer*. Stansbury, Watson, Willhoit.
- DECO 240 TEACHING SKILLS FOR DENTAL EDUCATION (2). *Summer*. Macker.
- ORTH 215 ORAL—PHARYNGEAL FUNCTION (1). *Summer*. Proffitt, Staff.
- ORTH 207 APPLIED AND RADIOGRAPHIC ANATOMY (2). *Fall*. Staff.
- ENVR 162 MODERN PHYSICS FOR ENVIRONMENTAL SCIENCE (3). *Fall*. Watson.
- EDFO 106 ED. MEASUREMENT AND EVALUATION (3). *Fall, spring, summer*. White, Stuck, Ware.
- ORPA 264 SEMINAR IN ORAL PATHOLOGY (2). *Spring*. Burkes.
- OBIO 204 CONGENITAL MALFORMATIONS OF THE ORAL-FACIAL REGION (1). Staff.
- ORTH 208 GROWTH AND DEVELOPMENT (4). *Spring*. Proffitt, Staff.

Orthodontics

Admission for graduate study in orthodontics is made only after review and approval of a completed application by the department faculty and by the Graduate School. Application for entry into the program in late August should be made by October 15th of the previous year. Interviews

are scheduled in October and November. Admission decisions normally are made late in November.

The two-year curriculum in orthodontics is designed to prepare dentists for clinical practice in the specialty of orthodontics, and meets the educational requirements for later specialty board certification. All students participate in research in the department, and are encouraged to earn the Master of Science degree by completion of a thesis project. For those especially interested in an academic or research career, additional experience in these areas can be provided by an extension of the two-year program.

During the first year of the program, students participate in seminars selected to the principal didactic courses, discuss clinical topics in seminars, and begin patient care. As the program progresses, didactic seminars gradually are replaced by research participation while clinical seminars continue and the volume of patient care increases. All students must perform satisfactorily on oral and written comprehensive examinations to successfully complete the program.

Graduate Courses in Orthodontics

- 201 ORTHODONTIC TECHNIQUE (4). Introduction to orthodontic technique and procedures, for beginning orthodontic graduate students. *Fall, first year.* K. Vig; staff.
- 203 ORTHODONTIC DIAGNOSIS (2, 2). Principles of orthodontic diagnosis and analysis of diagnostic records for orthodontic specialists. *Fall, spring.* P. Vig; staff.
- 204 INTRODUCTION TO CLINICAL ORTHODONTICS (2). Principles of clinical patient care for specialty practice in orthodontics. *Fall.* Hamilton; staff.
- 205 ADVANCED CLINICAL ORTHODONTICS (5,3,7,7,3). *Fall, spring, summer.* *abcde* Hamilton; staff.
- 206 BIOMECHANICS (2). Mechanical principles in orthodontic force production and control; biological response to orthodontic force. *Fall.* Proffit.
- 207 APPLIED AND RADIOGRAPHIC ANATOMY (2). Osteology and applied surgical anatomy of face and jaws; introduction to cephalometric radiology. *Fall.* Johnson.
- 208 GROWTH AND DEVELOPMENT (4). Principles of growth and development, emphasizing dento-facial development from an evolutionary and molecular biology perspective as well as the traditional anatomic perspective. *Spring.* Fields; staff.
- 209 PREVENTIVE ORTHODONTICS (3,3,3). Principles of orthodontic intervention for young patients, for pedodontists. *Spring, summer, fall.* Fields.
- 210 CRANIOFACIAL ANOMALIES (2). The clinical management of craniofacial anomalies, including cleft lip and palate, and the associated interdisciplinary approach to treatment planning. *Fall.* Vig; staff.
- 213 PRINCIPLES OF ORTHODONTIC TREATMENT FOR ADULTS. (2). Orthodontic treatment procedures for adults, for periodontic and prosthodontic graduate students. *Spring.* Hamilton.
- 215 ORAL-PHARYNGEAL FUNCTION (1). Maturation of oral and pharyngeal function, including speech, and its relation to dento-facial development. *Summer.* Vig.
- 222 ENVIRONMENT OF SPECIALTY PRACTICE (3). Trends in health care delivery; organization and management of orthodontic specialty practice. *Fall.* Proffit; staff.
- 301 RESEARCH. (2,1,2,3,3). *Arranged.* *abcde*

- 302 CURRENT TOPICS IN ORTHODONTICS (2,2). Seminars on pertinent orthodontic literature, for advance orthodontic students. *Fall, spring*. Hershey.
 ab
- 393 THESIS (3 or more).

Pedodontics

Admission to the Graduate School for training in Pedodontics requires proper application with transcripts of prior academic work which are reviewed and approved by the Director of Graduate Education for the School of Dentistry, the Chairman and the Director of Graduate Pedodontics, and members of the Pedodontic Faculty. A personal interview and the Graduate Record Examination (GRE) are required for consideration for acceptance.

The Department of Pedodontics offers a certificate and a Master of Science degree in Pedodontics upon submission of a thesis. In addition, a combined program leading to a Ph.D. degree with a clinical specialty in pedodontics is available for interested and qualified individuals. The program length is 24 months, beginning July 1 for master's candidates.

Emphasis is placed on a diversified educational experience which includes clinical, hospital, didactic and research opportunities. Patients are selected to provide students with a variety of clinical experiences in areas of interceptive orthodontics, growth and development, syndromes, developmental defects and genetic abnormalities as well as social and behavior management problems and treatment of the special patient. Hospital training is gained through North Carolina Memorial Hospital and the Lenox Baker Cerebral Palsy Hospital. The Dental Research Center provides opportunities for students to investigate original ideas under the direction of dental and medical faculty.

Limited financial aid is available in the form of grants, hospital residencies and teaching assistantships.

Graduate Courses in Pedodontics

- 200 (PEDO) PEDODONTIC DIAGNOSIS & TREATMENT PLANNING SEMINAR
 abcde (2,2,2,2,2) 10. *Two seminar hours a week, fall and spring, first year; two seminar hours a week, summer; two seminar hours a week, fall and spring, second year.* Oldenburg; staff.
- 203 (PEDO) PRINCIPLES OF PEDODONTICS (2,2,2). *Three seminar hours a week, fall, spring, summer, first year.* Oldenburg; staff.
- 204 (PEDO) ADVANCED CLINICAL PEDODONTICS (1,3,3,3,5) 15. *Nine clinical application hours a week, fall and spring, first year; nine clinical application hours a week, summer; nine clinical application hours a week, fall and spring, second year.* Oldenburg, staff.
- 301 (PEDO) RESEARCH (14). *Arranged.*
 abcd
- 393 THESIS (3 or more).

Periodontology

The graduate program in Periodontology consists of a 24 month course of study leading to a Certificate in Periodontics or a 36 month course of study leading to a Certificate and Master of Science degree. The first two years are devoted primarily to the study of the biologic concepts and literature that relate to periodontology, as well as the acquisition of the clinical skills required for certification. A portion of the first two years will be devoted to research which should result in a publishable paper suitable for a reputable journal. Elective courses relating to areas of research interests are available.

The Master of Science degree can be awarded after the third year. This year will involve a combination of teaching, research experience, and the successful completion of a thesis. The program is designed to prepare dentists to assume positions in academic and research as well as in the clinical practice of periodontics.

Students are admitted at the beginning of the fall session. The number of students is limited to four each year. Students initially applying for certificate training only will have the option to change to the Master of Science degree program at the end of the initial 12 months of training with approval of the faculty.

Admission to the Graduate School is accomplished only after the application, transcripts of prior academic work, letters of reference and other credentials are reviewed and approved by the appropriate committee.

Graduate Courses in Periodontology

- 250 (PERI) ADVANCED CLINICAL PERIODONTICS CLINICAL PRACTICE (9).
abc 405 hours. *Fall, spring, summer.* Staff.
- 251 (PERI) ADVANCED CLINICAL PERIODONTICS CLINICAL PRACTICE (9).
abc 405 hours. *Fall, spring, summer.* Staff.
- 260 (PERI) SCIENTIFIC WRITING (1). *Fall.* McFall.
- 266 (PERI) PERIODONTAL THERAPY (1,1,1). *Fall, spring, summer.* Simpson; staff.
abc
- 268 (PERI) CASE ANALYSIS (10). *Fall, spring, summer, fall, spring.* Simpson; staff.
abcde
- 270 (PERI) SEMINAR IN PERIODONTOLOGY (6). Review of literature. *Fall, spring
abc summer.* Simpson; staff.
- 271 (PERI) SEMINAR IN PERIODONTOLOGY (4). Review of literature. *Fall, spring.
ab Simpson; staff.*
- 285 (PERI) OCCLUSION AND OCCLUSAL DYSHARMONIES (2). *Spring.* McFall.
- 286 (PERI) CLINICAL MANAGEMENT OF OCCLUSAL DYSHARMONIES (1).
Lab. *Summer.* McFall.
- 301 (PERI) RESEARCH (5 each). Up to 1350 laboratory hours. *Arranged. Fall, spring.
abcdef summer.* Staff.
- 393 (PERI) THESIS (3 or more).

Prosthodontics

The admission policy for graduate training in Prosthodontics will follow the regular requirements for admission to the Graduate School. Admission to the Graduate School is granted only after the application, transcripts of prior academic work, letters of reference, and other credentials are reviewed and approved by the appropriate committee. All applications, transcripts, and letters of reference should be mailed to the Dental Admissions Office, UNC School of Dentistry, Chapel Hill, N.C. 27514. All application materials should be submitted by October 15 for the following fall class.

The Graduate Program in Prosthodontics is currently a twenty-four month course of study in Fixed, Removable, and Maxillofacial Prosthodontics. Students may elect to concentrate their training in either Fixed or Removable Prosthodontics during their second year, but not to the total exclusion of the other prosthodontic disciplines. The program satisfies the formal training requirements of the American Board of Prosthodontics for certification examination in Fixed or Removable Prosthodontics.

Graduate Courses in Prosthodontics

- 221 (PROS) EXTRAORAL PROSTHODONTICS (2,1). Review of literature and clinical
ab treatment of patients having congenital or acquired maxillofacial defects. *Spring and summer (first year)*. White, and staff.
- 223 (PROS) EXTRAORAL PROSTHODONTICS (2,2,1). Review of literature and
abc clinical treatment of patients having congenital or acquired maxillofacial defects. *Fall, spring, and summer (second year)*. White, staff.
- 224 (PROS) ADVANCED CLINICAL PROSTHODONTICS (REMOVABLE) (2,2,1).
abc The clinical management of patients requiring advanced technique in complete and removable partial denture treatment. *Fall, spring, summer (first year)*. Healey; staff.
- 225 (PROS) ADVANCED CLINICAL FIXED PROSTHODONTICS (2,3,1). Patient
abc treatment requiring the student to develop experience and competency in all phases of clinical fixed prosthodontics. *Fall, spring, summer (first year)*. Holland; staff.
- 226 (PROS) ADVANCED CLINICAL PROSTHODONTICS (Removable) (2,2,1). The
abc clinical management of patients requiring advanced technique in complete and removable partial denture treatment. *Fall, spring, summer (second year)*. Healey; staff.
- 227 (PROS) ADVANCED CLINICAL FIXED PROSTHODONTICS (3,3,1). Patient
abc treatment requiring the student to develop experience and competence in all phases of clinical fixed prosthodontics. *Fall, spring, summer (second year)*. Holland; staff.
- 228 (PROS) RESEARCH (3,1,4,4,2). This course includes instruction in fundamental re-
abc search techniques and methodology relative to needs of the individual's project design. The course also includes the design, research, and completion of an individual research project. *Spring, summer, fall, spring, and summer (Degree candidates)*. Healey, Holland, Wood, Murray, and staff.
- 230 (PROS) DIAGNOSIS AND TREATMENT PLANNING SEMINAR IN AD-
VANCED FIXED PROSTHODONTICS (2). Review of current literature relative to concepts, methods, and materials for diagnosis and treatment planning in advanced fixed prosthodontics. *Fall*. Holland; staff.

- 231 (PROS) SEMINAR ON OCCLUSION IN ADVANCED FIXED PROSTHODONTICS (2). Seminar on concepts of occlusion and planning restorative occlusion for the dentulous patient. Course will include the rationale for and use of various articulators in prosthodontics. *Spring*. Holland; staff.
- 232 (PROS) SPECIAL TOPICS SEMINAR IN ADVANCED FIXED PROSTHODONTICS (1). Seminar course designed to review concepts and methods of dealing with special problems in fixed prosthodontics (e.g., Class II and Class III patients). *Summer*. Holland; staff.
- 234 (PROS) DENTAL MATERIALS (2). Seminar discussion of the composition, physical properties, and manipulative procedures for dental biomaterials of particular interest to the prosthodontist. Emphasis is placed on clinical application, latest developments and the research potential for the future. *Fall*. Holland, Leinfelder, Sluder, Taylor; staff.
- 235 (PROS) SEMINAR IN ADVANCED REMOVABLE PROSTHODONTICS (2). Seminar in advanced removable prosthodontics case analysis and treatment planning, and literature review. *Fall*. Healey; staff.
- 236 (PROS) SEMINAR IN ADVANCED REMOVABLE PROSTHODONTICS (2). Seminar in advanced removable prosthodontics case analysis and treatment planning and literature review. *Spring*. Healey; staff.
- 237 (PROS) SEMINAR IN ADVANCED REMOVABLE PROSTHODONTICS (1). Seminar in advanced removable prosthodontics case analysis and treatment planning and literature review. *Summer*. Healey; staff.
- 238 (PROS) SEMINAR IN ADVANCED PROSTHODONTICS (FIXED AND REMOVABLE) (2). Seminar designed to review literature and topics common to fixed and removable prosthodontics. *Fall (second year)*. Healey, Holland; staff.
- 239 (PROS) ADVANCED TREATMENT PLANNING SEMINAR IN FIXED AND REMOVABLE PROSTHODONTICS (2). Combined fixed and removable prosthodontics seminar with emphasis on diagnosis and treatment planning of the more complex prosthodontic problems. *Spring (second year)*. Healey, Holland; staff.
- 393 (PROS) THESIS (3). Completion of thesis for Master of Science degree. Healey, Holland, Wood, Murray, and staff.

Endodontics

The curriculum in the Graduate Endodontic Program is developed within a three-year experience at the end of which time a degree of Master of Science will be awarded. The program is primarily designed to prepare dentists for a career in teaching and/or research in the specialty of endodontics and prepare candidates for certification by the American Association of Endodontists.

The first two years involve an integrated study of the biologic concepts and literature in endodontics and the clinical skills required for certification. The third year will be devoted to thesis completion of teaching.

Enrollment is limited to two candidates each year beginning their course of study in the summer.

Graduate Courses in Endodontics

- 210 (ENDO) ADVANCED CLINICAL ENDODONTICS (29). 870 hours of clinical practice. Staff. Required each semester.
 abcde
 211 (ENDO) ENDODONTICS SEMINAR AND CASE ANALYSIS (15). 180 hours conference. Staff. Required each semester.
 abcde
 212 (ENDO) ENDODONTICS LITERATURE REVIEW SEMINAR (20). 270 hours. Lewis; staff. Required each semester.
 abcde
 220 (ENDO) RESEARCH (15). 675 hours of laboratory. Staff. Required each semester.
 393 THESIS (3 or more). Third year.
 400 GENERAL REGISTRATION (0).

CORE courses required during first and second year:

- 207 (ANAT)
 105 (BIOS)
 263 (ORPA)
 210-213 (ORDI)
 220 (OMSU)
 250-251 (OMSU)
 235 (OBIO)
 269 (OBIO)
 260 (PERI)
 202ab (OBIO)

Dental Auxiliary Teacher Education

The primary objective of the Dental Auxiliary Teacher Education Master of Science Program is to prepare well qualified teachers for dental assisting, dental hygiene and dental technology programs. At the successful completion of this program, the student should be able to (1) give evidence of having acquired advanced knowledge and skills in two of the following areas of concentration: Dental Auxiliary Utilization, Dental Radiology, Science Basic to Dental Auxiliary Education, Oral Pathology, and Clinical or Laboratory Education, (2) develop the knowledge, skills and attitudes necessary in the conduct of dental auxiliary programs, (3) teach courses in more than one dental auxiliary field, (4) define their own problems from the present body of knowledge in dental auxiliary education, solve the problem, and present their work in a scholarly fashion.

Credit hour requirements vary and are based on the individual background of the student and on the areas of concentration selected by the student. Approximately 36-45 credits are required. Fifteen credit hours are required in the core (including thesis or research) and six credit hours of electives in allied areas are also required. Up to 12 credit hours of education are required for those students who do not have a background in education. The length of the program is approximately two years. Minimum admissions requirements for the program include current licensure

or certification by the appropriate agency representing each professional area, and a bachelor's degree from an accredited institution and graduation from a dental auxiliary program accredited by the Commission on Accreditation, American Dental Association. Work experience in dental auxiliary education or dental auxiliary practice is strongly recommended.

Applicants must have a grade point average of B or better in the professional undergraduate curriculum. Scores on the Graduate Record of Examination (GRE) must be submitted. Three letters of recommendation are required. An application to the University can be obtained by writing to the following address after September 1 for enrollment during the following Fall or Spring: Admissions Office, School of Dentistry 209H, The University of North Carolina at Chapel Hill, Chapel Hill, NC 27514. For further information contact Director, Dental Auxiliary Teacher Education Program, School of Dentistry 209H, The University of North Carolina at Chapel Hill, Chapel Hill, North Carolina 27514, 919/966-1161, extension 370/371.

The graduate required Core includes:

- 230 (DATE) LEADERSHIP AND ADMINISTRATION (2). *Fall.* George.
- 260 (PERI) SCIENTIFIC WRITING (1). *Fall.* Phillips.
- 105 (BIOS) PRINCIPLES OF STATISTICAL INFERENCE (3). *Fall.* Phillips.
- 160 (DATE) CURRENT ISSUES IN DENTAL AUXILIARY EDUCATION (2). *Summer, Spring.* M. George.
- 237 (DATE) INTERNSHIP AND SEMINAR (3-7). *Spring.* M. George.
- 393 (DATE) THESIS OR DATE 301 RESEARCH (3). *Fall.* Machen.

Courses required for each area of concentration include the following:

Dental Auxiliary Utilization

Prerequisite: DATE 15: Current Professional Skills, Clinical or Laboratory Section.

- 181 (HADM) INTERPERSONAL AND GROUP RELATIONSHIPS IN ADMINISTRATION (3). *Fall.* Sedlak, Edgerton.
- 198E (DATE) PERSONNEL MANAGEMENT SEMINAR (2). *Spring.*
- 234 (DATE) DAU PROGRAM MANAGEMENT (4). *Spring.* Staff.
- 252 (EDCI) GROUP PROCESS AND BEHAVIORAL CHANGE (3). *Spring.* Watson.

Dental Radiology

Prerequisites: DATE 15: Current Professional Skills, Dental Radiology Section; Physics 24 and 25; Calculus.

- 162 (RADI) INSTRUMENTATION AND IMAGING METHODS (4). *Spring.* Keene and staff.
- 161 (ENVR) ELEMENTS OF RADIOLOGIC HYGIENE (2). *Spring, II summer session.* Stansbury, Watson, Willhoit.
- 233 (DATE) SEMINAR AND PRACTICUM IN DENTAL RADIOLOGY EDUCATION (4). *Fall.* Whaley.

Biologic Sciences

Selection of courses based on student background and interests to total 12 credits.

- 105fs (ANAT) GROSS ANATOMY (5). *Fall, spring.* Montgomery.
 111fs (ANAT) MICROSCOPIC ANATOMY (3). *Fall, spring.* Peach.
 124 (DENT) BIOLOGIC SCIENCES LABORATORY (4). *Spring.* Peach.
 269 (OBIO) MICROBIOLOGY OF THE ORAL CAVITY (1). *Summer.* Crawford.
 112s (DATE) INTRODUCTION TO MICROBIOLOGY (2). *Spring.* Straughn.
 103fs (PHYI) PHYSIOLOGY FOR DENTAL STUDENTS (3). *Fall, spring.* Dreyer.
 123 (DENT) PHARMACOLOGY (2). *Fall.* Toverud.
 101ab (BIOC) BIOCHEMISTRY FOR DENTAL STUDENTS (4). *Fall, spring.* Bell.

Oral Pathology

- 120fsx (DATE) ORAL MEDICINE (3-7). *Fall, spring, summer.* Burkes.
 140f (DATE) ORAL MEDICINE (2-7). *Fall.* Burkes.

Clinical or Laboratory Education

Prerequisite: DATE 15: Current Professional Skills, Clinical or Laboratory Section.

- 136 (DATE) CLINICAL AND LABORATORY TEACHING PRACTICUM (3). *Fall.* M. George.
 153* (DATE) INTRA-ORAL FUNCTIONS FOR DENTAL AUXILIARY EDUCATORS (3). *Spring.* Staff.
 154 (DATE) INTRA-ORAL FUNCTIONS FOR DENTAL AUXILIARY EDUCATORS CLINICAL PRACTICE (3). *Fall.* Staff.
 156** (DATE) INDEPENDENT STUDY IN DENTAL LABORATORY TECHNOLOGY EDUCATION (3). *Spring.* Morr.
 236 (DATE) ADVANCED PRACTICUM IN CLINICAL AND LABORATORY INSTRUCTION (4). *Spring.* M. George.

*Not required for dental technicians.

**Required for dental technicians.

Other Graduate Courses Offered to Graduate Students In Dentistry

- 105 (BIOS) PRINCIPLES OF STATISTICAL INFERENCE (3). *Three lecture hours a week, fall.* Phillips; staff.
 202 (DECO) SPECIAL PROBLEMS IN COMMUNITY DENTISTRY (1-3). Prerequisite, D.D.S. or D.M.D. Degree. *Thirty-six laboratory hours, fall, spring, and summer.* Warren; staff.
 205 (DNED) DENTAL BIostatISTICS (3). Prerequisite, permission of instructor. Designed to provide dental students with experience in applying statistical concepts of design and analysis to dental research projects and in preparing results from these projects for publication. *Two lecture hours and one seminar hour a week, fall.* Phillips.
 208 (DECO) PUBLIC HEALTH DENTISTRY (1). *Two seminar hours a week, fall.* Hughes.

- 250 (DECO) ORAL FACIAL AND COMMUNICATIVE DISORDERS (3). *One lecture hour a week, summer, fall, and spring.* Posnick.
- 240 (DNED) TEACHING SKILLS FOR DENTAL EDUCATION (1). *Two seminar hours a week, summer.* Machen.
- 241 (DNED) SEMINAR ON DENTAL EDUCATION (2). *Two lecture hours a week, fall.* Machen.
- 245 (DNED) PROBLEMS IN DENTAL EDUCATION (1-3). Prerequisite, permission of instructor. Students interested in a corner in dental education will be given an opportunity to explore various aspects of dental education. Each student's particular interest will be the basis for constructing a review of relevant literature, interviews with selected faculty and students and seminar discussion with the instructor. *One to three hours of lecture and seminar per week, fall.* Machen.
- 210 (ORDI) ADVANCED ORAL DIAGNOSIS AND TREATMENT PLANNING (2). *Two lecture hours a week, fall.* Simpson; staff.
- 211 (ORDI) ADVANCED ORAL DIAGNOSIS AND TREATMENT PLANNING: CASE ANALYSIS (2). *Two lecture hours a week, spring.* Simpson; staff.
- 212 (ORDI) ADVANCED ORAL DIAGNOSIS AND TREATMENT PLANNING: SPECIAL TOPICS SEMINAR (2). *Two lecture hours a week, fall.* Simpson; staff.
- 213 (ORDI) ADVANCED ORAL DIAGNOSIS AND TREATMENT PLANNING: CASE ANALYSES (2). *Two lecture hours a week, spring.* Simpson; staff.
- 206 (ORDI) ADVANCED DENTAL RADIOLOGY (1). *Two lecture hours a week, Summer.* Via.
- 225 (ORDI) INDEPENDENT STUDY IN ADVANCED DENTAL RADIOLOGY (3). *Two lecture and two seminar hours a week, fall or spring.* Matteson.
- 226 (ORDI) PROJECT IN DENTAL RADIOLOGY (3). *One lecture, two seminar and three laboratory hours a week.* Matteson.
- 220 (OMSU) APPLIED PHARMACOLOGY (1). *One lecture hour a week, spring.* Bays.
- 207 (ANAT) REGIONAL ANATOMY (3). *Three lecture hours a week, fall.* Montgomery.
- 250 (OMSU) CLINICAL APPLICATIONS IN ADVANCED PAIN AND ANXIETY CONTROL (1). *Two seminar hours a week, fall.* Gregg, Baker.
- 251 (OMSU) ADVANCED PAIN AND ANXIETY CONTROL (2). *Two seminar hours a week, spring.* Gregg, Baker.

DEPARTMENT OF DRAMATIC ART

MILLY S. BARRANGER, *Chairman*

Professors

MILLY S. BARRANGER ¹	(21)	Dramatic Literature, Theory and Performance, Criticism and Theatre History
RUSSELL GRAVES	(3)	History, Literature, Criticism, Acting
ARTHUR L. HOUSMAN	(4)	Directing, Play Analysis, History
TOM REZZUTO, JR.	(10)	Scenic Design, Directing

Associate Professors

PATRICIA BARNETT	(1)	Stage Speech, Acting
ROBERTA OWEN	(2)	Costume Design

Lecturers

JOY JAVITS	(18)	Movement
EDGAR MARSTON		Theatre Management
GILLIAN PLESCIA	(19)	Stage Voice, Speech
ANN SHEPHERD	(20)	Acting

Visiting Associate Professors

GREGORY BOYD	Acting, Play Analysis, Dramatic Literature
DAVID ROTENBERG	Acting

Visiting Lecturers

FREDERICK BROWN	Costuming
LINWOOD TAYLOR	Design, Technical Director

The Department of Dramatic Art offers advanced courses leading to the degrees of Master of Fine Arts and to the Licentiate in Dramatic Art. The M.F.A. and L.D.A. are professional training programs in acting, costume design, scene design, and technical theatre.

Through the varied production program of the Department the student is provided with opportunities to work in various aspects of theatre. Plant facilities for this program include the historic Playmakers Theatre, the Koch Memorial Forest Theatre, the production facilities of the Graham Memorial Building, and the new 504 seat Paul Green (thrust) Theatre.

It is the responsibility of each student to become familiar with the general regulations of the Graduate School and particularly with the dates indicated on the calendar for the academic year; this information is contained elsewhere in the *Graduate School Record*.

A limited number of graduate appointments are available in the department; interested students should request an "Application for Graduate Assistantship" from the departmental office. Appointments are presently scheduled in the areas of acting, technical theatre, costuming, theatre

¹Effective July 1, 1982.

library, Laboratory Theatre, and in support of *Introduction to Theatre* (DRAM 15). All appointments involve instructional or laboratory supervisory responsibility.

Currently under review by the Administrative Board of the Graduate School is a proposal to institute a three-year MFA degree which would incorporate the current two-year MFA and the LDA. It is anticipated, should approval be forthcoming, that this three-year MFA will be in place by the Fall of 1982.

Information regarding the status of the three-year MFA proposal and any other information about the graduate programs may be obtained by addressing an inquiry to the Director of Graduate Studies, Department of Dramatic Art, The University of North Carolina at Chapel Hill, Chapel Hill, North Carolina 27514.

Master of Fine Arts

1. *Purpose.* The M.F.A. program prepares theatre artists, through an intensive training program, to enter the professional theatre as qualified journeymen with specializations in Acting, Costume Design, Scene Design, or Technical Theatre.
2. *Prerequisites.* In addition to the general regulations of the Graduate School and the completion of the Graduate Record Examination, the sole criterion for entrance to the M.F.A. Training Program is the demonstration of talent. The M.F.A. entrance committee will assess and evaluate the strength of the talent and temperament the individual applicant reveals to determine whether or not he or she will benefit from the training program and has promise for employment in the professional theatre. The applicant for each of the areas will be judged upon the bases listed in the supplementary information sheet which is available from the Department upon request.
3. *Curriculum.* The M.F.A. candidate enters the Professional Theatre Training Program as an apprentice-artist. The curriculum offers a conservatory approach with training in four areas: the classroom, the laboratory, the Departmental Production and the professional production with the Playmakers Repertory Company (an Equity LORT theatre).
4. *Evaluation.* Each candidate admitted to the M.F.A. program is formally evaluated in an interview/conference at the end of every semester, by the M.F.A. Board of his/her discipline. Continuance in each discipline from semester to semester is dependent upon the M.F.A. Board's assessment of the individual's demonstrated professional promise and development and not exclusively upon grades or the completion of academic work. Invitation and acceptance into the second year assures the candidate that, barring unforeseen alterations in the work or changes

in the individual's discipline, the M.F.A. degree will be granted at the conclusion of the program.

5. *Advisor.* Each individual discipline has a faculty advisor who works closely with the candidates of that discipline. All candidates are subject to the advice and review of the M.F.A. Board.
6. *Residency and Requirements.* The residency requirement for the M.F.A. degree currently is two consecutive years, i.e. four semesters of residence credit. M.F.A. candidates register for 12 hours of credit in course and Laboratory as directed by their program director.

Licentiate in Dramatic Art

An invitational third year program brings together the work of the first two years of the M.F.A. program by providing highly selected M.F.A. graduates in a journeyman's position with the Playmakers Repertory Company. The in-training work is equivalent to a first professional position. Individual tutorial, coaching, and advising is provided by on-campus professional theatre artists and workers who complement company assignments. Academic credit of 12 additional semester hours beyond the M.F.A. will be granted, at the end of the second consecutive semester. The M.F.A. from UNC-CH is a necessary prerequisite for admission.

More detailed information on these graduate programs may be obtained by addressing an inquiry to: Chairman, Department of Dramatic Art, The University of North Carolina at Chapel Hill, Chapel Hill, North Carolina 27514.

Courses for Graduates and Advanced Undergraduates

- 100 TECHNICAL DIRECTION (3). Prerequisites, 64a-c or equivalent technical practice in theatre production. An advanced study of the technical and engineering problems involved in theatre production and of the relationship of theatre architecture to theatre production methods. *Spring.* Staff.
- 150 SHAKESPEARE IN THE THEATRE (3). A study of the literary, stage history, and production problems of representative plays. *Spring.* Staff.
- 155 PLAYWRITING (3). A practical course in writing for the stage. May be repeated once for credit. *Fall.* Staff.
- 157 PLAYWRITING (3). Prerequisite, at least one semester of Dramatic Art 155. A practical course in the writing of the stage play. *Spring.* Staff.
- 166 SCENE DESIGN (3). Prerequisite, Dramatic Art 100 or equivalent training in drafting. Permission of the instructor required. General principles of visual design as applied to scenery for theatre. Instruction in standard techniques of planning and rendering scene design. *Spring.* Rezzuto.
- 167 COSTUME DESIGN I (3). Prerequisite, permission of instructor. An introduction to the theory and technique of costume design, with instruction in rendering and conception. *Two lectures and four lab hours a week, fall.* Owen.
- 168 LIGHTING DESIGN (3). Prerequisite, Dramatic Art 100 or equivalent training in drafting. Permission of the instructor required. General principles of lighting design as applied to the performing arts. Theory and instruction in standard techniques of lighting on the stage. *Fall.* Staff.

- 169 COSTUME DESIGN II (3). Prerequisites, Dramatic Art 167 and permission of instructor. An in-depth, advanced study of costume design implementing the techniques and theory examined in Costume Design I. *Two lectures and four lab hours a week, spring.* Owen.
- 170 THE HISTORY OF COSTUME—EGYPT TO THE FOURTEENTH CENTURY (3). A survey of historic costume forms. *Three lecture hours a week, fall.* (Alternate years.) Owen.
- 171 HISTORY OF COSTUME—14TH TO 20TH CENTURY (3). *Three lecture hours a week, spring.* (Alternate years.) Owen.
- 175 HISTORICAL DECORATIVE ARTS AS A THEATRICAL RESOURCE—EGYPTIAN TO 14TH CENTURY (3). *Three seminar hours a week, fall.* Rezzuto.
- 176 HISTORICAL DECORATIVE ARTS AS A THEATRICAL RESOURCE—FIFTEENTH CENTURY TO THE PRESENT (3). *Three seminar hours a week.*
- 177 PRINCIPLES OF DESIGN—I (3). *Three lecture hours a week, fall.* Rezzuto.
- 178 PRINCIPLES OF DESIGN—II (3). Prerequisite, DRAM 177. *Three lecture hours a week, spring.* Rezzuto.
- 190 THEATRE MANAGEMENT (3). *Three lecture hours a week.* Marston.
- 192 SPECIAL TOPICS STUDIES (3). Open only to majors in the Department of Dramatic Art. Permission of the instructor required. Special group studies of a selected area of theatre and drama. This course may be repeated once for credit. *Fall and spring.* Staff.
- 194 PROFESSIONAL THEATRE LABORATORY (3-12). Prerequisite, majors of advanced standing; permission of instructor. Individual programs or internships in acting, directing, design, management, and playwriting under the guidance of professional practitioners in conjunction with the Playmakers Repertory Company or of other professional theatre organizations. Locally supervised. *As required.* May be repeated once; total of 12 hours limit. Staff.

Courses for Graduates

- 220 ACTING I (3). Prerequisite, admission to the M.F.A. Acting program. Intensive professional training for the actor. *Must be taken fall and spring.*
- 221 ACTING II (3). Prerequisite, admission to second year of M.F.A. Acting program. Advanced professional training for the actor. *Must be taken fall and spring.*
- 222 VOICE AND SPEECH I (3). Prerequisite, admission to M.F.A. Acting program. Development of the individual actor's voice and speech. *Must be taken fall and spring.*
- 223 VOICE AND SPEECH II (3). Prerequisite, admission to second year of M.F.A. Acting program. Expansion of the individual actor's vocal versatility in performance. *Must be taken fall and spring.*
- 224 MOVEMENT I (3). Prerequisite, admission to M.F.A. Acting program. Development of the actor's body as an expressive instrument. *Must be taken fall and spring.*
- 225 MOVEMENT II (3). Prerequisite, admission to second year of M.F.A. Acting program. Advanced projects in movement. Special sessions in tumbling and stage combat. *Must be taken fall and spring.*
- 226 REHEARSAL & PERFORMANCE I (1). Prerequisite, admission to the M.F.A. Acting program. Rehearsal and performance of special ensemble projects. *Must be taken fall and spring.*
- 227 REHEARSAL & PERFORMANCE II (3). Prerequisite, admission to second year of M.F.A. Acting program. Practical application of techniques in rehearsal and performance in studio and mainstage production. *Must be taken fall and spring.*
- 230 ACTING PROGRAM INTERNSHIP (6-12). Prerequisite, completion of the M.F.A. degree in this Department and invitation into the LDA program.* Intensive

- practicum with an integrated theatre company, with coaching, tutorial and class attendance on an individual basis as needed. *Must be taken fall and spring.*
- 231 SEMINAR IN DRAMATIC LITERATURE (3). Prerequisite, admission to the M.F.A. program in any area. An examination of the literature of the theatre in terms of dramatic construction, theory and interpretation.
- 240 COSTUME LABORATORY I (3). Prerequisite, admission to M.F.A. Costume program. Practical work in the Costume shop. *Must be taken fall and spring.*
- 241 COSTUME LABORATORY II (3). Prerequisite, admission to second year of M.F.A. Costume program. Advanced practical work in the Costume shop. *Must be taken fall and spring.*
- 242 COSTUME CONSTRUCTION I (3). Prerequisites, D.A. 192 and admission into the M.F.A. Costume program. Dart manipulation. *Spring.*
- 243 COSTUME CONSTRUCTION II (3). Prerequisites, D.A. 242 and admission into the second year of M.F.A. Costume program. Construction of costumes from Egyptian through thirteenth century. *Fall.*
- 244 COSTUME CONSTRUCTION III (3). Prerequisite, D.A. 243. Construction of costumes from fourteenth through nineteenth centuries. *Spring.*
- 245 ADVANCED COSTUME DESIGN I (3). Prerequisite, admission to second year of M.F.A. Costume program. Projects exploring rendering technique through assigned plays and periods. *Fall.*
- 246 ADVANCE COSTUME DESIGN II (3). Prerequisite, D.A. 245. Further exploration of complicated design assignments through history, continuing to refine rendering techniques. *Spring.*
- 249 COSTUME DESIGN PROGRAM INTERNSHIP (6-12). Prerequisite, completion of the M.F.A. degree in this Department and invitation into the L.D.A. Program.* Intensive practicum in Costume Design and construction, with tutorial and class assignments on an individual basis as required. *Must be taken fall and spring.*
- 251 M.F.A. DESIGN/TECHNICAL THEATRE PRACTICUM I (3-6). Prerequisite, admission into M.F.A. Design/Tech program. Practical work in Scene shop. *Must be taken fall and spring.*
- 252 M.F.A. DESIGN/TECH PRACTICUM II (3-6). Prerequisite, D.A. 250 and admission to second year of M.F.A. Design/Tech program. Advanced practical work in Scene shop. *Must be taken fall and spring.*
- 259 L.D.A. DESIGN/TECH INTERNSHIP (6-12). Prerequisite, completion of M.F.A. degree in this Department and invitation into L.D.A. Program. Intensive practicum in production projects for Departmental and PRC productions, with independent studies as assigned on an individual basis.

CURRICULUM IN ECOLOGY

ALAN E. STIVEN, *Chairman*

Professors

RICHARD N. ANDREWS	(32)	Environmental Planning, Impact Assessment
ELIZABETH J. COULTER	(1)	Demography, Health Economics, Biostatistics
NORMAN A. COULTER	(2)	Biological Control Theory, Systems, Analysis, Bioengineering
J. ALAN FEDUCCIA	(3)	Ecology and Evolution of Vertebrates
NELSON G. HAIRSTON	(6)	Population and Community Ecology
CHARLES E. JENNER	(5)	Aquatic Ecology, Marine Zoology
JOHN D. KASARDA	(9)	Human Ecology, Demography, Urban Sociology
RICHARD J. KOPEC	(11)	Bioclimatology, Climate and Coastal Settlement
EDWARD J. KUENZLER	(7)	Marine and Wetlands Ecology, Nutrient Cycling, Phytoplankton
ELIZABETH A. MCMAHAN	(12)	Ecological Behavior, Social Behavior of Termites
HELMUT C. MUELLER	(13)	Ecological Behavior, Predation, Social Organization
ALBERT E. RADFORD	(15)	Community Ecology, Floristics, Plant Systematics
V. KERRY SMITH	(33)	Natural Resource Economics
ALAN E. STIVEN	(19)	Population and Community Ecology
CHARLES M. WEISS	(20)	Limnology of Impoundments and Water Quality, Organics of Water
RICHARD H. WILEY	(21)	Behavioral Ecology of Vertebrates, Social Organization
RICHARD A. YARNELL	(23)	Environmental Anthropology, Human Culture

Associate Professors

ROBERT K. PEET	(26)	Plant Community Ecology, Forest Systems
CHARLES H. PETERSON	(29)	Marine Ecology, Intertidal Communities
FREDERIC K. PFAENDER	(27)	Environmental Microbiology
SETH R. REICE	(16)	Systems Ecology, Community Structure, Detritus Processing in Streams
PETER J. ROBINSON	(17)	Meteorology, Longwave Radiation Exchange over Lakes, Energy Balances
PETER M. VITOUSEK	(31)	Plant Ecology, Nutrient Cycling, Control of Ecosystem Processes
JO ANN WHITE	(24)	Population and Evolutionary Biology, Insect Ecology

Assistant Professor

BRUCE P. WINTERHALDER

(30) Human and Cultural Ecology, Foraging Strategies.

Using the resources of many departments, the graduate Curriculum in Ecology provides both broad and specialized training in Ecology. Whereas degree programs with a strong ecology component may be arranged in Botany, Zoology, Environmental Science and Engineering, Sociology, Anthropology, and others, the Curriculum in Ecology by combining many approaches and methods provides balanced general ecological training, including preparation for the study and management of systems of nature and man. Degrees available in the Ecology Curriculum are the Master of Science, the Master of Arts, and the Doctor of Philosophy.

For the ecology degrees, course work is required in the following fields; *biosciences* including behavior and physiology, population biology, and community and systems ecology; *sociosciences* including cities and migration, human population dynamics, and social organization; *geosciences* including the atmospheric, terrestrial and aquatic sciences.

Preparation for careers in ecology also requires firm grounding in mathematics, computer science, introductory sciences, statistics, and systems analysis and experimental methods. Undergraduate preparation may include a major in a biological science, social science, or in environmental science.

Facilities available for special study include the North Carolina Botanical Garden, the Institute of Marine Sciences at Morehead City, Highlands Biological Station in the mountains, University Lake, Duke Forest, greenhouses, and ecological equipment administered by the supporting departments. Strong ecological faculties and research programs are available in sister institutions at N.C. State University and Duke University and members of these faculties may serve on the student's committees. The University of North Carolina is a member of the Organization of Tropical Studies which provides opportunities for field study in Costa Rica and other tropical areas, and the Institute of Ecology, a consortium dedicated to inter-institutional research.

Requirements for Admission

For admission to the Curriculum in Ecology, an undergraduate degree is required in a natural science such as physics, chemistry, biology, bacteriology, botany, zoology, geology; a social science such as anthropology, sociology, or economics; or a mathematical area such as statistics, mathematics, or systems analysis; an engineering area; or environmental science. Students are advised to develop a broad undergraduate science major with

as many as possible of the following courses: calculus; computer science; general physics; analytical, organic, and physical chemistry; general botany and zoology; geology; anthropology; sociology; invertebrate zoology or paleontology; general ecology; physiology; and statistics. Application for admission and graduate appointments accompanied by credentials and Graduate Record Examination scores should be submitted by January 1.

Degree Requirements

Doctor of Philosophy

The Ph.D. program for a student will be supervised by a faculty advisory committee drawn from the graduate faculty in ecology and may include faculty from N.C. State University or Duke University. The requirements for the major for the Ph.D. degree are determined by the student's advisory committee and normally will include the following: (a) at least two courses or equivalent training in each of the three core areas listed below. Recommended courses are indicated. Substitutions from other campuses of the Research Triangle may be arranged by petition; (b) two approved research skill courses selected from a current list; (c) two semesters registration in the Ecology seminar (ECOL 201). A supervised learning experience approved by the student's advisory committee in at least three environments appropriate to the student's interests is also recommended. Courses, research expeditions, oceanographic cruises, and extended field trips are examples of organized work in which guidance and instruction is given. Students attending OTS should register for ECOL 202. Requirements for the dissertation, written and oral examinations, admission to candidacy, residence, and final examinations are as provided in the regulations for the Graduate School. Foreign language competence is at the discretion of the student's advisory committee. A semester of teaching experience equivalent to six laboratory contact hours per week is also required.

Master of Arts

The Master of Arts degree program is similar to the doctoral program except that (a) two of the three core areas must be represented in the graduate major, (b) one skill course must be elected, (c) one semester registration is required in the Ecology seminar (ECOL 201), and (d) an organized learning experience is recommended in one environment other than those in the immediate Chapel Hill area. Requirements for the thesis, admission to candidacy, residence, and final examinations are provided in the regulations of the Graduate School.

Master of Science

Requirements for the Master of Science are the same as those for the Master of Arts except a Master of Science paper is prepared (ECOL 203) in place of the Master of Arts thesis and one semester's registration of field work is recommended (ECOL 202).

Minor in Ecology

Graduate majors in other programs who wish to declare an Ecology minor may do so by taking ECOL 201 and additional approved ecology courses necessary to the requirements of the Graduate School. A member of the faculty of the Ecology Curriculum appointed by the Chairman of the Curriculum must be represented on the student's advisory committee.

Ecology Core Areas

(Detailed descriptions will be found under the department which offers each course.)

BIOSCIENCE

Behavior and Physiology: Botn 105, Botn 223, Zool 120, Zool 150, Zool 151

Population Biology: Botn 243, Zool 116, Zool 186

Community and Systems: Botn 143, Botn 235, Botn 243, Envr 235, Zool 185

SOCIOSCIENCE

Cities and Migration: Anth 167, Geog 151, Plan 111, Soci 168, Soci 287

Human Population Dynamics: Anth 255, Bios 170, Econ 165, Geog 150, Soci 186

Social and Cultural Organization: Anth 117, Anth 122, Anth 139, Plan 233, Soci 118, Soci 218A

GEOSCIENCE

Atmospheric: Envr 249, Geog 110, Geog 112, Geog 115

Terrestrial: Geog 117, Geog 122

Aquatic: Envr 132, Envr 134, Envr 232, Geol 172, Masc 104, Masc 122, Plan 234, Zool 126

Courses in the Ecology Curriculum

- 201 SEMINAR IN ECOLOGY (2). Topics and problems in ecological research. May be taken more than once. *Two hours a week.* Staff.
- 202 FIELD EXPERIENCE IN ECOLOGY (2). Organized field work in remote environments with a faculty instructor as approved by student's supervisory committee. May be taken more than once. Staff.
- 203 MASTER OF SCIENCE PAPER (3). *Fall or spring.* Staff.
- 250 SPECIAL TOPICS IN ECOLOGY (2-4). Prerequisite, permission of instructor. *Fall and spring.* Staff.
- 300 RESEARCH IN ECOLOGY (2 or more). *Fall or spring.* Staff.
- 393 MASTER OF ARTS THESIS (3-6). *Fall or spring.* Staff.
- 394 DOCTORAL DISSERTATION (3 or more). *Fall or spring.* Staff.
- 400 GENERAL REGISTRATION (0).

Ecological courses in other departments that are considered appropriate for the major in the Ecology Curriculum:

Anthropology

- 117 Evolutionary Perspectives of Human Adaptation and Behavior (3). *Fall*. Winterhalder.
- 139 Environmental Anthropology (3). *Fall*. Yarnell.
- 165 Economic Anthropology (3). *Spring*. Staff.
- 167 Urban Anthropology (3). *Spring*. Gulick.
- 255 Seminar in Cultural Ecology and Population (3). *Spring*. Staff.
- 266 Seminar in Ethnobotany (3). *Spring*. Yarnell.

Biomedical Engineering and Mathematics

- 131 Introduction to Biomathematics (3). *Fall*. Lucas.
- 211 Biological Control Systems (3). *Spring*. Coulter.

Biostatistics

- 170 Demographic Techniques I (3). *Fall*. Staff.
- 271 Demographic Techniques II (3). *Spring*. Suchindran.
- 277 Mathematical Models in Demography (3). *Spring*. Suchindran.

Botany

- 105 Plant Physiology (4). *Spring*. Scott, Matthyse.
- 142 Plant Ecology (4). *Fall*. Peet.
- 143 Ecological Plant Geography (3). *Spring*. Peet.
- 231 Principles of Taxonomy (5). *Spring*. Radford.
- 232 Variation and Evolution in Plants (5). *Fall*. Bell.
- 235 Plant Ecosystematics (5). *Fall*. Radford.
- 243 Population and Community Ecology (3). *Spring*. Peet.
- 245 Ecology of Phytoplankton (Envr 235) (4). *Fall*. Kuenzler.
- 348 Ecology Seminar (1). *Fall or spring*. Staff.

City and Regional Planning

- 140 Natural Resources and Environmental Systems in Urban Areas (3). *Fall*. Moreau.
- 181 Renewable Energy Systems (3). *Spring*. Hill.
- 219 Environmental Systems Analysis (3). *Fall*. Moreau.
- 233 Natural Resource Law and Policy (Envr 283) (3). *Fall, spring*. Heath, Campbell.
- 234 Planning of Water Resource Systems (Envr 284) (3). *Fall*. Hill.
- 235 Land Use Planning (3). *Spring*. Kaiser.

Economics

- 111 Resource and Environmental Economics (3). *Fall, spring*. Smith.
- 165 Economics of Population (3). *Fall*. Turchi.
- 265 Economics and Population (3). *Spring*. Turchi.

Environmental Sciences and Engineering

- 132 Limnology and Water Pollution (3). *Fall and spring*. Weiss.
- 137 Ecology of Wetlands (6). *Summer*. Kuenzler, Frankenber.
- 211 Environmental Management (3). *Summer*. Shiffman.
- 215 Environmental Assessment (2). *Spring*. Shiffman, Weiss.
- 217 Systems Analysis in Environmental Planning (3). *Fall*. Sherwani.
- 218 Environmental Systems I: Deterministic Models (3). *Spring*. Sherwani.
- 219 Environmental Systems Analysis (3). *Fall*. Moreau.
- 232 Special Topics in Aquatic Biology (2). *Spring*. Kuenzler, Weiss, Sobsey.
- 233 Microbial Ecology (4). *Fall*. Pfaender.
- 246 Biological effects of Air Pollution (3). *Spring*. Fox.
- 253 Environmental Policy Analysis (3). *Spring*. Andrews.

Epidemiology

- 160 Principles of Epidemiology (2). *Fall*. Staff.
- 161 Epidemiology in Population Dynamics and Family Planning Programs (1). *Fall*. Staff.

Geography

- 110 Meteorology (3). *Fall*. Robinson.
- 112 Micrometeorology (3). *Spring*. Robinson.
- 115 Climatology (3). *Fall*. Kopec, Robinson.
- 117 Soils (3). *Spring*. Robinson.
- 132 The World's Food Supply (3). *Fall*. Hawley.
- 150 Population Geography (3). *Spring*. Florin, Birdsall.
- 156 Natural Resources (3). *Fall*. Basile.
- 171 Cartography (3). *Fall and spring*. Kopec.
- 178 Aerial Photo Interpretation (3). *Fall*. Hawley.

Sociology

- 118 Social Organization in Ecological Perspective (3). *Fall*. Staff.
- 186 Population (3). *Fall*. Staff.
- 212 Demography I (3). *Fall*. Staff.
- 213 Demography II (3). *Spring*. Staff.
- 218A Human Ecology (2). *Spring*. Kasarda.
- 218B Seminar on Human Ecology (1). *Fall*. Kasarda.
- 287 Migration and Population Distribution (3). *Spring*. Staff.

Zoology

- 109 Introduction to Hydrobiology (4). *Spring*. Jenner.
- 116 Population Biology (3). *Fall*. White.
- 120 Comparative Physiology (3). *Fall*. Hagadorn.
- 126 Oceanography (3). *Fall*. Staff.
- 140 Biological Oceanography (4). Staff.
- 141S Special Problems in Marine Biology (6). *Summer*. Institute of Marine Sciences. Staff.
- 146 Marine Ecology (3). *Spring*. Rieger, Peterson.
- 150 Animal Societies and Communication (3). *Fall*. Wiley.
- 150L Animal Societies and Communication Laboratory (3). *Fall*. Wiley.

- 151 Behavioral Ecology (3). *Spring*. Mueller.
- 158 Evolutionary Patterns (3). *Spring*. Hairston.
- 185 Population Ecology (3). *Yearly*. Stiven and White.
- 185L Laboratory Population Ecology (2). *Yearly*. Stiven and White.
- 186 Systems Ecology (3). *Yearly*. Reice.
- 186L Systems Ecology Laboratory (2). *Yearly*. Reice.
- 213 Advanced Marine Ecology (3). *Spring*. Jenner.
- 255 Seminar in Ecology (2). Hairston, Reice, Stiven, White.
- 257 Seminar in Evolutionary Biology (2). Feduccia.
- 259 Seminar in Comparative Animal Behavior (2). Mueller, Wiley.
- 265 Seminar in Marine Biology (2). Jenner, Rieger.

DEPARTMENT OF ECONOMICS

JAMES L. MURPHY, *Chairman*

Professors

ARTHUR BENAVIDE	(3)	Macroeconomic Theory
ROBERT E. GALLMAN	(8)	Economic History
JAMES C. INGRAM	(10)	International Economics, Economic Development
MAURICE W. LEE	(3)	Macroeconomics, Social Responsibility of Business
C.A. KNOX LOVELL	(18)	Microeconomic Theory
DAVID MCFARLAND	(19)	Industrial Organization
JAMES L. MURPHY	(21)	Econometrics
R. WILLIAM PFOUTS	(23)	Economic Theory
V. KERRY SMITH	(20)	Resource Economics
VINCENT J. TARASCIO	(30)	History of Economic Thought
ROGER N. WAUD	(32)	Macroeconomic Theory, Monetary Theory

Associate Professors

JOHN S. AKIN	(1)	Public Finance, Human Resources
DENNIS R. APPELYARD	(2)	International Economics, Economic Development
ALFRED J. FIELD	(6)	Economic Development, International Economics
RICHARD T. FROYEN	(7)	Macroeconomics, Monetary Policy
DAVID K. GUILKEY	(39)	Econometrics
THOMAS J. KNIESNER	(13)	Labor Economics
THOMAS J. ORSAGH	(22)	Economic History, Economics of Crime
SOLOMON W. POLACHEK	(25)	Human Capital
STEVE S. ROSEFIELDE	(26)	Comparative Economic Systems
JOHN F. STEWART	(36)	Industrial Organization
BOONE A. TURCHI	(31)	Demography
KENNETH L. WERTZ	(33)	Applied Microeconomics
JAMES A. WILDE	(34)	Public Finance
ANN D. WITTE	(35)	Applied Microeconomics, Urban Economics

Assistant Professors

CATHY L. MCHUGH	(47)	Economic History
THOMAS P. O'TOOLE	(44)	International Economics
MICHAEL K. SALEMI	(38)	Macroeconomics, Monetary Economics
HELEN V. TAUCHEN	(40)	Transportation Economics, Mathematical Economics
DONALD M. WALDMAN	(42)	Econometrics, Industrial Organization

Emeritus Professors

JAMES C. D. BLAINE
DUDLEY J. COWDEN
PAUL N. GUTHRIE
CLARENCE HEER
CLIFTON H. KREPS
HENRY A. LATANÉ
OLIN T. MOUZON
CORYDON P. SPRUILL

The Department of Economics offers programs leading to the degrees of Master of Arts and Doctor of Philosophy. The Department of Economics is located adjacent to the School of Business Administration in a separate quadrangle of the University campus, in four buildings originally designed especially for their joint use.

The two-million-volume Wilson Library includes substantial collections in economics, for both research and instructional purposes. The Business Administration and Social Sciences Division of the Wilson Library is organized to serve the library needs of students and faculty of the Department of Economics and School of Business Administration. This Division contains over 550 current scholarly, trade, and other journals in economics and business, as well as a selected collection of important books, plus important business services. The Wilson Library is a depository of the publications of the federal government and the United Nations. These collections, along with the unique collection of state publications, constitute basic research materials of special value of economics. Through mutual cooperative arrangements, the collections of the Duke University Library are also available to faculty and graduate students in the Department of Economics.

In collaboration with the Southern Economic Association, The University of North Carolina at Chapel Hill publishes *The Southern Economic Journal*, one of the leading professional journals in the field. Articles are published in all areas of economics.

Master of Arts

The Master of Arts program requires one course in microeconomics, one course in macroeconomics, one course in statistics or econometrics, two courses in a major area, and three electives. All courses are to be selected in consultation with and with the approval of the Director of Graduate Studies. No more than four courses below the 200 level may be selected. In addition to coursework, the 30 credit-hour program includes a master's thesis.

Doctor of Philosophy

Students seeking the doctorate in Economics must offer a minimum of 16 courses distributed as follows:

The Fundamentals of Economics. The following seven courses or their equivalent are required: Economics 200, 201, 202, 203, 235, 251, and 271.

The Areas of Concentration. The student must select a major and minor area of concentration from among the following fields:

Comparative Economic Systems	International Economics
Econometrics	Monetary and Financial Economics
Economic Development	Labor Economics
Economic History	Mathematical Economics
Economic Theory	Population Economics
History of Economic Thought	Public Finance
Industrial Organization	

At least three courses must be taken in the major field of concentration and two courses in the minor field.

Supporting Courses. The remaining courses will be supporting courses chosen by the student in consultation with the Director of Graduate Studies in Economics. The courses should be chosen to give greater background and scope to the areas of concentration and may be selected from within the Department of Economics as well as from other departments in the University.

Experience in Research and Teaching. As part of the requirements for the degree each candidate is expected to perform two semesters of service in teaching and research.

Foreign Languages—Research Skill. Additionally, the candidate must either demonstrate competence in one foreign language or fulfill a research skill requirement. The research skill may be chosen from among mathematics, statistics, or computer science. The skill requirement is satisfied by successful completion of two courses approved by the Director of Graduate Studies in Economics.

Fellowships and Assistantships

Teaching and non-teaching fellowships and a number of assistantships and instructorships are available to graduate students in economics. Detailed information regarding these fellowships, assistantships and instructorships may be obtained from the Director of Graduate Studies in Economics.

Courses for Graduates and Advanced Undergraduates

Note: *Economics 10, or equivalent, with grade of C or better, is a prerequisite to all courses in Economics listed below.*

- 100 MICROECONOMICS: THEORY AND APPLICATIONS (3). Analysis of the ways in which consumers and business firms interact in a market economy. *Fall and spring.* Staff.
- 101 INTERMEDIATE THEORY: PRICE AND DISTRIBUTION (3). Prerequisites, Economics 10 and Mathematics 22 or equivalent. The determination of prices and the distribution of income in a market system. *Fall and spring.* Staff.
- 111 RESOURCE AND ENVIRONMENTAL ECONOMICS (3). Prerequisite, Economics 100 or 101 or permission of the instructor. Overview of the economic theory and analytical tools involved in understanding environmental and resource problems. Focus on economic issues involved in: air and water pollution; natural environments; exhaustible resources and energy. *Fall and spring.* Smith.
- 120 LOCATION AND SPACE ECONOMY (City and Regional Planning 176) (3). Prerequisite, Economics 100 or 101 or permission of the instructor. The course is designed to provide the student with an understanding of the effects of space on economic and social activity. *Fall.* Witte.
- 122 URBAN ECONOMICS (3). Prerequisite, Economics 100 or 101 or permission of the instructor. The course will explore the urban problems facing us today: unorganized growth, disparate land uses, fiscal crisis, and ghetto, poverty, employment, housing transportation inadequacies and crime. *Fall or spring.* Akin, Witte.
- 130 MONEY, THE FINANCIAL SYSTEM, AND THE ECONOMY (3). Analysis of the role of money in the economy, its creation and management, institutional setting, policy implications, and interrelationships with other variables in determining the level of economic activity. *Fall and spring.* Staff.
- 132 INTERMEDIATE THEORY: MONEY, INCOME AND EMPLOYMENT (3). An introduction to contemporary macroeconomic concepts and analysis. Topics include the level, fluctuations, and growth of national income, and monetary and fiscal policies designed to achieve economic goals. *Fall and spring.* Staff.
- 135 ECONOMIC HISTORY OF THE UNITED STATES (3). Main features of the American economy: colonial times to the present. *Fall and spring.* Gallman, McHugh, Orsagh.
- 137 REVISIONIST ECONOMIC HISTORY (3). A critical evaluation of recent controversies in economic history, concentrating on methods but attending as well to the main re-interpretations offered by economics historians. *Spring.* Gallman, Orsagh.
- 138 ECONOMIC DEVELOPMENT OF THE UNITED STATES (3). Prerequisites, Economics 101 and 132. Students may receive credit for either Economics 135 or Economics 138 but not for both. This course parallels Economics 135 but is designed for students with a higher level of theoretical preparation. Gallman, Orsagh.
- 140 INTRODUCTION TO PUBLIC FINANCE (Political Science 191) (3). Principles and practices of the budgetary activities of American governments—federal, state, and local. Students may not receive credit for both Econ 140 and 141. Akin, Wertz, Wilde.
- 141 ANALYSIS OF PUBLIC FINANCE (3). Prerequisite, Economics 100 or 101. Application of economic analysis to the taxing and spending functions of government. Students may not receive credit for both Econ 140 and 141. *Fall and spring.* Akin, Wertz, Wilde.
- 142 ADVANCED TOPICS IN PUBLIC FINANCE (3). Prerequisite, Economics 140 or 141. Selected topics in taxation, public expenditures and governmental transfer programs. *Fall.* Akin, Wertz, Wilde.

- 145 PUBLIC POLICY TOWARD BUSINESS (3). Prerequisite, Economics 100. Industry structure and its relation to performance; market imperfections; description and analysis of antitrust and regulation. Students may not receive credit for both Econ 145 and 147. *Fall*. McFarland, Stewart, Waldman.
- 147 INDUSTRIAL ORGANIZATION (3). Prerequisite, Economics 101. Theoretical and empirical development of structure-conduct-performance relationships in the industrial sector; description and analysis of U.S. industry. Students may not receive credit for both Econ 145 and 147. McFarland, Stewart, Waldman.
- 148 ADVANCED TOPICS IN INDUSTRIAL ORGANIZATION AND SOCIAL CONTROL (3). Prerequisite, Economics 145 or 147. Theory of market failure and its relationship to antitrust and regulatory policy; exploration of empirical literature of industrial organization; current issues in social control. McFarland, Stewart, Waldman.
- 150 INTRODUCTION TO HEALTH ECONOMICS (3). Prerequisite, Economics 100 or 101. An economic analysis of the production and distribution of health care. *Spring*. Staff.
- 151 TRANSPORTATION ECONOMICS (3). Application of economic principles to transportation topics such as pricing and regulation, the public provision of transport services, the relationship between transport cost and location. *Fall or spring*. Tauchen.
- 158 HEALTH ECONOMICS: PROBLEMS AND POLICY (3). Economic analysis applied to problems and public policy in health care. *Fall*. Staff.
- 159 HISTORY OF ECONOMIC DOCTRINES (3). A survey of the fundamental forms of economic thought from the scholastics through Keynes. *Fall or spring*. McFarland, Tarascio.
- 161 INTERNATIONAL ECONOMICS (3). Prerequisite, Economics 100 or 101. An introduction to international trade, the balance of payments, and related issues of foreign economic policy. *Fall and spring*. Appleyard, Field, Ingram, O'Toole.
- 162 TOPICS IN INTERNATIONAL ECONOMICS (3). Prerequisite, Economics 161. Analysis and interpretation of selected problems and policy issues. Content varies, but attention is given to such topics as trade barriers, trade patterns, floating exchange rates, and international monetary policy. Appleyard, Field, Ingram, O'Toole.
- 163 ECONOMIC DEVELOPMENT (3). Prerequisite, Economics 100 or 101 or permission of instructor. An introduction to the economic characteristics and problems of the less developed countries and to theories and policies applicable to the developing economy. *Fall and spring*. Appleyard, Field, Ingram.
- 165 ECONOMICS OF POPULATION (3). Analysis of economic-demographic interrelations including demographic analysis, population and economic growth and development, economic models of fertility and migration, and population policy. *Fall*. Turchi.
- 166 CRIME AND CRIMINAL JUSTICE: AN ECONOMIC APPROACH (3). Prerequisite, Economics 10 or permission of the instructor. The application of economic theory and methodology to the determination of criminal behavior and the societal response to that behavior. *Spring*. Orsagh.
- 167 CRIME AND MICROECONOMIC DECISION-MAKING (3). Criminal victimization of business firms and public agencies. Optimizing behavior: theory and practice for private business firms and criminal justice system. Emphasizes application of theory to real-world situations. *Fall*. Orsagh.
- 168 THE SOVIET ECONOMY: PLANNING AND SOCIALISM (3). The institutional structure of the Soviet economy, its socialist character and evolution, analysis of Soviet planning practice, the Soviet growth achievement, comparative U.S.-Soviet performance and current reforms. *Spring*. Rosefield.

- 170 ECONOMIC APPLICATIONS OF STATISTICAL ANALYSIS (3). Prerequisite, Economics 70 or equivalent. Statistical methods in the construction, estimation, testing, and application of linear economic models; computer programs and interpretation of their output in empirical analysis of common economic theories. *Spring*. Guilkey, Murphy, Witte.
- 181 TOPICS IN MICROECONOMIC THEORY (3). Prerequisite, Economics 100 or 101. A treatment of topics in microeconomic theory not normally covered in Economics 100 or Economics 101. Staff.
- 182 TOPICS IN MACROECONOMIC THEORY (3). Prerequisite, Economics 130 or 132. This course will emphasize theoretical and empirical topics such as growth, labor search, Phillips curves, stagflation, and optimal government policy. Staff.
- 185 ECONOMIC FLUCTUATIONS (3). An overview of economic stabilization efforts in a fluctuating economy. Interaction between stabilization policies, the economy and its financial institutions. An applied macroeconomics course. *Fall*. M. W. Lee.
- 188 MICROECONOMIC THEORY (3). Prerequisite, graduate standing in Business Administration or permission of the instructor. Utility and demand theory of the firm; perfect and imperfect competition; applications and welfare economics. *Spring*. Staff.
- 189 MACROECONOMIC THEORY (3). Prerequisite, graduate standing in Business Administration or permission of the instructor. Determination of national income, interest rates, and the price level. *Fall*. Froyen.
- 190 LABOR AND INDUSTRIAL RELATIONS I (3). Prerequisite, Economics 100. An analysis of the determination of wages, employment, unemployment, and inflation with special attention given to the role of unions. Students may not receive credit for both Econ 190 and 194. Kniesner, Polachek.
- 192 LABOR AND INDUSTRIAL RELATIONS II (3). Prerequisites, Economics 100 and 190. An economic analysis of working conditions including such topics as the pay package, job satisfaction, workplace, health and safety, promotions, grievances, employment stability, pensions, and mandatory retirement. Students may not receive credit for both Econ 192 and 195. *Spring*. Kniesner, Polachek.
- 193 HISTORY OF THE LABOR MOVEMENT (3). A history of the labor movement in the United States, with special reference to its economic significance. *Fall*. Gallman.
- 194 LABOR ECONOMICS (3). Prerequisite, Economics 101. An introduction to the field of labor economics with emphasis on how the interactions between firms and workers influence wages, employment, unemployment, and inflation. Students may not receive credit for both Econ 194 and 190. *Fall and spring*. Kniesner, Polachek.
- 195 TOPICS IN LABOR ECONOMICS (3). Prerequisite, Economics 192 or 194. A theoretical and empirical analysis of current social problems involving individuals and their jobs. Included are such topics as poverty, discrimination, and working conditions. Students may not receive credit for both Econ 195 and 192. *Fall*. Kniesner, Polachek.
- 199 SEMINAR IN ECONOMICS (3). Detailed examination of selected problems in economics and a critical analysis of pertinent theories. *Fall and spring*. Staff.

Courses for Graduates

Graduate standing in Economics or permission of the Director of Graduate Studies in Economics is required for all courses numbered 200 or above.

- 200 ADVANCED MICROECONOMIC THEORY I (3). Prerequisite, Economics 131 for equivalent. Theory of utility and demand; brief review of perfect competition; theories of imperfect competition. *Fall*. Lovell, Pfouts, Wertz.

- 201 ADVANCED MICROECONOMIC THEORY II (3). Prerequisite, Economics 200 or equivalent. Advanced theory of utility and demand; continuation of imperfect competition; brief treatment of methodology, of input-output methods and of welfare economics. *Spring*. Lovell, Pfouts, Wertz.
- 202 ADVANCED MACROECONOMIC THEORY I (3). Prerequisite, Economics 132 or equivalent. Keynesian and Classical equilibrium models; the neo-Keynesian synthesis; monetarist and other alternative analytic frameworks. *Spring*. Froyen, Salemi, Waud.
- 203 ADVANCED MACROECONOMIC THEORY II (3). Prerequisite, Economics 202 or equivalent. Growth models, general equilibrium approach to monetary theory; input-output; disequilibrium theory; extensions of Keynesian and classical models. *Fall*. Benavie, Salemi, Waud.
- 207 GENERAL ECONOMIC THEORY (3). Prerequisite, graduate standing in a department other than Economics. Theory of demand, production, market structures and economic welfare, national income accounts and theory of national income determination, unemployment, inflation. *Spring*. Staff.
- 210 BASIC QUANTITATIVE TECHNIQUES (3). Topics from linear algebra, calculus, linear and nonlinear programming, and the theory of difference and differential equations with applications to economics. *Fall*. Lovell.
- 223 MATHEMATICAL ECONOMICS I (3). Prerequisite, Economics 210 or equivalent. Basic concepts of mathematical economics. Linear equations and inequalities; quadratic forms; differential calculus; convex sets and functions; constrained maxima. Activity analysis, consumption and production. *Fall*. Tauchen.
- 224 MATHEMATICAL ECONOMICS II (3). Prerequisite, Economics 223. Mathematical investigation of economic concepts and models. *Spring*. Staff.
- 227 ADVANCED OPTIMIZATION TECHNIQUES IN ECONOMIC MODELS (3). Prerequisite, Economics 210 or equivalent. Convex programming, duality theory, control theory, and other optimization procedures applied to economic models. *Spring*. Staff.
- 235 GENERAL ECONOMIC HISTORY (3). Pre-industrial societies, early stages of industrial growth, and growth of the world economy in the nineteenth century. *Fall*. Gallman, McHugh, Orsagh.
- 236 MODERN ECONOMIC HISTORY (3). Prerequisite, Economics 235 or permission of the professor. Economic change in modern Western societies. Comparative study of growth in Europe and North America. *Spring*. Gallman, McHugh, Orsagh.
- 240 ADVANCED PUBLIC FINANCE: EXPENDITURE (3). Analysis of market failure and reasons for public spending, cost-benefit analysis and program budgeting, public decision-making, redistribution and fiscal equity, intergovernmental transfers. *Spring*. Akin, Wertz, Wilde.
- 241 ADVANCED PUBLIC FINANCE: REVENUES (3). Prerequisite, Economics 240 or permission of instructor. Criteria for judging tax structures, incidence and impact of taxation, user charges and debt finance, intergovernmental coordination, and macroeconomic effects. *Fall*. Akin, Wertz, Wilde.
- 242 URBAN AND SPATIAL ECONOMICS (3). Prerequisite, permission of the instructor. The economics of space and location plus selected topics in urban problems. There will be an emphasis on the public sector and public policy in the problem portion of the course. *Fall or spring*. Akin, Witte.
- 245 ADVANCED BUSINESS ORGANIZATION AND SOCIAL CONTROL (3). Prerequisite, permission of the professor. Extensive readings in the literature are required. Emphasis is placed upon the role of economic analysis in dealing with problems in this field. (Alternate years.) *Spring*. McFarland, Stewart.

- 246 TRANSPORTATION PROBLEMS AND POLICIES (3). A course designed to develop an understanding of the major problems affecting the American transportation system and of the need to formulate effective transportation policies. *Fall*. Tauchen.
- 247 DYNAMICS OF TRANSPORTATION (3). Prerequisite, permission of the professor. The role of transportation in providing mobility in developing mature economies. *Spring*. Tauchen.
- 248 ECONOMIC REGULATION OF INDUSTRY (3). Economic regulation in theory and practice. Principles of optimal regulation are developed, and regulatory performance in various industries is appraised. *Fall*. Stewart.
- 250 HEALTH ECONOMICS (3). Prerequisite, equivalent of Economic 188. Demand analysis, manpower planning and location models, health indexes, production functions, health and the labor force, the structure of the health services market, hospitals and the non-profit firm, and cost-benefit analysis. *Spring*. Staff.
- 251 HISTORY OF ECONOMIC THOUGHT I (3). A survey of the development of economic thought from the seventeenth century to the present, with particular emphasis on doctrines reflected in modern economic theory. *Spring*. Tarascio.
- 252 HISTORY OF ECONOMIC THOUGHT II (3). A study of economic doctrines from the nineteenth century to the present in a methodological perspective. *Fall*. Tarascio.
- 253 SOCIALIST ECONOMIC THOUGHT IN HISTORICAL PERSPECTIVE (3). A systematic study of the development of socialist economic theory from Owen to Cohn-Bendit, emphasizing Marx, Russian Marxism, and contemporary Marxist economic theory. *Spring*. Rosefield.
- 261 THEORY OF INTERNATIONAL TRADE (3). Prerequisite, graduate standing in economics or permission of the instructor. The theory of international values; comparative advantage and the gains from trade; commercial policy. *Fall or spring*. Appleyard, Ingram.
- 262 INTERNATIONAL MONETARY ECONOMICS (3). Prerequisite, graduate standing in economics or permission of the instructor. Analysis of the international monetary system; exchange rates; the process of adjustment in the balance of payments. *Fall or spring*. Ingram, O'Toole.
- 263 ECONOMIC DEVELOPMENT: THEORY AND POLICY (3). Prerequisite, permission of the instructor. Intensive study of the development processes and problems of the less developed countries, with emphasis upon theories of growth and development, internal and external policies, and planning strategies. *Fall or spring*. Field.
- 264 SELECTED TOPICS IN ECONOMIC DEVELOPMENT AND DEVELOPMENT PLANNING (3). Prerequisite, Economics 263 or equivalent. Examination of various topics in economic development of the less developed countries, with special emphasis on the role of development planning. *Fall or spring*. Field.
- 265 ECONOMICS AND POPULATION (3). Prerequisite, graduate standing in economics or permission of the instructor. Analysis of economic-demographic interrelationships including: population and economic development; population, environmental decay and zero-population-growth; models of fertility, migration, and spatial organization; population policy. *Spring*. Turchi.
- 267 COMPARATIVE ECONOMIC SYSTEMS (3). This course focuses on alternative theories of U.S. capitalism, French indicative planning, Yugoslavian worker managed, market socialism, Soviet central planning, and the Chinese worker controlled decentralized planning model. *Fall*. Rosefield.
- 271 FUNDAMENTALS OF STATISTICAL THEORY (3). Prerequisites, Economics 70 and 175 or equivalent. Review of probability theory; estimation; tests of hypotheses; regression and analysis of variance. Emphasis is on economic data and applications. *Fall*. Guilkey, Murphy, Waldman.

- 272 **ECONOMETRICS (3)**. Prerequisite, Economics 271 or equivalent. One semester coverage of basic econometrics. Topics include: regression under ideal and non-ideal conditions; special models, including simultaneous equations models, and applications and econometric computer programs. *Spring*. Guilkey, Murphy.
- 273 **ADVANCED ECONOMETRICS I (3)**. Prerequisites, Economics 271 and Mathematics 147 or equivalent. Economics 273 or 274 constitute a two-semester coverage of econometrics with some theoretical emphasis, 273 covers mainly single equation estimation and related problems. *Fall*. Guilkey, Murphy, Waldman.
- 274 **ADVANCED ECONOMETRICS II (3)**. Prerequisite, Economics 273. A continuation of Economics 273, covering identification and estimation in simultaneous equations, and special topics. *Spring*. Guilkey, Murphy, Waldman.
- 281 **MONETARY THEORY (3)**. Examination of theory and evidence on money demand, money supply, and portfolio analysis. Barter versus monetary economics, portfolio school, monetarism, monetary theories of interest rate determination. *Fall*. Froyen, Waud.
- 282 **MONETARY POLICY (3)**. Prerequisite, Economics 202 or permission of the instructor. Optimal policy under uncertainty, financial intermediation and monetary control, channels of monetary influence, monetary policy and inflation, rules versus authority. *Spring*. Froyen, Waud.
- 285 **ANALYSIS OF ECONOMIC FLUCTUATIONS (3)**. Nature of economic fluctuations. Business cycle theory. Economic stabilization and growth. *Spring*. Froyen.
- 288 **MANAGERIAL ECONOMICS (3)**. Prerequisite, graduate standing in the MBA program. The price system, competitive equilibrium and imperfect competition. *Fall*. Staff.
- 289 **STABILIZATION AND ECONOMIC GROWTH (3)**. Prerequisite, graduate standing in the MBA program. The macrostructure and operation of the aggregate system; emphasis on the growth and economic fluctuations. Consideration of stabilization problems, domestic and international; macroeconomic forecasting. *Spring*. Lee, Wilde.
- 291 **LABOR ECONOMICS I (3)**. Prerequisite, Economics 200 or permission of instructor. An analysis of the short and long run aspects of supply and demand of labor including empirical analysis contrasting the labor force behavior of males, females, blacks, and whites. Topics include the microeconomic effects of marriage, fertility, and mobility on labor supply, as well as the macroeconomic effects of unemployment on inflation. *Fall or spring*. Kneisner.
- 292 **LABOR-MANAGEMENT RELATIONS (Business Administration 292) (3)**. An advanced study of the procedure, subject matter and legal framework of collective bargaining. *Spring*. Staff.
- 294 **LABOR ECONOMICS II (3)**. Life cycle analysis of supply and demand for labor as a determinant of individual wages. Topics include an analysis of discrimination, union power, and governmental manpower policies on the distribution of earnings across the population. *Fall or spring*. Polachek.
- 300 **SEMINAR IN ECONOMICS THEORY I (3)**. Prerequisites, Economics 201 and 202. Seminar study of advanced topics in economic theory. *Spring*. Lovell, Pfouts.
- 301 **SEMINAR IN ECONOMIC THEORY II (3)**. Prerequisite, Economics 300 or permission of the professor. Seminar of advanced topics in economic theory. *Fall*. Benavie, Waud.
- 304 **SEMINAR IN MATHEMATICAL ECONOMICS (3)**. Prerequisite, permission of the instructor. Advanced topics in mathematical and quantitative economics. *Spring*. Staff.
- 335 **SEMINAR IN ECONOMIC HISTORY (9)**. Relation of economic history to economics; history of work in the field. Current problems and techniques of study and research. *Fall or spring*. Gallman, Orsagh.

- 341 RESEARCH IN PUBLIC FINANCE (3). Prerequisite, permission of the professor. Open to qualified graduate students who wish to make intensive studies in particular fields of public finance. Conference hours subject to arrangement. Written reports are normally required. *Fall or spring*. Wilde.
- 351 SEMINAR IN THE HISTORY OF ECONOMIC THOUGHT (3). Prerequisite, permission of the professor. Advanced study of economic analysis beyond the scope of Economics 251 and 252. *Fall or spring*. Tarascio.
- 361 SEMINAR IN INTERNATIONAL ECONOMICS (3). Prerequisite, Economics 262 for equivalent. A directed reading and research course. *Fall or spring*. Appleyard, Ingram, O'Toole.
- 363 SEMINAR IN ECONOMIC DEVELOPMENT (3). Prerequisite, Economics 262 or equivalent. Directed reading and research on selected problems in economic development. *Fall or spring*. Field.
- 365 SEMINAR IN POPULATION (3). Prerequisite, graduate standing in economics. For advanced population students, this course addresses the newest and most advanced economic demography literature. *Fall*. Turchi.
- 371 RESEARCH IN ECONOMIC STATISTICS 93). Prerequisite, permission of the professor. *Spring*. Staff.
- 381 SEMINAR IN MONETARY ECONOMICS (3). Prerequisite, permission of the instructor. Advanced study of theoretical and applied topics in monetary economics. *Fall or spring*. Waud.
- 386 SEMINAR IN PORTFOLIO MANAGEMENT (Business Administration 386) (3). Prerequisite, permission of the professor. Development, testing, and economic effects of models for determining the selection of assets. *Spring*. Latañé.
- 388 SEMINAR IN FINANCIAL MARKETS (Business Administration 388) (3). Prerequisite, permission of the instructor. Intensive study of market characteristics and interrelationships, market price and yield determination, impact of monetary and regulatory policies, and effect of market structure on performance. *Fall or spring*. Carleton.
- 391 SEMINAR IN LABOR (3). Prerequisite, permission of the professor. This course offers mature students an opportunity to carry their investigations of significant matter beyond the limits of the formal course offerings. *Fall or spring*. Polachek.
- 393 MASTER'S THESIS (3 or more). *Fall and spring*. Staff.
- 394 DOCTORAL DISSERTATION (3 or more). *Fall and spring*. Staff.
- 396 SEMINAR IN SOVIET ECONOMICS (3). Prerequisite, permission of the professor. Studies of selected problems of the Soviet economy and related aspects of Soviet economic thought. Seminar members are expected to present reports on assigned research topics. *Fall*. Rosefelde.
- 399 SEMINAR. Prerequisite, permission of the professor. Individual research in a special field under direction of a member of the Department. *Fall and spring*. Staff.
- 400 GENERAL REGISTRATION (0).

SCHOOL OF EDUCATION

WILLIAM C. SELF, *Dean*

Professors

J. HUNTER BALLEW	(070)	Mathematics Education; Curriculum and Instruction
DUANE BROWN	(095)	Elementary School Counseling; Center Development; Behavioral Consultation
RICHARD H. COOP	(120)	Educational Psychology; Cognitive Development; Adolescent Development
BARBARA D. DAY	(140)	Early Childhood Education
JOHN P. GALASSI	(182)	Counseling Psychology; Behavior Therapy; Counseling College Students and Adults
JAMES J. GALLAGHER	(187)	Child Development; the Gifted Child; Public Policy in Education
R. STERLING HENNIS, JR.	(220)	English Education; Curriculum and Instruction
SAMUEL M. HOLTON	(230)	Foundations of Education; Higher Education
PAUL B. HOUNSHELL	(240)	Science Education; Curriculum and Instruction
DAVID L. LILLIE	(290)	Early Childhood Education; Parent Involvement; Technical Assistance
JAMES L. MORRISON	(335)	Sociology of Higher Education
WILLIAM S. PALMER	(345)	Reading and Language Arts
JAMES L. PAUL	(350)	Emotional Disturbance; Advocacy; Technical Assistance
RICHARD C. PHILLIPS	(390)	Social Studies and Social Foundations
PHILLIP C. SCHLECHTY	(460)	Sociology of Education
WILLIAM C. SELF	(475)	Educational Administration and Supervision
RUNE J. SIMEONSSON	(481)	Social/Cognitive Development; Child Development Research; Psychological Assessment
DONALD J. STEDMAN	(500)	Program Planning and Evaluation; Child Development
DONALD G. TARBET	(530)	Educational Administration and Supervision
NEAL H. TRACY	(560)	Educational Administration and Supervision
WILLIAM B. WARE	(581)	Educational Statistics; Research Design and Analysis
BARBARA H. WASIK	(580)	Behavior Modification; Social, Emotional, and Cognitive Development of Children
KINNARD P. WHITE	(600)	Educational Psychology; Measurement and Evaluation
RONALD D. WIEGERINK	(611)	Educational Administration and Supervision; Special Education

Associate Professors

JOHN C. BRANTLEY	(090)	School Psychology; Interpersonal Perception; Psycho-educational Assessment
WILLIAM I. BURKE	(100)	Curriculum and Instruction
JAMES W. CUNNINGHAM	(123)	Reading and Language Arts
DAVID D. DILL	(142)	Higher Education
JULIO R. GEORGE	(186)	Educational Administration and Supervision
WALLACE H. HANNUM	(417)	Educational Media and Instructional Design; Theories of Instruction
MARY TURNER LANE	(270)	Intermediate Education
JAMES D. MCKINNEY	(315)	School Psychology; Cognitive Development; Exceptional Children
GEORGE W. NOBLIT	(418)	Educational Administration and Supervision
WALTER B. PRYZWANSKY	(410)	School Psychology; Consultation; Learning Disabilities
GILBERT G. RAGLAND	(430)	Special Education Administration; Legal Issues
DWIGHT C. RHYNE	(448)	Adult and Higher Education; Comparative Education
R. NEILL SCOTT	(470)	Educational Psychology; Growth and Development; Sex Education
MARIAN SMALLEGAN	(485)	Adult Education; Population Education
FRANK T. STRITTER	(510)	Adult and Higher Education
GARY B. STUCK	(515)	Educational Psychology; Learning; Evaluation
GERALD UNKS	(570)	Social Foundations of Education
EUGENE R. WATSON	(590)	Adult and Higher Education
RALPH E. WILEMAN, JR.	(620)	Educational Media and Instructional Design
MARVIN D. WYNE	(630)	Deviations in Learning and Development; Classroom Research; Gifted Education

Assistant Professors

RICHARD A. BRICE	(092)	Early Childhood Education
LINDA BROOKS	(427)	Counseling Psychology; Career Development; Sex-Fair Counseling
COURTLAND C. LEE	(416)	Cross-Cultural Counseling; Minority Career Development; Secondary School Counseling
HAZEL LELER	(301)	Parent Education
DIXIE LEE SPIEGEL	(491)	Reading and Language Arts
VALORA WASHINGTON	(578)	Child Development and Psychology; Early Childhood Education; Minority Group Children
JILL F. WHALEY	(414)	Reading and Language Arts
ROBERTA WOOLEVER	(625)	Intermediate Education

Lecturers

JAMES D. CONDIE	(115)	Higher and Adult Education; Student Personnel Services
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| GAYLE W. HYATT | (635) | Mental Retardation |
| TIMOTHY SANFORD | (421) | Institutional Research; Higher Education |
| JOSEPH J. SPARLING | (495) | Child Development |

Adjunct Associate Professor

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|----------------|-------|--|
| JOHN N. PYECHA | (411) | Educational Psychology; Measurement and Evaluation; Management Information Systems |
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Adjunct Assistant Professors

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| LENORE B. BEHAR | (011) | Emotional Disturbance; Prevention; Parent Support Service |
| VIRGINIA J. DICKENS | (143) | Field-Based Education; Learning Disabilities; Curriculum Development |
| MICHAEL D. LOVEN | (634) | Adolescent Development; Community Mental Health; School Psychological Services |
| RALPH D. WENGER | (582) | School Psychology |

Clinical Professors

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|-----------------|-------|--|
| JAMES B. MACHEN | (306) | Educational Psychology |
| ROBERT SAKATA | (452) | Counseling Psychology; Evaluation and Measurement; Rehabilitation Psychology |

Clinical Associate Professors

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| DONALD A. BOULTON | (087) | Student Personnel; Higher Education |
| DALE C. FARRAN | (631) | Social Development; Language Development; Educational Psychology |
| HENRY T. FRIERSON, JR | (170) | Educational Psychology |
| KENNETH G. JENS | (246) | Severely Handicapped; Special Education Administration; Infant and Preschool Education |
| J. GREGORY OLLEY | (117) | Autism; Child Development |
| JOHN W. PELOSI | (370) | Program Evaluation; Human Services |
| PASCAL L. TROHANIS | (565) | Educational Media and Instructional Design |
| J. FRANK YEAGER | (632) | Educational Administration and Supervision; Personnel Management |

Clinical Assistant Professors

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|----------------------|-------|--|
| DONALD B. BAILEY JR. | (419) | Early Childhood; Severely Handicapped; Mainstreaming |
| BETTY C. EPANCHIN | (150) | Emotional Disturbance |
| PAUL F. FENDT | (250) | Adult and Higher Education; Future Studies |
| CHARLES P. FRIEDMAN | (168) | Higher Education; Medical Education |
| THELMA HARMS | (205) | Childhood Education |
| WILLIAM C. MCGAGHIE | (420) | Educational Psychology |
| PATRICIA P. OLMSTED | (413) | Educational Psychology |

ROBERTA I. RUBIN	(449)	Educational Psychology; Applied Behavioral Analysis; Precision Teaching
DANIEL A. SHUGARS	(424)	Educational Psychology
ELLEN S. VASU	(640)	Statistics; Micro Computers; Mathematics Education

Clinical Instructor

BOBBIE B. LUBKER	(300)	Language Development; Speech and Hearing Disorders
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Visiting Assistant Professor

ROSALIND L. HEIKO	(643)	Consultation and Child Abuse
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Visiting Lecturer

JONATHAN P. SHER	(633)	Rural Education and Development; Comparative Education; Public Policy in Education
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Emeritus Professors

NORTON L. BEACH
 CARL F. BROWN
 ROBERTA H. JACKSON
 ANNIE LEE JONES
 ARNOLD K. KING
 H. ARNOLD PERRY
 WILLIAM D. PERRY
 ROY E. SOMMERFELD
 THELMA G. THURSTONE

The School of Education, in keeping with the general goals of The University of North Carolina at Chapel Hill, embraces a three-fold mission of teaching, research and service. With these purposes in mind, the graduate programs of the School are designed to meet the needs of the professional educators who seek to further their knowledge, understanding and skills relating to educational processes. It is recognized that these professionals vary in their career orientations. Some are employed in or wish to become employed in educational institutions and others in agencies and organizations performing non-instructional educational functions.

The research mission involves continuing inquiry into the development of knowledge of the teacher-learning process, human development, the organization of schools and educational agencies and the processes of program development and implementation.

The service mission provides both public and private institutions and agencies with the benefits of research and consultation, thereby enhancing their capabilities to satisfy their educational objectives.

The teaching mission involves the faculty and graduate students in applying the knowledge base in field settings and translating it in course work.

To synthesize these missions, the School of Education endeavors to meet the needs for educational progress and to address educational issues on the State, national and international levels.

Administratively, the Dean, Dr. William C. Self, is assisted by an Associate Dean, Dr. Barbara H. Wasik, who is responsible for academic programs. Organizationally, the School of Education is divided into four divisions. All graduate programs are offered within one of these divisions and responsibilities for graduate degree or certificate programs are described below.

The Division of Curriculum and Instruction, J. Hunter Ballew, Chairperson—Four graduate degree programs are available through the Division of Curriculum and Instruction: the Master of Education the Master of Arts, the Master of Arts in Teaching and the Doctor of Philosophy.

The Master of Education (M.Ed.) is designed for individuals certified in Elementary Education (Early Childhood or Intermediate), Educational Media and Instructional Design, and Reading, and requires a planned sequence of thirty to thirty-six semester hours of graduate credit.

The Master of Arts in Teaching (M.A.T.) is designed for individuals certified in content areas (Art, English, Foreign Languages, Mathematics, Music, Science and Social Studies). This program of studies requires a total of thirty semester hours of graduate credit with a minimum of eighteen semester hours in the student's content specialty and a maximum of twelve hours in Education, with each student's program being planned by the student and the advisor. A few students without prior teacher certification are admitted to the Master of Arts in Teaching program with the provision that they complete the necessary undergraduate certification requirements.

The Doctor of Philosophy program is designed for in-depth concentration in the area of Curriculum and Instruction. The program accommodates individuals with undergraduate and master's degrees in areas from pre-school through college. Each candidate's program is planned cooperatively by the student, the advisor and the doctoral committee and involves course work, internships and research. Three areas in the Ph.D. in Curriculum and Instruction program exist: Curriculum and Instruction Design, Curriculum and Instruction Implementation, Curriculum and Instruction Evaluation.

The Division of Human Development and Psychological Services, Duane Brown, Chairperson—The Division of Human Development and Psycho-

logical Services includes the speciality areas of Counseling Psychology, Educational Psychology and School Psychology leading to the Doctor of Philosophy degree. At the master's level (Master of Education or Master of Arts), there are programs in Educational Psychology (30 semester hours), Counseling (45 semester hours), and School Psychology (60 semester hours). These programs are grouped administratively because of the common foundation in psychology. All doctoral students are required to complete course work in generic psychology, research and evaluation, and in the area of specialty. The programs of Counseling Psychology, Counseling and School Psychology all have required concurrent field experiences. The School of Psychology program holds full accreditation by the American Psychological Association.

The Division of Organizational Development and Institutional Studies, Julio R. George, Chairperson—The Division of Organizational Development and Institutional Studies includes the Master of Education and Master of Arts (M.Ed. and M.A.) programs in Higher and Adult Education (30 semester hours) and Educational Administration and Supervision (30 semester hours), and a two-year graduate certification program in Administration and Supervision. At the doctoral level are programs in Educational Administration and Supervision (Ed.D., Ph.D.), Higher and Adult Education (Ph.D.) and Social Foundations of Education (Ph.D.).

The two-year graduate program in supervision is designed for the candidate to meet North Carolina requirements for the supervisor's certificate at the fifth-year (master's) level and for the advanced certificate at the sixty-year level. The two-year program in administration leads to recommendation for advanced certification in school administration.

The Division of Special Education, James L. Paul, Chairperson—The Division of Special Education offers programs of graduate study leading to the Master of Education, Master of Arts and the Doctor of Philosophy degrees. The master's program requires a minimum of thirty (30) semester hours of graduate study including an internship. An entering student who does not meet the requirements of North Carolina initial level certification as a teacher in special education will be responsible for meeting these prerequisites through coursework and practicum beyond the 30 graduate hours, preferably prior to entry into the program. Students may choose to emphasize study of mild or severe handicapping conditions in different age groups. They are certified in one or more categories of exceptionality including mental retardation, learning disabilities, and emotional disturbance. Internship experiences are designed individually. A student's program of study depends primarily on the student's former training and professional experiences.

The doctoral program includes a sequence of required and elective seminars, research experiences and internships tailored to the particular interest of each student (Research, University Teaching, and Human Services Management).

Advanced Degrees

The School of Education offers programs leading to the following degrees: Master of Arts, Master of Arts in Teaching, Master of Education, Doctor of Education, and Doctor of Philosophy. The requirements for the degree of Master of Arts and Doctor of Philosophy in all departments in the University are discussed elsewhere in this catalogue. The specific requirements for the professional degrees offered by the School of Education are described in the catalog of the School of Education and in the handbook materials. For additional information concerning the graduate programs, address inquiries to the appropriate division in the School of Education.

Course Offering

The School of Education is a member of the American Association of Colleges for Teacher Education. All graduate degree programs for the preparation of public school personnel have been approved by the National Council for Accreditation of Teacher Education.

Course offerings are categorized by content areas. Courses numbered 100 to 199 are open to qualified advanced undergraduate students and to graduate students. Courses numbered 200 and above are open only to graduate students.

Many of the graduate courses in education are available in one or both of the two terms of the summer session. See the catalogue of the Summer Session for details.

Curriculum and Instruction

- EDCI AUDIO VISUAL INSTRUCTION: TECHNIQUES AND MATERIALS (3). Pre-111 sends the techniques and methods for using the appropriate educational media and supporting resources in instruction situations. *Fall, spring and summer.* Wileman, Trohanis.
- EDCI INTRODUCTION TO INSTRUCTIONAL MATERIALS PRODUCTION 113 (RTVMP 113) (3). The planning and production of two and three dimensional materials, such as: television graphics, slides, overhead transparencies, manipulative tactile materials and animated motion pictures. *One lecture, two laboratories per week. Fall and spring.* Wileman.
- EDCI PRINCIPLES OF INSTRUCTIONAL DESIGN (3). Prerequisite, EDUC 71 or 115 EDFO 100. This course presents the principles and techniques for the design of instruction. Students will design and produce instructional materials incorporating: goal analysis, learning task analysis, behavioral objectives, entry behavior, criterion

- tests, instructional strategies, design planning and formative evaluation. *Fall*. Hannum.
- EDCI EARLY CHILDHOOD EDUCATION (3). The development of early childhood
120 education; growth and development characteristics of very young children; providing an environment for learning; and organizing and administering programs and services. *Fall and summer*. Day, Brice.
- EDCI THE CURRICULUM OF EARLY CHILDHOOD EDUCATION (3). The objec-
121 tives of early childhood education; and curricula in language development, science, social living, number, music, art, and dramatic play. *Spring and summer*. Day, Brice.
- EDCI EDUCATIONAL TELEVISION PRODUCTION (RTVMP 140) (3). Prerequisite,
140 permission of the Department. To prepare the educational television participant, including the producer-director, the classroom and studio, and the curriculum coordinator of instructional materials for effective production of instructional materials. Current uses of television; content considerations; cooperative program planning; techniques; sources of material; special visual considerations; potentials of various instructional forms; evaluation methodology. *Two lecture and two laboratory hours per week*. *Fall*. Gwyn.
- EDCI POPULATION EDUCATION PROGRAMS AND ISSUES (3). A survey of cur-
183 rent and historical studies related to population and population education with attention to problems, issues, curriculum development, and teaching materials. *Fall*. Smallegan.
- EDCI SEX EDUCATION IN THE SCHOOL CURRICULUM (3). A survey of current and
184 historical studies related to sexuality and population, with attention to sex-related problems of man. Emphasis is given to materials and methodology for teaching in the area. *Spring*. Scott.
- EDCI MUSIC IN THE PUBLIC SCHOOL, K-12 (Music 186) (3). A study of the goals, his-
186 torical development, and present curricular practices in music education at all levels of public schooling. *Summer and fall*. Bostley (of the Music department).
- EDCI ADVANCED CHORAL METHODS AND VOCAL DEVELOPMENT PRO-
187 CEDURES FOR SECONDARY SCHOOL MUSIC (3). Seminar and workshop in pedagogical procedures in choral art and musical development. *Summer*. Staff (of the Music department).
- EDCI THE TEACHING OF APPLIED MUSIC: VOCAL (Music 188) (3). Physiological
188 and acoustical analysis of the singing act; phonics and phonetics as applicable to singing. English and foreign languages; vocal exercises and techniques suitable for classroom and choral rehearsal. *Summer*. Bostley (of the Music Department).
- EDCI INDEPENDENT STUDY IN CURRICULUM AND INSTRUCTION (1-3). May
199 be repeated for a maximum of 6 hours of credit. Prerequisite, permission of the instructor. Readings and research under the direction of a member of the Division whose interests coincide with those of the student.
- EDCI INTRODUCTION TO CURRICULUM (3). Open to graduate students in education
200 or by permission of the instructor. *Fall and spring*. Hennis, Burke, Hounshell, Stritter.
- EDCI ELEMENTARY EDUCATION IN THE UNITED STATES (3). A survey of the
202 major features of Elementary Education: curriculum determinants in the past and present; organization, structure and instruction in Language Arts, Social Studies, Mathematics, Science and the Arts; trends, issues, and research in the field. *Fall*. Lane.
- EDCI THE JUNIOR HIGH SCHOOL (3). *Fall*. Staff.
204
- EDCI SECONDARY EDUCATION IN THE UNITED STATES (3). The American high
206 school, its history, evolving development and structure, purposes and functions. *Fall and spring*. Staff.

- EDCI THE COLLEGE CURRICULUM (3). Prerequisite, EDCI 261 or the equivalent, or
208 permission of the instructor. A study of the theories of general education and the determinants and issues of the curriculum in the college; an analysis of research and policy in relation to academic procedures. *Fall*. Stritter.
- EDCI CURRICULUM THEORY (3). An advanced course in curriculum theory, research
209 and experimentation. Study and evaluation of recent curriculum reports and system-wide curriculum developments including provisions for the atypical and culturally deprived student. *Spring*. Burke.
- EDCI INSTRUCTIONAL THEORIES (3). Prerequisites, a prior course on learning and
210 permission of the instructor. The course examines the nature and application for various theories concerning instruction to instructional goals, individual differences, teaching strategies, sequencing, motivation, and assessment. The course explores the theoretical basis for instructional practices. *Spring and summer*. Hannum.
- EDCI INSTRUCTIONAL SYSTEMS DEVELOPMENT (3). This course delineates sys-
211 tematic strategies for developing and improving instructional systems including: needs assessment, job analysis, goal setting, performance objectives, criterion tests, target population analysis, delivery systems, instructional management options, implementation strategies, project management and evaluation of learners and programs. *Spring*. Hannum.
- EDCI ORGANIZATION AND SUPERVISION OF PROGRAMS FOR YOUNG CHIL-
220 DREN (3). A course concerned with organizational structures of schools for young children focusing on students, staff, finances, physical plant, school services, public relations, and curriculum. Required of early childhood majors assuming supervisory roles. *Fall*. Day, Brice.
- EDCI PRINCIPLES AND METHODS IN PARENT EDUCATION AND INVOLVE-
223 MENT (3). Prerequisites, basic knowledge of child development and permission of the instructor. Principles, theories, models, and methods for work with parents and families in educational settings, with relevant research and practical applications. *Fall, summer and spring*. Leler.
- EDCI THE LANGUAGE ARTS IN THE ELEMENTARY SCHOOL (3). A consideration
230 of the objectives, methods and materials of instruction, issues, trends, and research related to oral language, written expression, listening skills and reading. *Fall, spring, and summer*. Palmer, Cunningham, Spiegel, Whaley.
- EDCI IMPROVEMENT IN READING (3). This survey course in developmental and cor-
231 rective reading instruction considers objectives, methods, materials, issues, trends and bibliography. *Fall, spring and summer*. Palmer, Cunningham, Spiegel, Whaley.
- EDCI DIAGNOSIS AND TREATMENT OF READING DIFFICULTIES (3). Prerequisites,
232 EDCI 231 and permission of the instructor. The course considers causes of reading disability, observation procedures, standardized, informal, and psycholinguistic diagnosis testing, report writing, and methods and materials of instruction. *Fall and summer*. Palmer, Cunningham, Spiegel, Whaley.
- EDCI PRACTICUM IN DIAGNOSIS AND TREATMENT OF READING DIFFICUL-
233 TIES (3). Prerequisite, EDCI 232. A supervised clinical laboratory practicum with reading disability cases. *Spring and summer*. Palmer, Cunningham, Spiegel, Whaley.
- EDCI THE SOCIAL STUDIES IN THE ELEMENTARY SCHOOL (3). *Fall*. Lane.
235
- EDCI NATURAL SCIENCE IN THE ELEMENTARY SCHOOL (3). An examination of
236 programs and materials for elementary school science, K-6, with activities to assist teachers in organizing and operating science programs in the classrooms. *Spring*. Hounshell.
- EDCI MATHEMATICS IN THE ELEMENTARY SCHOOL (3). *Summer*. Ballew.
237

- EDCI INVESTIGATIONS AND TRENDS IN THE TEACHING OF ENGLISH (3).
240 Prerequisite, Class A teaching certificate or equivalent. An advanced course designed to examine research, current experimental practices and the effects of language theories upon the purposes, structure, and programs of the language arts. *Summer*. Hennis.
- EDCI INVESTIGATIONS AND TRENDS IN THE TEACHING OF SOCIAL STUDIES
245 (3). Prerequisite, Class A teaching certificate or equivalent or permission of the instructor. An advanced course designed to examine research and the effects of educational theories upon the objectives, structure, and curriculum of the social studies. *Summer*. Phillips, Unks.
- EDCI INVESTIGATIONS AND TRENDS IN TEACHING NATURAL SCIENCE (3).
246 Prerequisites, a North Carolina Class A Certificate or its equivalent and permission of the instructor. Current trends in the teaching of science with emphasis on experimental programs in science and research in science education. *Spring and summer*. Hounshell.
- EDCI INVESTIGATIONS AND TRENDS IN THE TEACHING OF MATHEMATICS
247 (3). Prerequisites, a North Carolina Class A teaching certificate or its equivalent, or permission of the instructor. Current trends in the teaching of mathematics with emphasis on research results and experimental programs developed by mathematics curriculum study groups. *Summer*. Ballew.
- EDCI ADULT EDUCATION, A GENERAL SURVEY (3). Prerequisite, permission of the
250 instructor. The history, philosophy and organizational patterns of adult education. Adult Education as a social movement. Current developments in this and other countries. The adult learning environment. Problems in adult learning. *Fall*. Fendt, Watson, Rhyme.
- EDCI PROGRAM PLANNING IN ADULT EDUCATION (3). Prerequisite, permission
251 of the instructor. Designing of programs, courses, and classes for adult community groups; business and industrial groups; governmental and voluntary agencies; and continuing higher education. Emphasis upon evaluation and appraisal. *Spring*. Rhyme.
- EDCI GROUP PROCESS AND BEHAVIORAL CHANGE (3). Prerequisite, permission
252 of the instructor. Examination of fundamental research orientations in the small group area, and their application in the study of task and socioemotional aspects of group functioning. Introduction to sensitivity training and laboratory method in general. *Fall, spring, and summer*. Watson.
- EDCI THE TWO-YEAR COLLEGE (3). History, philosophy, objectives, curriculum
260 status and trends in the development of the two-year college. *Fall*. Morrison.
- EDCI HIGHER EDUCATION IN THE UNITED STATES (3). Prerequisite, EDFO 241
261 or EDFO 242, or History 71-72, or the equivalent. The history and present status of the organization, administration and curriculum of higher education; the growth of denominational and Land-Grant Colleges and Universities, the two-year college and graduate and professional education. *Fall*. Dill, Sanford.
- EDCI TEACHER EDUCATION IN THE UNITED STATES (3). A study of the research
263 relating to teacher effectiveness, the issues in teacher education and the programs for the preparation of teachers. Designed for students planning to work in teacher education. *Fall*. Burke.
- EDCI COLLEGE TEACHING (3). *Fall and spring*. Staff.
265
- EDCI ORGANIZATION AND ADMINISTRATION OF HIGHER EDUCATION (3).
268 The theory and practice of administration of public and private institutions of higher education, including the two and four-year colleges and universities. *Spring*. Dill.

- EDCI INVESTIGATIONS AND TRENDS IN MUSIC EDUCATION (Music 287) (3).
287 *Summer*. Staff (of the Music Department).
- EDCI RESEARCH IN CURRICULUM AND INSTRUCTION (3). Prerequisites, EDFO
297 180, 281, 285, EDCI 200, 209, 210, or permission of the instructor. Review and interpretation of existing research in the area of Curriculum and Instruction, and an exploration of areas of needed research. *Spring*. Ballew.
- EDCI PROBLEMS IN CURRICULUM AND INSTRUCTION (3-6). May be repeated for
303 credit. Prerequisites, two courses in graduate education. *Fall and spring*. Curriculum and Instruction Staff. *Sections*: 1. Early Childhood; 2. Intermediate; 3. Parent Education; 4. Secondary/Subject; 5. Adult/Higher; 6. Media; 7. Reading; 8. General.
- EDCI PRACTICUM IN CURRICULUM AND INSTRUCTION (3-6). Practicum experi-
306 ences may include projects, field studies or internships with any one of a number of agencies concerned with education. Students will organize and conduct workshops, become involved in curriculum development and implementation projects, or conduct field research. *Fall, spring and summer*. Curriculum and Instruction Staff. *Sections*: 1. Early Childhood; 2. Intermediate; 3. Parent Education; 4. Secondary/Subject; 5. Adult/Higher; 6. Media; 7. Reading.
- EDCI PRACTICUM PROBLEMS IN EARLY CHILDHOOD EDUCATION RE-
321 LATED TO TEACHING (3). Prerequisites, EDCI 120 and 121. Supervised observation and teaching internship experiences in programs for young children. *Spring*. Day, Brice.
- EDCI PRACTICUM PROBLEMS IN EARLY CHILDHOOD EDUCATION RE-
322 LATED TO SUPERVISION AND ADMINISTRATION (3). Prerequisites, EDCI 120 and 121 and to be taken with or after EDCI 321. A supervised internship experience in both an administrative and a supervisory role in programs for young children. *Spring*. Day, Brice.
- EDCI INVESTIGATIONS IN READING (3). Prerequisites, EDCI 231 and permission of
330 the instructor. *Spring*. Palmer, Cunningham, Spiegel, Whaley.
- EDCI GROUP AND ORGANIZATIONAL DEVELOPMENT CONSULTATIONS (3).
351 Prerequisites, EDCI 252 and permission of the instructor. Application of behavioral research through laboratory method. Development of advanced skills in group diagnosis and helping relationships. Design and application of training exercises for continuing groups. *Fall and spring*. Watson.
- EDCI INTERNSHIP IN HIGHER AND ADULT EDUCATION (1-9). Prerequisite,
360 permission of the instructor. The internship is for apprenticeship training in administration, teaching, or research. The amount of credit will be tailored to the specific experience. Staff.
- EDCI PROBLEMS IN HIGHER AND ADULT EDUCATION (3). Staff.
365
- EDCI EDUCATION WORKSHOPS (3 or 6). Open by special permission to a limited num-
380 ber of qualified graduate students who have specific interests or problems that are adapted to staff and local resources available. *Summer*. Staff; visiting faculty.

Educational Foundations

- EDFOPSYCHOLOGICAL FOUNDATIONS OF EDUCATION (3). The nature and rele-
100 vance of educational psychology; source and interpretation of educational and psychological data, components of teacher learning situations, evaluation, and reporting. *Fall, spring and summer*. Staff.
- EDFOPSYCHOLOGY OF CHILDHOOD AND ADOLESCENCE (3). Theories of child
100 and adolescent development plus research findings which aid in the understanding of human behavior and development. *Fall, spring and summer*. Coop, Scott.

- EDFO PSYCHOLOGY OF ADULT LEARNING: INTERACTION OF VALUES, PER-
103 SONALITY AND COGNITION (3). This course will study the interaction of personality, motivation, values, attitudes, and cognition of students from late adolescence through middle age. *Spring*. Stuck.
- EDFO EDUCATIONAL MEASUREMENT AND EVALUATION (3). Basic concepts
106 in measurement and evaluation. The role of evaluation in curriculum construction and revision and in the improvement of instruction. *Fall and summer*. Stuck, Ware, White.
- EDFO MENTAL HYGIENE IN TEACHING (3). Prerequisite, introductory courses in
108 psychology and education. The role of the teacher in the socialization and development of emotional health in children as accompanying academic development. *Fall and spring*. Staff.
- EDFO MINORITY CHILDREN: PSYCHOLOGICAL AND COGNITIVE DEVELOP-
115 MENT (Afro-American Studies 115) (3). An analysis of research, theory and programs regarding the social and cognitive development of minority children. *Fall and spring*. Washington.
- EDFO SOCIAL FOUNDATIONS OF AMERICAN EDUCATION (3). A study of the
120 historical developments, philosophical theories and social forces influencing American education. Not appropriate in a doctoral program. *Fall, spring and summer*. Holton, Phillips, Unks.
- EDFO STATISTICS AND DESIGN I (4). Introduction to descriptive and inferential
180 statistics applicable to the design and analysis of educational research. This course will also introduce the student to the fundamentals of research design in education. *Fall*. Ware, White.
- EDFO INDEPENDENT STUDY IN HUMAN DEVELOPMENT AND PSYCHOLOG-
199 ICAL SERVICES (1-3). May be repeated for a maximum of 6 hours of credit. Prerequisite, permission of the instructor. Readings and research under the direction of a member of the Division whose interests coincide with those of the student. Brown, Brantley, Washington, White.
- EDFO PSYCHOLOGY OF LEARNING IN THE SCHOOL (3). Prerequisite, Education
201 71 or equivalent. A study of learning in the school setting; fundamental concepts, issues, evaluation of materials and experiences. *Fall and spring*. Stuck.
- EDFO THEORIES AND RESEARCH IN HUMAN DEVELOPMENT (3). Prerequi-
202 site, permission of instructor. An advanced level course in human development covering the basic theories of human development and the research bases of instructional decisions relating to the development of humans. *Fall*. Coop.
- EDFO THEORY AND USE OF INDIVIDUAL INTELLIGENCE TESTS (3). Prerequi-
207 site, permission of the instructor. *Summer*. Staff.
- EDFO PHILOSOPHY OF MODERN EDUCATION (3). A comparative study of the
220 current philosophies of education with particular attention to their impact on solutions offered to problems currently recognized in American education. *Fall*. Holton, Phillips.
- EDFO ETHICAL ISSUES IN EDUCATION (3). Identifies issues arising in the profes-
222 sional activities of education personnel in the context of systematic consideration of the nature of ethical choice. *Spring*. Holton.
- EDFO EDUCATIONAL SOCIOLOGY (3). An application of sociological theory and re-
223 search to problems of concern to educators. *Fall*. Schlechty, Noblit.
- EDFO THE SCHOOL IN AN URBAN SETTING (3). This course is designed as a seminar
228 to explore the implications of urbanization for educational agencies. Particular attention will be given to public schools. *Spring*. Schlechty.
- EDFO EUROPEAN FOUNDATIONS OF MODERN EDUCATION (3). A survey of the
241 development of western education in Europe from ancient times until the beginning of the twentieth century. *Fall*. Holton, Phillips.

- EDFO SOCIAL AND EDUCATIONAL HISTORY OF THE UNITED STATES (3). A
242 survey of the social forces influencing the development of American education from
the period of colonization to the early years of the twentieth century. *Spring*.
Holton, Phillips.
- EDFO COMPARATIVE EDUCATION (3). A study of education in other cultural set-
245 tings with implications for the student of American education. *Fall and spring*.
Holton, Rhyne.
- EDFO STATISTICS AND DESIGN II (4). Prerequisite, EDFO 180. Hypothesis testing in
281 educational research using analysis of variance and regression models. The student
will also learn to use the computer to analyze data using the statistical models
presented. *Fall, spring and summer*. Ware, White.
- EDFO LOGIC OF INQUIRY (3). Prerequisite, EDFO 180 or permission of the instructor.
285 An orientation to research methods, problems and procedure in historical, survey,
developmental, and comparative studies; criteria for evaluating research; and the
communication of research findings. *Fall and spring*. Tracy, White.
- EDFO MULTIVARIATE ANALYSIS OF EDUCATIONAL DATA (3). Prerequisites,
286 EDFO 180, 281 and 285 (which may be taken concurrently), or permission of the
instructor. The designing, conducting, and analyzing of significant school-oriented
research procedures—statistical techniques; methods of control; sampling pro-
cedures; data collecting procedures. Introduction to computer techniques. *Spring*.
Ware.
- EDFO PROGRAM EVALUATION IN EDUCATION (3). Prerequisites, EDFO 180 and
288 285. The course emphasizes those aspects of evaluation that are distinctively differ-
ent from research. Students will acquire the tools to undertake program evaluation
studies using a variety of approaches. *Spring*. Friedman, Morrison.
- EDFO SEMINAR IN HUMAN DEVELOPMENT AND INDIVIDUAL DIFFER-
301 ENCES (3). Prerequisites, at least one course in human development at the graduate
level, or permission of instructor. An analysis of research data and theoretical
positions pertaining to individual differences in human development in the educa-
tional setting. *Fall*. Coop.
- EDFO SEMINAR IN HUMAN LEARNING AND COGNITION (3). Prerequisite, one
302 and preferably two courses in educational and developmental psychology. Psychol-
ogy of learning (theoretical aspects) and psychology of learning (practical applica-
tions). *Spring*. Stuck.
- EDFO PROBLEMS IN EDUCATIONAL MEASUREMENT (2). May be repeated for
303 credit. Prerequisites, EDFO 106, permission of instructor. *Fall and spring*. Staff.
- EDFO PROBLEMS IN EDUCATIONAL PSYCHOLOGY (3-6). Prerequisite, permis-
305 sion of instructor. Study and development of original investigations. Staff.
- EDFO SEMINAR IN EDUCATIONAL PHILOSOPHY (3-6). Repeat for credit. Topics
321 in educational philosophy to be determined by the students with the instructor. *Fall
and spring*. Holton.
- EDFO PROBLEMS IN THE PHILOSOPHICAL FOUNDATIONS OF EDUCATION
323 (3 or more). Prerequisites, EDFO 220 and 221, or equivalents. *Spring*. Staff.
- EDFO PROBLEMS IN THE SOCIOLOGICAL FOUNDATIONS OF EDUCATION (3
324 or more). Prerequisites, EDFO 223 and 228, or equivalents. *Spring*. Staff.
- EDFO PROBLEMS IN THE ANTHROPOLOGICAL FOUNDATIONS OF EDUCA-
325 TION (3 or more). Prerequisites, EDFO 123 and Anthropology 121 and 122, or
equivalent. *Spring*. Staff.
- EDFO PROBLEMS IN HISTORY OF EDUCATION (3 or more). Prerequisites, EDFO
341 241 and 242, or equivalents. *Fall and spring*. Staff.
- EDFO PROBLEMS IN COMPARATIVE EDUCATION (3 or more). Prerequisites,
342 EDFO 245, or equivalent. *Spring*. Staff.

- EDFO DOCTORAL RESEARCH SEMINAR (3). Prerequisites, two courses in graduate
385 education. Permission of instructor. *Fall and spring*. Members of the Graduate
Faculty.
- EDFO SEMINAR IN EDUCATION (3). Prerequisites, two courses in graduate education.
390 Permission of instructor. *Fall and spring*. Members of the graduate faculty.
- EDFO MASTER'S THESIS (3 or more). *Fall, spring and summer*. Members of the graduate
393 faculty.
- EDFO DOCTORAL DISSERTATION (3 or more). *Fall, spring and summer*. Members of
394 the graduate faculty.
- EDFO GENERAL REGISTRATION (0).
400

Specialized Professional Education

- EDSP INTRODUCTION TO SCHOOL PSYCHOLOGY (3). A course designed to provide
120 the student with an introduction to concepts and methods involved in school psychol-
ogy. *Fall, spring, summer*. Staff.
- EDSP INTRODUCTION TO EXCEPTIONAL CHILDREN (3). A comprehensive survey
130 of the gifted child and of the various handicapping conditions—mental retardation,
emotional disturbance, learning disabilities, speech impairment, deaf, blind, crippled
and neurologically impaired. *Fall, spring and summer*. Ragland, Wyne.
- EDSP THE GIFTED CHILD IN SCHOOL AND SOCIETY (3). The nature of giftedness
132 and creativity, characteristics of gifted and creative children; approaches to encourag-
ing the development and utilization of their abilities. *Spring*. Gallagher.
- EDSP PSYCHOLOGY OF MENTAL RETARDATION (3). An intensive study of the psy-
135 chological and sociological aspects of educationally handicapping conditions and of
the children who manifest those conditions. Analysis and integration of classic and
current research. *Fall and summer*. Wyne, Ragland.
- EDSP METHODS OF TEACHING SPEECH TO THE HEARING IMPAIRED (SPHS
141 203) (3). This course reviews general principles of speech development, the underlying
problems in speech acquisition by moderately to profoundly hearing impaired indi-
viduals, deviant spoken language, and the practical and theoretical aspects of evaluat-
ing and establishing speech. *Summer*. Staff.
- EDSP INTRODUCTION TO COMMUNICATION DISORDERS (SPHS 183) (3). This
143 course is designed to explore the etiology, epidemiology, assessment, and educational
implications of speech and language disorders. *Fall, spring and summer*. Lubker.
- EDSP FOUNDATIONS OF PHONOLOGICAL AND VOICE DEVIATIONS (SPHS
144 184) (3). Prerequisite, SPHS 130 or its equivalent. First semester of a two semester
course offering in evaluation, analysis and measurement (assessment), modification of
behaviors, breakdown of processes in speech disorders with emphasis on voice and
articulation disorders. *Spring*. Hadjian.
- EDSP PHONETICS (3). The recognition, analysis, production and transcription of the
145 sounds of the English language using the international phonetic alphabet. *Summer*.
Staff.
- EDSP MANAGEMENT OF LEARNING ENVIRONMENTS (3). Emphasis on affective
179 behavior management and applied behavior analysis techniques for intervening in the
environment of exceptional children to increase learning. *Spring and summer*. Bailey.
- EDSP INTRODUCTION TO SCHOOL COUNSELING (3). Prerequisite, graduate stand-
200 ing. Philosophical bases of pupil personnel services are discussed with emphasis upon
elementary and secondary school guidance programs. *Summer*. Brown.
- EDSP THEORIES OF COUNSELING (3). Prerequisite, permission of instructor. Current
201 theories of counseling will be examined. Emphasis will be placed upon theory as a
means of conceptualizing behavior change in the counseling process. *Fall, summer*.
Brown, Galassi, Lee.

- EDSP CAREER DEVELOPMENT AND COUNSELING (3). Major theories of career
202 development are examined. The use and appraisal of student information in career
counseling is a major topic. *Fall*. Brown.
- EDSP PRE-PRACTICUM IN COUNSELING (3). Prerequisite, EDSP 201, or may be
203 taken concurrently, and permission of the instructor. Interviewing techniques will be
presented. Role playing, video and audio feedback will be utilized. Student will learn
skills at specified level. *Summer*. Galassi, Lee.
- EDSP TESTS AND MEASUREMENTS (3). Prerequisite, EDSP 200. Basic concepts in
204 tests and measurements. Application and interpretation of tests. The student may be
required to purchase tests. *Fall, spring and summer*. White, Lee.
- EDSP GROUP COUNSELING PROCEDURES (3). Prerequisite, permission of instruc-
205 tor. Organizing and implementing group counseling will be stressed. Individual and
group counseling approaches will be compared. Research literature will be reviewed.
Application of counseling theory to groups will be covered. *Spring*. Brown.
- EDSP INTERNSHIP IN GUIDANCE (3-6). Prerequisites, EDSP 201 and 203. Students
206 will familiarize themselves with the specific institution to which they are assigned by
apprenticing themselves to the personnel in the institution. *Fall*. Brooks, Brown,
Galassi, Lee.
- EDSP PRACTICUM IN COUNSELING AND CONSULTATION (3-6). Prerequisites,
207 EDSP 201, EDSP 203, and permission of instructor. Students will engage in counsel-
ing and consultation activities under supervision in appropriate placements. Com-
petency in individual counseling, group counseling and consultation is required for
completion. *Fall and spring*. Brooks, Brown, Galassi, Lee.
- EDSP ISSUES IN ORGANIZING GUIDANCE SERVICES (3). Prerequisite, 18 hours in
209 Counselor Education. Issues in organizing guidance services will be discussed. Among
these are the special needs of women, minority groups, and the drug problem.
Emphasis will be placed on organizing guidance services to meet these problems.
Summer. Brown.
- EDSP CROSS-CULTURAL COUNSELING (3-6). Prerequisite, permission of instructor.
210 An exploration of the cognitive and affective considerations of counseling in cul-
turally different social systems. This will include ways to incorporate specific socio-
cultural dimensions into the counseling process. *Spring*. Lee.
- EDSP PROFESSIONAL ISSUES IN COUNSELING PSYCHOLOGY (1-3). May be re-
212 peated for credit. Prerequisites, Graduate standing in Guidance and Counseling or
Counseling Psychology and permission of the instructor. Professional issues in coun-
seling and counseling psychology will be addressed including ethics, licensure, politi-
cal action, writing for publication, professional involvement and other relevant issues.
Fall. Brown.
- EDSP PSYCHO-EDUCATIONAL ASSESSMENT (3). May be repeated for credit. Pre-
221 requisite, permission of instructor. A sequence of courses addressing knowledge and
skills in techniques of observing, interviewing, assessment of environment, intelli-
gence, achievement, perceptual motor skills, and interpersonal perceptions. *Fall,*
spring. Brantley, Lee, Simeonsson.
- EDSP BEHAVIORAL INTERVENTION IN COUNSELING AND SCHOOL PSY-
222 CHOLOGY (3). May be repeated for credit. Permission of instructor required. Topics
covered will include behavior management and therapy, individual and group ther-
apy. The school psychology sections include consideration of theoretical interventions
beyond those of a behavioral perspective. *Fall, spring, and summer*. Brantley, Galassi,
Simeonsson, Wasik.
- EDSP SCHOOL CONSULTATION METHODS (3-12). May be repeated for credit. Vari-
223 ous models of consultation, the role of the consultative model in the schools and
related agencies. Role playing and experience in the school will be utilized. *Fall and*
spring. Pryzwansky.

- EDSP WORKING WITH PARENTS AND FAMILIES OF HANDICAPPED CHILDREN (3). Four units encompassing trends, research, sociological and psychological issues, intervention procedures, and interaction with families of handicapped children will be presented. Field experiences with families of handicapped children provided. *Summer*. Lillie.
- EDSP THE PROBLEMS OF MALADJUSTMENT AMONG CHILDREN (3). The etiology and behavioral characteristics of the major forms of maladjustment in children as they relate to intervention alternatives. *Fall, spring, and summer*. Staff.
- EDSP SEMINAR IN APPLIED INVESTIGATIONS (3). This course is designed to provide opportunities to explore in depth specific areas of research interest in school psychology. *Fall and spring*. Galassi, McKinney.
- EDSP SEMINAR IN PROFESSIONAL SCHOOL PSYCHOLOGY (2-3). Repeat for credit. The goals and roles of school psychology, ethical concerns, privileged information, certification and licensing and other relevant areas. *Fall*. Brantley, Pryzwansky.
- EDSP EXTERNSHIP IN SCHOOL PSYCHOLOGY (1-6). Repeat for credit. Prerequisite, permission of instructor. Supervised observation and participation in school psychological services in schools and school-related field facilities. *Fall and spring*. Staff.
- EDSP DOCTORAL SEMINAR IN PROFESSIONAL SCHOOL PSYCHOLOGY (3). Prerequisites, appropriate courses and permission of the instructor. Advanced topics in the field of school psychology; professional issues, interdisciplinary relations. *Fall and spring*. Brantley, Pryzwansky.
- EDSP TEACHING THE HANDICAPPED CHILD (3). Emphasis on classroom educational procedures including methods, curriculum and materials for teaching pupils handicapped by academic learning problems or developmental problems. May be repeated for credit. *Fall*. Jens, Lillie.
- EDSP MULTIDISCIPLINARY APPROACHES TO EXCEPTIONALITY I (3). This seminar focuses on the theory and research related to the bio-medical and psychological aspects of exceptionality. *Fall*. Simeonsson.
- EDSP MULTIDISCIPLINARY APPROACHES TO EXCEPTIONALITY II (3). This course focuses on the theory and research related to the sociological, legal, and educational aspects of exceptionality. *Spring*. Wiegerink.
- EDSP INTRODUCTION TO THE EDUCATION OF EMOTIONALLY DISTURBED CHILDREN (3). The education of emotionally disturbed children including history, philosophical issues, alternative conceptions of emotional disturbance, management and educational programming. *Fall and summer*. Epanchin, Paul.
- EDSP TEACHING THE EMOTIONALLY DISTURBED CHILD (3). Prerequisite, EDSP 237. An examination of management and educational planning and programming for emotionally disturbed children, the roles of the teacher, and the establishment of programs. Each student will be expected to assume some responsibility for working on a limited basis in a supervised experience with an emotionally disturbed child or with a small group. *Spring*. Epanchin.
- EDSP EXCEPTIONAL CHILD DEVELOPMENT (3). The emphasis is on developmental deviations exhibited by exceptional children in cognitive, language, social, affective and perceptual neurological development. *Fall and/or spring*. Simeonsson, Farran.
- EDSP AUDIOLOGY I (SPHS 123) (3). Theory and practice of the measurement of hearing, causative factors in hearing loss, evaluation of audiometric results, demonstration and participation in clinical program in audiology. *Fall*. Staff.
- EDSP FOUNDATIONS OF NEUROLOGICAL AND FLUENCY DEVIATIONS (SPHS 244) (3). Prerequisite, EDSP 144. A continuation of a two-course offering as described under 144 with emphasis on stuttering and organic disorders of speech. *Spring*. Mahaffey, Peters.
- EDSP ADVANCED THEORY AND PRACTICE IN EDUCATING THE SPEECH HANDICAPPED (3). *Summer*. Visiting faculty.

- EDSP EDUCATIONAL EVALUATION OF HANDICAPPED CHILDREN (3). Study
247 and practice in the use of both formal and informal diagnostic assessment and obser-
vational techniques appropriate for the teacher of children with learning problems.
Fall and spring. Jens, Wyne.
- EDSP CURRICULUM DEVELOPMENT IN SPECIAL EDUCATION (3). Designed to
248 help the student put diagnostic and assessment procedures into practice in the class-
room. Includes development of I. E. P.'s, a thorough understanding of legislative
mandates directed toward special education population and development of evalua-
tion techniques for accountability. *Spring.* Epanchin.
- EDSP PLANNING, IMPLEMENTING AND ASSESSING SCHOOL IMPROVE-
284 MENTS ON FEDERAL, STATE AND LOCAL LEVELS (3). Prerequisites, EDSP 286,
EDSP 291, EDSP 293, EDSP 295, EDSP 288. This course examines the division of
governmental responsibility for school improvement, current and anticipated school
improvements, and approaches to planning, implementing and assessment. *Spring.*
Schlechty.
- EDSP ADMINISTRATION AND SPECIAL SERVICES (3). An overview of special pro-
285 grams and special services which operate in the nation's schools. Focus is on the
interaction of federal, state and local policies. *Fall.* Wiegerink.
- EDSP SCHOOL REFORM (3). This course examines historical attempts in educational
286 reform and critically analyzes different types of reform, reform processes, impedi-
ments and consequences of reform attempts. *Fall.* Staff.
- EDSP SCHOOLS AND COMMUNITIES (3). This course examines the values, processes
287 and approaches to school-community relations. The focus is on analyzing various
attempts at school-community linkages and not on public relations. *Spring.* Staff.
- EDSP POLITICS IN EDUCATION (3). This course will focus upon political issues, pro-
288 cesses and problems that influence decision and policy-making in elementary,
secondary and higher education. *Fall.* George, Self.
- EDSP SCHOOL ORGANIZATION AND MANAGEMENT (3). An introduction to the
290 organizational choices, relationships, and management practices in the schools (K-12
or K-14). *Fall.* Tracy.
- EDSP STRUCTURE AND BEHAVIOR IN EDUCATIONAL ORGANIZATION (3). An
291 examination of theories of organization structure, organizational behavior and group
dynamics in educational organizations. *Fall.* George, Noblit, and Watson.
- EDSP THE PRINCIPALSHIP: ELEMENTARY AND SECONDARY SCHOOLS (3).
292 Prerequisite, North Carolina Class A Certificate; a minimum of one year's teaching
experience. An analysis of the leadership role of the principal in relation to staff,
students, the educational program and the community. *Spring and summer.* Tracy,
Tarbet, Noblit, George.
- EDSP MANAGEMENT IN EDUCATIONAL ORGANIZATIONS (3). Prerequisite,
293 EDSP 291. Introduction to management functions of planning and control in educa-
tional organizations. Potential relevance of contemporary management techniques
will be examined. Individual decision making will be emphasized through a case study
method. *Spring.* Dill, Wiegerink.
- EDSP SUPERVISION AND INSTRUCTION (3). Nature and purposes of supervision,
294 recent trends in theory and practice, teacher participation in policy, organization, and
planning, specific techniques and devices of supervision, training and qualifications of
supervisors. *Summer, fall and spring.* Schlechty.
- EDSP LEADERSHIP BEHAVIOR AND ORGANIZATIONAL CHANGE IN EDUCA-
295 TIONAL SETTINGS (3). Prerequisite, EDSP 291. An examination of theoretical
and empirical studies which provide bases for interpreting leadership roles in educa-
tional organizations and various current perspectives on how organizational change
can be affected. *Spring.* George, Watson.

- EDSP SCHOOL FINANCE IN THE ECONOMIC AND POLITICAL CONTEXT (3).
296 The content covers the area of financing of school corporations in the current economic and political setting, with emphasis on interrelationships of educational, economic, and political decisions. *Fall*. Tracy.
- EDSP FIELD TECHNIQUES IN EDUCATIONAL RESEARCH (3). Prerequisite, EDFO
297 285, EDFO 180. The course is an introduction to field research methods and analysis of qualitative data. The focus is on the application of these techniques in evaluation and policy research. *Spring*. Noblit.
- EDSP SCHOOL LAW (3). Prerequisites, courses required for the Class A North Carolina
298 Teachers Certificate and 6 semester hours of graduate work in school administration. *Fall of alternate years*. Tracy.
- EDSP RESEARCH AND THEORY BUILDING IN CAREER DEVELOPMENT (3). An
300 intensive review of the present theories of career development and a critique of related research. Emphasis upon theoretical constructs and theory building in career development. *Fall*. Brooks, Brown.
- EDSP INTRODUCTION TO STUDENT PERSONNEL SERVICES (3). Prerequisite,
301 graduate standing. Students personnel administration structure, admissions, student discipline, institutional climate, housing, health services, counseling and testing, placement, foreign students, and financial aid are considered. *Fall*. Boulton, Condie.
- EDSP INTERNSHIP IN STUDENT PERSONNEL SERVICES (4). The internship pro-
302 vides experiences in student personnel offices and in the function or functions specific to the student's career orientation. Students are placed in college or university student personnel offices under the joint supervision of administrative personnel of these officers and staff members of the School of Education. *Spring*. Staff.
- EDSP ADVANCED COUNSELING: THEORIES AND PRACTICE (3). Prerequisite,
304 EDSP 201 or equivalent and permission of instructor. An examination of major theories of counseling combined with readings, practice and analysis of counseling experiences. *Spring*. Brooks, Brown.
- EDSP PROBLEMS IN COUNSELING PSYCHOLOGY (3). May be repeated for credit.
305 Prerequisites, two graduate courses in guidance, permission of instructor. *Fall and spring*. Brooks, Brown, Galassi, Lee.
- EDSP DOCTORAL PRACTICUM IN COUNSELING AND CONSULTATION (3). May
306 be taken three times for credit. Prerequisite, permission of the instructor. Practicum experiences working with individual, family and group counseling and consultation arranged. *Fall and spring*. Brown, Galassi, Lee.
- EDSP SUPERVISION AND TEACHING IN COUNSELING PSYCHOLOGY (3). To en-
308 able students to gain skills which will enhance their functions as professors in the field and in leadership positions in counseling agencies. Strategies of practicum summarized. Practicum research literature reviewed. Demonstration and on-site supervision. Students will act as co-instructors. *Spring*. Galassi.
- EDSP DOCTORAL SEMINAR IN COUNSELING PSYCHOLOGY (3). Prerequisite,
309 doctoral standing. In depth appraisal of topics of theoretical and/or clinical nature which are of particular relevance to the field. *Fall and spring*. Brooks, Brown, Galassi, Lee.
- EDSP DOCTORAL EXTERNSHIP IN SCHOOL PSYCHOLOGY (1-6). Prerequisite,
320 permission of the instructor. Supervised field placement experiences for doctoral level students in school psychology integrating training with field responsibilities at a systems level in schools and school-related settings. *Fall and spring*. Staff.
- EDSP SEMINAR IN LEARNING DISABILITIES (3). Repeat for credit. This course is
322 designed to explore the etiology, classroom manifestations and treatment programs of children with learning disabilities, test patterns, differential functioning and related research. *Fall and summer*. Pryzwansky.

- EDSP PROBLEMS IN SCHOOL PSYCHOLOGY (3-6). Repeat for credit. Available for
325 advanced graduate students to engage in supervised research. *Fall and spring*. Staff.
- EDSP MASTER'S INTERNSHIP IN SPECIAL EDUCATION (3 or 6). Provides thor-
340 ough supervised experience in a phase of Special Education most appropriate to the
student's qualifications, experience, and future educational goals. Requires a mini-
mum of 300 clock hours at the internship site per semester. *Fall and spring*. Bailey;
staff.
- EDSP SUPERVISED POST-MASTER'S INTERNSHIP IN SPECIAL EDUCATION
341 (3, 6, or 9). Prerequisite, permission of instructor. A full-time field placement under
the joint direction of a University staff member and a selected professional at the
internship site. *Fall and spring*. Staff.
- EDSP SEMINAR IN SPECIAL EDUCATION (3). May be repeated for credit. Graduate
342 level seminar which draws from both theory and research to deal with critical issues.
Fall and spring. Staff.
- EDSP PROBLEMS IN SPECIAL EDUCATION (3). May be repeated for credit. Available
345 for post-master's students who wish to engage in supervised field and pilot research.
Prerequisite, by permission of instructor. *Fall and spring*. Staff.
- EDSP SEMINAR AND SUPERVISED INTERNSHIP IN EDUCATIONAL ADMINIS-
390 TRATION (3). A supervised internship or field problem explicitly relevant to the pro-
gram in administration and to the student's progress toward certification in the prin-
cipalship. *Fall and spring*. Self, Noblit.
- EDSP ADVANCED SEMINAR AND SUPERVISED INTERNSHIP IN EDUCATION-
391 AL ADMINISTRATION (6). Prerequisites, three semesters of graduate work in-
cluding EDSP 290, 291, 292, 296. Tracy, Tarbet, George, Self.
- EDSP PROBLEMS IN EDUCATIONAL ADMINISTRATION (3 or 4). May be repeated
395 for credit. Prerequisites, EDSP 290 or equivalent, one other course in educational
administration. Permission of instructor. *Fall, spring, and summer*. Staff.
- EDSP PROBLEMS IN SUPERVISION (3 or 4). Prerequisite, permission of the instructor.
396 A study of major problems in the supervision of instruction. Investigations of new
trends and recent research. Staff.

DEPARTMENT OF ENGLISH

JOSEPH M. FLORA, *Chairman*

Professors

LAURENCE G. AVERY	(2)	American Literature, the Drama
ROBERT A. BAIN	(3)	Colonial and Nineteenth-Century American Literature
DORIS W. BETTS	(59)	Creative Writing
ALAN C. DESSEN	(6)	Renaissance
CHARLES E. EDGE	(11)	Prose Fiction, Nineteenth-Century English Novel
JOSEPH M. FLORA	(13)	American Literature, Twentieth-Century British and American
ROBERT L. HAIG	(16)	Eighteenth-Century British
WILLIAM R. HARMON	(17)	Twentieth-Century British and American, Poetry, Creative Writing
HOWARD M. HARPER, JR.	(18)	Twentieth-Century British and American
ROBERT HOWREN	(67)	Linguistics
GEORGE J. KANE	(58)	Medieval Literature
J. KIMBALL KING	(23)	Twentieth-Century Drama, American Literature
CHARLES T. LUDINGTON, JR.	(27)	Twentieth-Century British and American
DANIEL W. PATTERSON	(36)	American Literature, Folklore
MARK L. REED	(40)	English Romanticism
LOUIS D. RUBIN, JR.	(41)	Modern American, Literary Criticism, Creative Writing
RICHARD D. RUST	(42)	American Literature
JOHN D. SEELYE	(56)	American Literature
HAROLD I. SHAPIRO	(53)	Victorian Literature
H. MAXWELL STEELE	(43)	Director, Creative Writing
ALBRECHT B. STRAUSS	(44)	Eighteenth-Century British
FRED C. THOMSON	(47)	Victorian Literature
WELDON E. THORNTON	(48)	Twentieth-Century British and American, the Novel
ROBERT B. VOITLÉ	(49)	Seventeenth-Century British

Associate Professors

CHRISTOPHER M. ARMITAGE	(1)	Twentieth-Century British, Canadian
CHRISTOPHER BROOKHOUSE	(5)	Creative Writing, Twentieth-Century Literature, Film
THADIOUS DAVIS	(61)	American Literature, American Studies
CONNIE C. EBLE	(9)	English Language, Linguistics
DARRYL J. GLESS	(62)	Renaissance
JOHNNY LEE GREENE	(57)	American Literature
ANNE D. HALL	(54)	Renaissance
TRUDIER HARRIS	(60)	American Literature, Folklore
EDWARD D. KENNEDY	(22)	Medieval Literature
ROBERT G. KIRKPATRICK	(24)	English Romanticism

GEORGE S. LENSING, JR.	(26)	Modern Poetry, American Literature
ALLAN R. LIFE	(55)	Victorian Literature
ERIKA C.D. LINDEMANN	(63)	Composition
DOUGALD McMILLAN III	(30)	Twentieth-Century British
WILLIAM A. MCQUEEN	(32)	Seventeenth-Century British
JERRY L. MILLS	(33)	Renaissance
MARGARET A. O'CONNOR	(35)	American Literature, Contemporary Literature, Women's Studies
JULIUS R. RAPER, III	(38)	American Literature
THOMAS A. STUMPF	(45)	Eighteenth-Century British
JOSEPH S. WITTIG	(51)	Medieval Literature
CHARLES G. ZUG, III	(52)	Folklore, Nineteenth-Century American

Assistant Professors

RANDALL HENDRICK	(68)	Linguistics, Criticism
RITCHIE D. KENDALL	(64)	Renaissance
THEODORE H. LEINBAUGH	(65)	Medieval Literature
PATRICK P. O'NEILL	(66)	Medieval Literature
BEVERLY W. TAYLOR	(67)	Victorian Literature

Emeritus Professors

RAYMOND W. ADAMS
LYMAN A. COTTEN
NORMAN E. ELIASON
RICHARD H. FOGLE
JAMES R. GASKIN
C. CARROLL HOLLIS
ALMONTE C. HOWELL
BLYDEN JACKSON
LEWIS LEARY
CLIFFORD P. LYONS
FRED H. MACINTOSH
PETER G. PHIALAS
HARRY K. RUSSELL
ROBERT B. SHARPE
ERNEST W. TALBERT
WILLIAM S. WELLS

The Department offers work leading to the Master of Arts and Doctor of Philosophy degrees. The M.A. degree aims at mastery of scholarly techniques, examination of the English language, and broad knowledge of British and American literature. Building on the M.A., the Ph.D. is a more specialized degree, with a major in one of six literary periods and a minor in either a second literary period or in the English language. The Department recognizes the following areas of specialization:

- (1) the English Language.
- (2) English Literature from the Beginning to 1485.
- (3) English Literature from 1485 to 1660 (including Milton).
- (4) English Literature from 1660 to 1798.

- (5) English Literature from 1798 to 1900.
- (6) American Literature to 1900.
- (7) British and American Literature from 1900 to the Present.

Admissions Requirements

Application for admission must be made on forms provided by the Graduate School. These forms serve also as applications for fellowships and assistantships if the applicant marks the appropriate statement on the form.

Applicants for advanced degrees must have completed at the time of enrollment an undergraduate degree, customarily with a major in English. To be reviewed for admission by the Department's Graduate Advisory Committee, applications must be supported by scores on the Graduate Record Examination Aptitude Test (Advanced test not required), at least three letters of recommendation, and official transcripts showing courses, grades, and degrees awarded.

Only applicants with an M.A. in English are eligible for admission directly into the Ph.D. program. Every applicant without an M.A. in English is considered an applicant for the M.A. degree. Students who complete an M.A. in the English Department must be reviewed and re-admitted for doctoral work.

Fellowships and Assistantships

Financial support for graduate students is described in the General Information section under the heading "Fellowships and Financial Aid." Applicants to the English Department are eligible to compete for University Fellowships and Assistantships. In addition, the Department awards two types of assistantships—Research Assistantships and Teaching Assistantships. Neither type is usually available in the summer. Research Assistants are assigned to faculty members to help with research projects. They work ten hours a week and receive a stipend of \$600 a semester. Teaching Assistants have full instructional responsibility for sections of beginning composition courses. Normally, only persons with an M.A. are eligible for Teaching Assistantships, although appropriate high school or college teaching experience may substitute for the M.A. for this purpose. The stipend for a Teaching Assistant is \$2300 per section, the initial assignment usually one section a semester. Teaching Assistants are trained and supervised by the Director of Composition and are subject to student and faculty evaluation.

The M.A. Program

Candidates for the M.A. must complete nine courses, demonstrate a reading knowledge of a foreign language, write a thesis, and pass a written

comprehensive examination. The courses elected by an M.A. student must include Bibliography and Methodology (English 298); either Old English (English 237) or Modern Grammar (English 136); and six courses from the literary fields enumerated above, no more than two from a single group. If a minor outside the Department (normally nine semester hours) is chosen, the program must be adjusted and the adjustment approved by the student's adviser and the Director of Graduate Studies. Most students take one and a half years to complete the degree.

The Ph.D. Program

Graduate School requirements for the degree Doctor of Philosophy are set forth under the heading "Graduate Degrees and Degree Requirements." To fulfill these requirements in the English Department, a Ph.D. student must pass three seminars, Old English (English 237), and either History of the English Language (English 238) or Studies in Old English Literature: Beowulf (English 250). Although no further course work is required, most students choose additional courses to help prepare for the required doctoral examinations in five fields. In addition to course work, Ph.D. students take a written examination in three literary fields not being declared the major or minor and an oral examination on the major and minor fields. Doctoral candidates must also demonstrate a reading knowledge of two foreign languages. The culmination of the candidate's program is the writing and successful defense in an oral examination of a dissertation. The Department strongly recommends that candidates for the Ph.D. have supervised classroom teaching experience before receiving the degree. Such experience, when it can be offered, will be considered as fulfilling a requirement for the degree. Students generally take three to five years beyond the M.A. to complete the degree.

Foreign Language Proficiency

The English Department considers a reading knowledge of foreign languages essential to the educational and professional aims of its degree programs. M.A. candidates must show proficiency in one foreign language and Ph.D. candidates in two. The Department recommends Latin, French, and German. The use of other languages to fulfill the requirement must be approved by the Director of Graduate Studies. An undergraduate major in an approved language automatically satisfies the requirement. Ordinarily, however, students fulfill the requirements by passing an examination administered by the Educational Testing Service; by completing reading courses for graduate students offered by the Classics, German, and Romance Language Departments; or by completing with a grade of at least B an undergraduate literature course in a foreign language. The foreign language requirement must be satisfied before the student can be admitted to candidacy.

Library and Research Facilities

The library system at the University of North Carolina at Chapel Hill has recently been ranked among the top twenty research libraries in the United States. It has excellent holdings for the study of English philology and British and American literature, including the Southern Historical Collection (containing manuscripts, letters, diaries, etc.) and the Hanes Collection of incunabula, early printed books, and manuscripts. Through cooperative arrangements, Duke University libraries are open to graduate students from the University of North Carolina at Chapel Hill.

Publications

Studies in Philology and *The Southern Literary Journal* are edited by English Department faculty members and have their editorial offices in the English Department building.

Courses for Graduates and Advanced Undergraduates

- 107 INTRODUCTION TO MODERN IRISH (3). A basic course in modern Irish grammar and pronunciation; background readings in Irish history and culture. *Fall*. O'Neill.
- 108 READINGS IN MODERN IRISH (3). Prerequisite, English 107. Selected readings from various genres: the autobiography (*Mo Scéal Féin*, Peig, *Fiche Blian ag Fás*) and poetry (the *aisling* and the *caoineadh*). *Spring*. O'Neill.
- 130 ADVANCED EXPOSITORY WRITING (3). This course is planned to strengthen the writing of graduate students and to ground them in the body of knowledge available to help them confront the writing problems most frequently faced in the worlds of thought, work, and teaching. Open to graduate students in all disciplines. *Spring*. Rust.
- 131 RHETORICAL THEORY AND PRACTICE (3). A study of rhetorical theories and practices from classical to modern times. Emphasis is on translation of theories into practices in contemporary college rhetorics. *Spring*. Lindemann.
- 134 ADVANCED CREATIVE WRITING. (3). Advanced workshop in fiction. Written exercises in the use of scene, point of view, narration, dialogue. Student projects in short story or beginning novel. (Permission of instructor required.) *Spring*. Steele.
- 136 MODERN ENGLISH GRAMMAR (3). A study of current English structure and usage using a traditional approach modified by appropriate contributions from structural and generative grammar, with some attention to the application of linguistics to literary analysis. *Fall*. Eble.
- 140 INTERPRETATION OF LITERATURE (3). A study of various critical approaches to literature, including traditional, new critical, psychological, archetypal, etc. *Summers*. Bain, Harper, Lensing, Stumpf.
- 142 LITERATURE AND FILM (3). An examination of several books made into films, with stress on the relationship of literature to the filmed image. Harper, Brookhouse.
- 144 STUDIES IN ENGLISH LITERATURE AND THE CLASSICS.
- 146 INTRODUCTION TO FOLKLORE (3). A survey of the primary genres (song, narrative, proverb, riddle, custom, belief, drama, game) with attention to their forms, transmission, and functions in traditional and urban societies. Zug.

- 151 ENGLISH LITERATURE OF THE MIDDLE AGES (3). A survey of Old and Middle English literature exclusive of Chaucer. Old English texts and Middle English texts with difficult language are read in translation. For non-specialists. Kennedy, Wittig, Leinbaugh.
- 153 MEDIEVAL ROMANCE (3). British and continental Arthurian literature in translation from the early Middle Ages to Sir Thomas Malory. Kennedy.
- 154 NON-DRAMATIC LITERATURE OF THE ENGLISH RENAISSANCE (3). A survey of major non-dramatic genres and of about twenty authors from the period 1485-1605. *Fall*. Mills.
- 160 SEVENTEENTH-CENTURY LITERATURE (3). A survey of representative examples of English poetry and prose from Donne to Marvell. *Spring*. McQueen.
- 166 ENGLISH LITERATURE, 1660-1780 (3). A survey of English literature from Dryden to Burke. Though the emphasis falls on Swift, Pope, and Johnson, there will be a considerable amount of reading in minor authors who provide essential background for the period. *Fall*. Stumpf.
- 172 ROMANTIC LITERATURE (3). A survey of the major English Romantic writers, including Blake, Wordsworth, Coleridge, Shelley, Byron, Keats, with an introduction to the chief scholarly and critical problems in this period. *Fall or spring*. Kirkpatrick.
- 174 VICTORIAN LITERATURE (3). A survey of the major Victorian writers, such as Tennyson, Browning, Arnold, Carlyle, Mill, Ruskin, Dickens, Eliot. *Fall or spring*. Life.
- 181 AMERICAN LITERATURE TO 1900 (3). A survey of American authors and literary trends from the seventeenth through the nineteenth centuries, with emphasis on the works of Franklin, Irving, Cooper, Poe, Emerson, Thoreau, Hawthorne, Melville, Whitman, Dickinson, Mark Twain, James, and Crane. Bain, Rust.
- 184 AMERICAN NEGRO FICTION AND POETRY (3). An intensive study of either Negro fiction or Negro poetry aimed at some comprehension of Negro literature as a whole. Jackson.
- 186 FOLK NARRATIVE (3). An intensive study of myths, legends, and folktales (marchen, tall tale, animal tale, fable) with attention to their aesthetic and cultural applications. *Spring*. Zug.
- 187 FOLKLORE IN THE SOUTH (3). Exploration of folklore in the South, with emphasis on genres like tales, black and white spirituals, chanted sermons, work songs, blues, and dance music. Attention to social and historical backgrounds. *Spring*. Patterson.
- 188 SOUTHERN AMERICAN LITERATURE (3). The literature of the South, with special attention to the Southern Literary Renaissance of 1930-1950, Rubin.
- 190 ENGLISH AND AMERICAN LITERATURE OF THE TWENTIETH CENTURY (3). A survey of 20th-century British and American drama, poetry, fiction, and criticism.
- 195 BRITISH AND AMERICAN DRAMA OF THE TWENTIETH CENTURY (3). A survey of British and American drama, poetry, fiction, and criticism.
- 196 IMAGES OF WAR IN TWENTIETH CENTURY LITERATURE (Peace, War, Defense 196) (3). A study of literary works written in English and concerning World War I, the Spanish Civil War, and World War II. Texts include poems and memoirs by Graves, Sassoon, Owen, David Jones, T.E. Lawrence, E.E. Cummings, Keith Douglas, Alan Lewis, Evelyn Waugh, and novels by Hemingway, Dos Passos, Faulkner, and others. Ludington.

Courses for Graduates

- 237 OLD ENGLISH GRAMMAR AND READINGS (3). A study of grammar and phonology of Old English. Readings from Old English prose. An introduction to Old English versification. *Fall*. Wittig, Leinbaugh.

- 238 HISTORY OF THE ENGLISH LANGUAGE (3). Prerequisite, English 237. A study of the linguistic development of the sounds and vocabulary of English from 1000 to the present, with emphasis on the English language in America. *Spring*. Eble.
- 240 STUDIES IN BRITISH AND AMERICAN LITERARY CRITICISM (3). An examination of the major movements and figures in British and American literary criticism, together with attention to classical and continental influences. *Fall*. Hendrick, Rubin, Harmon, Thornton.
- 243 STUDIES IN THE ENGLISH NOVEL OF THE EIGHTEENTH CENTURY (3). An examination of representative novels by Defoe, Fielding, Richardson, Smollett, Sterne, Goldsmith and others. *Fall*. Strauss.
- 244 STUDIES IN THE ENGLISH NOVEL OF THE NINETEENTH CENTURY (3). Examination of the major 19th-century novelists, such as Austen, Scott, Dickens, Thackeray, Eliot, and Brontes, Trollope, Hardy, Meredith, with particular attention to problems of these and technique. *Fall*. Edge.
- 250 OLD ENGLISH LITERATURE: BEOWULF (3). Translation, interpretation and background of selected Old English poetry, including *Beowulf*. *Spring*. Wittig, Leinbaugh.
- 251a EARLY MIDDLE ENGLISH LITERATURE (3). Prerequisite, Old English. Close reading of Middle English texts before c.1300. For intending specialists in the medieval field.
- 251b MIDDLE ENGLISH LITERATURE TO 1400 (3). Prerequisite, a working knowledge of Middle English. Historical and critical study of Middle English literature with particular attention to the fourteenth century.
- 251c LATER MIDDLE ENGLISH LITERATURE (3). A historical and critical study which included consideration of medieval drama and the Scottish "Chaucerians".
- 252 CHAUCER (3). Critical and historical study of Chaucer's poetry.
- 254 STUDIES IN THE NON-DRAMATIC LITERATURE OF THE ENGLISH RENAISSANCE (3). Selected themes and authors from the period 1485-1605.
- 255 STUDIES IN ENGLISH DRAMA TO 1600 (3). Major figures and forms of medieval, Tudor, and Elizabethan drama exclusive of Shakespeare.
- 258 STUDIES IN SHAKESPEARE: THE EARLY PLAYS (3). The romantic comedies, the history plays, and the early tragedies.
- 259 STUDIES IN SHAKESPEARE: THE LATE PLAYS (3). The major tragedies, the problem plays, and the romances.
- 260 STUDIES IN ENGLISH LITERATURE, 1600-1660 (3). Studies in English poetry from 1600 to 1660.
- 261 STUDIES IN ENGLISH DRAMA, 1600-1642 (3). Jacobean and Caroline drama exclusive of Shakespeare, with emphasis upon Jonson, Webster, and Middleton.
- 264 STUDIES IN MILTON (3). A study of all of Milton's major poetry, of selected minor poems, and of selections from the prose.
- 265 RESTORATION AND EIGHTEENTH CENTURY DRAMA (3).
- 266 STUDIES IN ENGLISH LITERATURE, 1660-1740 (3). A study of the works of Dryden, Swift, and Pope. *Fall*. Haig.
- 267 STUDIES IN ENGLISH LITERATURE, 1740-1800 (3). A study of the major authors (exclusive of novelists and dramatists) of the later 18th-century. Authors considered are Gray, Collins, Boswell, Johnson, Goldsmith, Burke, Reynolds, and Gibbon. *Spring*. Strauss.
- 272 STUDIES IN ENGLISH LITERATURE, 1780-1832 (3). Sections: (1) Blake, Wordsworth, Coleridge; (2) Byron, Shelley, Keats. Examination of the major Romantic poets, supplemented by readings in other Romantic authors. *Fall, spring*. Fogle, Reed.

- 273 STUDIES IN VICTORIAN LITERATURE: PROSE (3). Examination of three major Victorian critics with regard to the issues they confront and the literary structure of their works. *Spring*. Shapiro.
- 274 STUDIES IN VICTORIAN LITERATURE: POETRY (3). Examination of the poetry of Tennyson, Browning, and Arnold. *Spring*. Shapiro.
- 280 STUDIES IN AMERICAN LITERATURE (3). An introduction to the emerging genres of American literature during the colonial and early national period, with an emphasis on prose narrative. Bain, Rust, Seelye.
- 281 STUDIES IN AMERICAN LITERATURE, 1830-1855 (3). Interpretation of selections from Emerson, Thoreau, Poe, Hawthorne, and Melville, with attention to these writers as American Romantics. Fogle.
- 282 STUDIES IN AMERICAN LITERATURE, 1855-1900 (3). A survey of American writing from 1855-1900, with emphasis on Whitman, Dickinson, Mark Twain, Henry James, and the local colorists. Rust.
- 283 STUDIES IN THE AMERICAN NOVEL (3). Historical survey of the American novel from its beginnings to the first World War, with some attention to the cultural and social conditions out of which it comes. Representative novels will be read to examine the history of genres, techniques, critical schools, and modes. Rubin, Rust.
- 288 THE DEVELOPMENT OF LITERATURE IN THE SOUTH (3). A study of important themes, motifs, social and historical relationships, and formal problems in the literature and life of the South from colonial times onward. Rubin.
- 290 STUDIES IN TWENTIETH CENTURY ENGLISH AND AMERICAN LITERATURE (3). Studies in special modern literary topics; e.g., the Irish literary renaissance, politics and the modern American novel, realism and fantasy in recent American fiction, cultural influences in modern American literature. Ludington, Raper, Thornton.
- 291 STUDIES IN RECENT ENGLISH AND AMERICAN CRITICISM (3). Usually taught as a survey of major types of modern literary criticism. Harmon, Hendrick, Rubin.
- 292 STUDIES IN ENGLISH AND AMERICAN POETRY OF THE TWENTIETH CENTURY (3). Usually taught as a survey of major poets: Yeats, Frost, Stevens, Williams, Pound, Eliot, Auden, with some more recent poets. Harmon, Lensing.
- 293 STUDIES IN ENGLISH AND AMERICAN FICTION OF THE TWENTIETH CENTURY (3). Usually taught as a survey of major writers: Joyce, Lawrence, Woolf, Hemingway, Faulkner, with some other writers. Harper, Thornton.
- 295 STUDIES IN ENGLISH AND AMERICAN DRAMA OF THE TWENTIETH CENTURY (3). Usually taught as a survey of major playwrights of the modern era, from the continental influences (Ibsen and Strindberg) to such contemporary figures as Pinter and Stoppard. Avery, King.
- 298 BIBLIOGRAPHY AND METHODOLOGY (3). An introduction to the materials and methods of research in literary study, and to that branch of literary study known as textual criticism. Required of all candidates for the M.A. and Ph.D. degrees.
- 343 SEMINAR IN THE ENGLISH NOVEL (3). Topics concerning major novelists and critical issues in the field of the novel. *Fall or spring*. Edge, Strauss, Thomson.
- 350 SEMINAR IN OLD ENGLISH LANGUAGE AND LITERATURE (3).
- 351 STUDIES IN MIDDLE ENGLISH LITERATURE (3). Seminars on particular authors and genres.
- 354 SEMINAR IN ELIZABETHAN LITERATURE (3). Selected topics in the non-dramatic literature of the English Renaissance.
- 358 SEMINAR IN SHAKESPEARE (3). Selected topics.
- 360 SEMINAR IN SEVENTEENTH CENTURY LITERATURE (3). Selected topics in the literature of the period 1600-1660.

- 366 SEMINAR IN EIGHTEENTH CENTURY LITERATURE (3).
- 372 SEMINAR IN NINETEENTH CENTURY ROMANTICISM IN ENGLAND (3). Topics concerning major authors and issues of the Romantic period. *Fall or spring*. Fogle, Reed.
- 373 SEMINAR IN VICTORIAN LITERATURE (3). Topics concerning major authors and issues of the Victorian period. *Fall or spring*. Shapiro, Thomson.
- 381 SEMINAR IN AMERICAN LITERATURE TO 1855 (3). Topics vary: e.g., New England response to American literary nationalism; Emerson; Hawthorne; Irving, Hawthorne and Poe and the development of the American short story. Fogle, Rust, Seelye.
- 382 SEMINAR IN AMERICAN LITERATURE, 1855-1900 (3). Topics vary: e.g., Native American humor, Whitman and Mark Twain.
- 383 SEMINAR IN THE AMERICAN NOVEL (3). Topics vary: e.g., Time, space, and history in the American novel; the literary artist as American. Rubin.
- 384 SEMINAR IN AMERICAN NEGRO LITERATURE (3). An exploration in depth of Black American poetry. Jackson.
- 388 SEMINAR IN SOUTHERN AMERICAN LITERATURE (3). Topics vary: e.g., Mark Twain, Southern literary identity, Southern literature of memory. Rubin.
- 390 SEMINAR IN TWENTIETH CENTURY LITERATURE, ENGLISH AND AMERICAN (3).
- 393 MASTER'S THESIS (3).
- 394 DOCTORAL DISSERTATION (3).
- 395 SEMINAR IN MODERN DRAMA (Dramatic Art 395) (3).
- 397 DIRECTED READINGS (3). Topics vary according to the needs and interest of the individual student and the professor directing the reading and writing project.
- 398 THE USE OF MIDDLE ENGLISH MANUSCRIPT MATERIALS (3). Prerequisite, a working knowledge of Middle English. Training in reading English vernacular hands of the Middle Ages, with an introduction to the theory and practice of textual criticism. Kane.
- Celtic INTRODUCTION TO OLD IRISH (3). Old Irish language and literature (600-900),
105 with the main emphasis on grammar; readings from selected Old Irish glosses (Strachan) and from Aislinge Oénguso (Shaw). *Fall*. O'Neill.
- Celtic MEDIEVAL WELSH I (3). An introduction to Medieval Welsh language and litera-
105A ture, with selected readings from the *Mabinogi* and the early nature poetry. From time to time as alternative to Celtic 105. *Fall*. O'Neill.
- Celtic OLD IRISH LITERATURE (3). Prerequisite, Celtic 105. Readings in genres of Old
106 Irish literature: *Stories from the Táin* (Strachan), *Críth Gablach* (Vinchy), *Cambrai Homily*, *Early Irish Lyrics* (Murphy), *Scéla Mucce Meic Dátho* (Thurneysen). *Spring*. O'Neill.
- Celtic MEDIEVAL WELSH II (3). Prerequisite, Celtic 105A. Selected readings from
106A Medieval Welsh poetry (*Cynfeirdd*, *Gogynfeirdd*, and *cywdd* poets), sagas (*Branwen*), and laws (*The Laws of Hywel Dda*). From time to time as alternative to Celtic 106. *Spring*. O'Neill.

CURRICULUM IN FOLKLORE

DANIEL W. PATTERSON, *Chairman*

Professors

JOHN GULICK	(3)	Social Organization, Urban Cultures, Middle East
DANIEL W. PATTERSON	(9)	Folksong, Southern Folklore, Folk Religion
JAMES LOWE PEACOCK	(10)	Culture Change, Symbolic Systems, Southeast Asia
JACK M. SASSON	(17)	Ancient Near East
RIA STAMBAUGH	(12)	German Volkskunde, Literary Relations
PETRUS W. TAX	(13)	German Volkslied, Literary Relations
RUEL W. TYSON JR.	(15)	Rhetoric and Ethics of Religion

Associate Professors

JULIA GORHAM CRANE	(1)	Field Methods, Social Organization, Caribbean
ROBERT EDWARD DANIELS	(2)	Social Anthropology, Culture and Personality, Africa
JOHN W. FLORIN	(16)	Population Geography, Medical Geography, and Historical Anglo-America
JACQUELYN HALL	(18)	American History, Southern Oral History
TRUDIER HARRIS	(19)	Afro-American Folklore and Literature
EDWARD DONALD KENNEDY	(6)	Medieval Romances, Arthurian Literature
AUGUSTIN MAISSEN	(7)	Spanish Folklore, Swiss Folklore
CHARLES GORDON ZUG	(14)	Folklore Theory, Folk Narrative, Material Folk Culture

This curriculum assembles the facilities of the University for those who desire a major or minor for the master's degree or a doctoral minor in folklore with a major in some related department. It uses the pertinent graduate instruction offered in such departments as Anthropology, English, Geography, Germanic Languages, History, Music, Religion, and Romance Languages. Students with an undergraduate major in any such department are eligible to take work in the folklore curriculum.

The resources of the University Library include books, periodicals, manuscripts and an Archive of sound recordings. These resources are strongest in folklore of the United States, especially the Southern region, and of the British Isles and West Africa.

The specialized research interests of the faculty indicate the lines along which students may pursue their research training most advantageously: the proverb, the ballad, the spiritual, folk music, the folktale, folklore of the South, the folklore of medieval Germanic literatures, folk religion, oral history, and material folk culture. Phonographic recording apparatus is

available on the campus, and the Southern region is one of the richest sections of the nation for the collection of folklore. All students in the program are expected to undertake some field work.

For complete course descriptions see the departmental course listings.

Courses for Graduates and Advanced Undergraduates

- 103 THEORY AND PRACTICE OF ORAL HISTORY: A FIELDWORK APPROACH (History 103) (3). *Fall*. Hall.
- 104 FOLK MUSIC OF EUROPE AND THE NEW WORLD (Music 104) (3). Not offered 1981-1982.
- 105 CELTIC: OLD IRISH (Linguistics 105) (3). *Fall*. O'Neill.
- 106 CELTIC: READINGS IN OLD IRISH (Linguistics 106) (3). *Spring*. O'Neill.
- 121 CULTURE AND PERSONALITY (Anthropology 121) (3). *Spring*. Daniels.
- 122 CULTURAL ANTHROPOLOGY (Anthropology 122) (3). *Spring*. Not offered 1981-1982.
- 123 MAGIC, RITUAL, AND BELIEF SYSTEMS (Anthropology 123) (3). *Spring*. Evens.
- 125 DEVELOPMENT OF ANTHROPOLOGICAL IDEAS (Anthropology 125) (3). *Spring*. Not offered 1981-1982.
- 126 AFRICA: PEOPLES AND CULTURES (Anthropology 126) (3).
- 129 SOUTHEAST ASIA: PEOPLES AND CULTURES (Anthropology 129) (3). *Spring*. Peacock.
- 132 LATIN AMERICAN CULTURES (Anthropology 132) (3).
- 133 THE PEOPLE OF THE CARIBBEAN (Anthropology 133) (3). *Fall*. Crane.
- 135 CONSCIOUSNESS AND SYMBOLS (Anthropology 135) (3). *Fall*. Peacock.
- 137 MODERN CULTURES OF THE MIDDLE EAST (Anthropology 137) (3). *Fall*. Gulick.
- 141 THE LITERATURE OF THE ANCIENT NEAR EAST (Religion 121) (3). *Spring*. Sasson.
- 146 INTRODUCTION TO FOLKLORE (English 146) (Comparative Literature 146) (Anthropology 146) (3). *Fall*. Zug.
- 147 BRITISH AND AMERICAN FOLKSONG (English 147) (3). *Fall*. Patterson.
- 148 TRADITIONAL CRAFTSMANSHIP (3). An introduction to material folk culture, the study of the origins and transmission, forms and construction, functions and meanings, of traditional architecture, arts, crafts, food, clothing, tools and technology. *Spring*. Zug.
- 153 MEDIEVAL ROMANCE (English 153) (3). *Fall*. Kennedy.
- 154 HISTORICAL GEOGRAPHY OF THE UNITED STATES (Geography 154) (3). *Fall*. Florin.
- 175 ETHNOGRAPHIC METHOD (Anthropology 175) (3). *Spring*. Crane.
- 184 LANGUAGE AND CULTURE (Anthropology 184) (3). *Fall*. Holland.
- 186 FOLK NARRATIVE (English 186) (3). *Spring*. Zug.
- 187 FOLKLORE IN THE SOUTH (English 187) (3). *Spring*. Patterson.
- 188 OBSERVATION AND INTERPRETATION OF RELIGIOUS ACTION (Religion 188) (Anthropology 188) (3). *Spring*. Not offered 1981-1982.
- 196 TOPICS IN FOLKLORE (3). *Fall*. Staff.
- 198 FIELD RESEARCH (3). *Fall and spring*. Staff.
- 199 DIRECTED READINGS IN FOLKLORE (3). *Fall and spring*. Staff.

Courses for Graduates

- 205 PEASANT SOCIETY AND CULTURE (Anthropology 205) (3).
- 218 THE SPANISH BALLAD (Spanish 218) (3).
- 270 GENERAL INTRODUCTION TO GERMAN VOLKSKUNDE (German 270) (3).
Spring. Tax.
- 297 THEORY AND METHODS OF FOLKLORE RESEARCH (3). An introduction to the history, theory, tools, and techniques of folklore research. *Spring. Staff.*
- 393 MASTER'S THESIS (3-6). Research in a special field under the direction of members of the staff. *Fall and spring.*
- 395 RESEARCH. *Fall and spring. Staff.*
- 400 GENERAL REGISTRATION (0).

CURRICULUM IN GENETICS

JOHN B. GRAHAM, *Chairman*

Professors

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|-------------------------|------|--|
| JOHN B. GRAHAM | (1) | Hereditary Diseases, Blood Coagulation, Population Dynamics |
| EDWARD G. BARRY | (17) | Microbial Genetics, Cytogenetics |
| KENNETH F. BOTT | (3) | Molecular Genetics, Control of Bacterial Sporulation, Gene Cloning |
| BRUCE K. ECKLAND | (19) | Social Stratification, Education and Population Genetics |
| MARSHALL H. EDGELL | (4) | Genetic Engineering, Molecular Genetics, Behavior Genetics |
| EDWARD GLASSMAN | (6) | Neurochemical Genetics |
| HARRY GOODER | (7) | Bacterial Genetics, Bacterial Cell Wall |
| GEOFFREY HAUGHTON | (9) | Transplantation Genetics |
| CLYDE A. HUTCHISON, III | (10) | Genetic Engineering, Molecular Genetics, Virus Structure |
| HENRY NEIL KIRKMAN | (11) | Human Biochemical Genetics |
| JOHN C. LUCCHESI | (13) | Functional Aspects of Chromosome Organization, Biochemistry of Development |
| WILLIAM S. POLLITZER | (14) | Anthropological Genetics, Human Population Genetics, Behavior Genetics |
| P. FREDERICK SPARLING | (30) | Bacterial Genetics |
| DARREL W. STAFFORD | (37) | Biochemistry of Development; Gene Control; Ribosomal Genes |
| MICHAEL R. SWIFT | (15) | Clinical, Mathematical and Cell Culture Genetics |

Associate Professors

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|------------------------|------|---|
| STEVEN L. BACHENHEIMER | (30) | Molecular Biology of Viruses |
| JACK GRIFFITH | (35) | Chromosome Structure: Viruses and their Host Cells |
| GUSTAVO P. MARONI | (23) | Biochemical Genetics, Genic Regulation, <i>Drosophila</i> |
| ANN G. MATTHYSSE | (24) | Molecular Biology of Plants |
| JOHN E. NEWBOLD | (20) | Molecular Virology, Molecular Biology of Mitochondria |
| GAIL T. WERTZ | (36) | Molecular Virology Virus; Host Cell Interaction |

Assistant Professors

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|-------------------------|------|---|
| PHILIP J. BASSFORD, JR. | (38) | Bacterial Genetics; Molecular Biology of Prokaryotic Membrane Biogenesis and Function |
| ELIZABETH FOWLER | (27) | Control of Gene Action, Membrane Receptors and Antigens |

ARTHUR H. LOCKWOOD	(32)	Protein Synthesis
PATRICIA F. MANESS	(41)	Biochemical Basis of Malignant Transformation
PATRICIA J. PUKKILA	(34)	Mechanism in Genetic Recombination; Eukaryotic Genome Organization
HOWARD M. REISNER	(25)	Immunogenetics of Human Plasma Proteins
MICHAEL D. TOPAL	(42)	Mutagenesis, Carcinogenesis

Adjunct Professors

FREDERICK J. DE SERRES	(16)	Microbial Genetics, Chemical and Environmental Mutagenesis, Mutagenicity of Carcinogens
JOHN W. DRAKE	(28)	Mutagenic Mechanisms
BURKE JUDD	(33)	Chromosome Organization; Gene Function and Regulation
ROBERT C. ELSTON	(5)	Statistical Genetics, Human Genetics, Behavior Genetics

Adjunct Associate Professors

BARRY W. GLICKMAN	(39)	Molecular Mechanism of Mutagenesis
MICHAEL A. RESNICK	(40)	Roles of various DNA Repair in Meiosis

Adjunct Assistant Professor

J. CARL BARRETT	(31)	Chemical Carcinogenesis, Mutagenesis of Mammalian Cells in Culture
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Clinical Assistant Professor

PHILIP D. BUCHANAN	(43)	Human Cytogenetics; Cell Culture Genetics
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Research Associate Professor

KADAMBARI K. NAMBOODIRI	(29)	Human Genetics, Quantitative and Behavior Genetics
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Genetics is one of the more rapidly developing fields of modern biology and basic to the understanding of many aspects not only of biology but also of medicine and the future of man. The Curriculum in Genetics was established to provide an integrated and interacting interdepartmental program of study leading to the Ph.D. degree in genetics. The courses open to the students are primarily those of the participating departments; the facilities as well as the talent of those departments are available to students in the Curriculum in Genetics. Types of research being conducted by faculty members of the Genetics Curriculum include bacterial and viral genetics, microbial genetics, mutagenesis, immunogenetics, human and medical genetics, cytogenetics, biochemical genetics, tissue culture, chromatin structure, behavioral genetics, anthropological genetics, develop-

mental genetics, statistical and population genetics, *Drosophila* genetics, cell biology, and molecular biology. (Although there is a research program of study in medical genetics, there is not a professional program in genetic counseling or medical genetics.) With a stable population, large families in earlier generations, and good records, the state of North Carolina is well-suited for the study of human family and population genetics.

Requirements for Admission for Graduate Work

Applications will be favorably considered from students with good academic records and interest in careers in genetic research. They should preferably have majored or minored in one of the following disciplines: genetics, biology (zoology or botany), bacteriology, chemistry, mathematics, physics, or biophysics. They should have taken calculus and organic and physical chemistry although these are not absolutely essential. Predoctoral applicants are accepted to begin their initial studies in August. They must apply to both the Graduate School and the Genetics Curriculum. Graduate Record Examination scores, transcripts of records, and *three* recommendations (submitted on the Graduate School official form) should be received soon after the application. Those persons whose application portfolio places them highest on the admission list will be asked to visit Chapel Hill for interviews. Students are encouraged to apply as early as possible, preferably before January. (Those applicants seeking a master's degree will not be considered for admission.)

Requirements for the Ph.D. Degree

Students may receive the Ph.D. degree either in Genetics or in one of the departments participating in the Curriculum. No minor is required for those majoring in Genetics; the requirements concerning a minor for those majoring in a department vary among the participating departments. Graduate students are expected to master one subdiscipline of genetics, but to be sufficiently versed in related aspects of that science. Students work under a research advisor of their choosing, assisted by other faculty members in closely allied branches of genetics.

The most important requirement is independent laboratory research leading to the dissertation. Written and oral examinations in the field of the major research interest are required.

Financial Aid

A limited number of NIH predoctoral fellowships are available; they carry stipends plus tuition and fees.

Genetics Club

This seminar provides a forum for persons interested in all phases of genetics. The club meets at 12:30 p.m. every Friday during the academic year. Seminars are presented by faculty, students, and invited speakers from other institutions.

Courses for Graduates and Advanced Undergraduates

- 105 MOLECULAR BIOLOGY (Biochemistry 105) (3). Prerequisites, Biochemistry 100 or equivalent. Mechanisms of replication, transcription, and translation of genetic material in prokaryotic and eukaryotic systems and gene sequence, organization, biochemical genetics, and regulatory mechanisms. *Three lecture hours a week, fall.* Holbrook (Coordinator).
- 106 MOLECULAR MECHANISMS IN BIOCHEMISTRY (Biochemistry 106) (3). Prerequisites, Biochemistry 100 or equivalent. An analysis of enzyme catalysis and related biological processes such as energy transfer in muscle contraction and regulatory mechanisms. *Three lecture hours a week, spring.* (1981 and alternate years.) Caplow, Jones, Wolfenden.
- 108 MOLECULAR AND CELLULAR BASIS OF MICROBIOLOGY (Bacteriology 105) (5). Prerequisites, organic chemistry, permission of department except for department majors. Basic concepts of the structure, metabolism, growth and reproduction, genetics and control and regulation of prokaryotes and single cell eukaryote systems. *Five lecture hours, fall.* Bachenheimer.
- 115 HUMAN GENETICS AND EVOLUTION (Anatomy 115, Anthropology 115) (3). Fundamental principles of genetics; population genetics; factors of evolution; race and species formation; evolution of primates and man. The interaction of genetics and culture in human behavior, society, and evolution. *Three lecture hours a week, spring.* Pollitzer.
- 122 HUMAN GENETICS (Zoology 122) (3). Prerequisite, Biology 53. Applications of traditional and contemporary methods of genetic analysis to matters of human concern; pedigree analysis, population genetics, tissue transplants, immunogenetics, somatic cell genetics, and recombinant DNA in medical applications. *Three lecture hours a week, fall or spring.* Maroni.
- 150 ELEMENTS OF PROBABILITY AND STATISTICAL INFERENCE (Biostatistics 150) (3). Prerequisite, integral calculus. Fundamentals of probability theory; descriptive statistics; fundamentals of statistical inference, including estimation and hypothesis testing. *Three lecture hours a week, fall.* Biostatistics Staff.
- 160A ADVANCED GENETICS: DEVELOPMENTAL (Zoology 160A) (3). Prerequisite, Biology 53. The genetic control and molecular basis of gene expression during development. *Three lecture hours a week, fall or spring.* Lucchesi.
- 160B ADVANCED GENETICS: MOLECULAR GENETICS OF EUKARYOTES (Zoology 160B) (3). Prerequisites, Biology 53 or permission of instructor. The physical and genetic organization of the genome of higher organisms. Gene expression and its regulation. Discussion of methodologies and specific examples. *Three lecture hours a week.* Maroni, Pukilla.
- 160L ADVANCED GENETICS LABORATORY (Zoology 160L) (3). Corequisite, Biology 53. Methods and techniques of developmental and biochemical genetics and cytogenetics. Each student will develop an individual project in the laboratory of one of the instructors. *Six laboratory hours a week, fall.* Lucchesi, Maroni, Pukilla.

- 164 MOLECULAR BIOLOGY (Zoology 164) (3). Prerequisite, Zoology 120 or 121; Chemistry 61, prerequisite or corequisite. The nature, production, and replication of biological compounds and their relation to structure and function in development. *Three lecture hours a week, spring.* Stafford.
- 169 INTRODUCTION TO HUMAN IMMUNOGENETICS (Pathology 169) (3). Prerequisite, permission of the instructor. A seminar course to familiarize participants with genetic systems defined in humans using immunological techniques. Includes discussion of methodology and its application to problems of interest to participants. *Three lecture hours a week.* Reisner.
- 170 MUTAGENESIS AND GENETIC TOXICOLOGY (Toxicology 170) (2). Prerequisite, course in general genetics and general biochemistry. A survey of basic mechanisms of mutagenesis, its impact on populations, mutagenicity screening systems and their deployment. *Two lecture hours a week, spring.* Drake, de Serres.
- 172 CYTOGENETICS (Botany 172) (3). Prerequisite, Genetics 113. Critical study of research papers concerned with the behavior and organization of chromosomes. *Spring.* (1982-1983 and alternate years.) Barry.
- 173 PLANT GENETICS AND SPECIATION (Botany 173) (3). Prerequisite, Genetics 113 (Biology 101) or permission of the instructor. Mendelian genetics of vascular plants, with emphasis on genetic phenomena characteristic of vascular plants and the role of heredity in biosystematics. *Three lecture hours a week, spring.* (1981-1982 and alternate years.) Parks.
- 180 STRUCTURE-FUNCTION OF DNA AS IT RELATES TO CELL PATHOLOGY (Pathology 180) (Biochemistry 180) (3). Prerequisite, Biochemistry course and permission of the instructor. The basic chemistry of DNA and its associated structural and replicative proteins as it relates to mechanisms of mutagenesis and carcinogenesis. *Three lecture hours a week, spring.* (1981-1982 and alternate years.) Topal.
- 190 EUKARYOTIC GENE ORGANIZATION (Bacteriology 190) (4). Prerequisite, Organic Chemistry, permission of instructor. Basic concepts of classical chromosomal structure, function and mechanics. Eukaryotic molecular genetics and cellular regulation will be emphasized. Readings, short answer examinations, term project. *Four lecture hours, fall.* Bachenheimer.
- 191 MECHANISMS OF EUKARYOTIC GENE CONTROL (Bacteriology 191) (3). Prerequisites, Bacteriology 190 and permission of instructor. Current research and possible new approaches to elucidating the mechanisms of eukaryotic gene control will be critically analyzed. *Three seminar hours, spring.* Fowler.
- 210 SEMINAR/TUTORIAL IN MICROBIAL CHEMISTRY AND GENETICS (Bacteriology 210) (3). One or two faculty and a small number of students will consider in depth current research of importance. Emphasis will be on current literature, invited speakers, etc., rather than textbooks. *Fall.* Hutchison.
- 222a HUMAN GENETICS AND CONSTITUTIONAL PATHOLOGY (Pathology 222) (3½). Prerequisite, permission of the instructor. Includes elementary statistics, basic genetic theory and relevant field work with persons, archives and census records. *Two conference and six laboratory hours a week.* (On occasion). Graham.
- 235 LEGAL ISSUES IN GENETICS AND MEDICINE (2-3). (Course is also open to law and medical students.) Prerequisite, permission of the instructor. The course examines the interfaces of law with medicine and genetics. Considers implications of medical records and data banks, informed consent, abortion, privacy, genetic engineering, etc. *Ten lecture hours a week, first summer session.* (On occasion). Shaw.
- 240 SPECIAL TOPICS IN GENETICS (2-4). Prerequisite, permission of the instructor. *Fall.* Staff.
- 241 SPECIAL TOPICS IN GENETICS (2-4). Prerequisite, permission of the instructor. *Spring.* Staff.

- 249 GENETICS OF COMMON DISEASES (Epidemiology 249) (3). Prerequisite, Biostatistics 150, Genetics 122 or Epidemiology 160, or permission of the instructor. Critical analysis of genetic issues in human disease. The genetics of cancer, heart disease, diabetes, mental illness, mental retardation, hypertension and arthritis will be covered. The application of genetic and epidemiological techniques will be examined. *Three lecture hours a week, spring.* Swift.
- 270 SEMINAR IN GENETICS (Zoology 270) (2). Prerequisite, permission of instructor. *Two seminar hours a week, fall and spring.* Lucchesi, Maroni, Pukkila.
- 275 GENETICS SYSTEMS (Bacteriology 275, Biochemistry 275, Botany 275, Pathology 275, Zoology 275) (3). An advanced course in genetics emphasizing the genetics and molecular biology of viruses, bacteria, fungi, insects and mammals and based upon the personal research of the staff. Required of all candidates for the degree in Genetics. *Fall.* (1982-1983 and alternate years.) Staff.
- 281 STATISTICAL METHODS IN HUMAN GENETICS (Biostatistics 281) (3). Prerequisite, permission of the instructor. An introduction to statistical procedures for genetic counseling, testing genetic hypotheses and estimating genetic parameters from human data. Topics covered include models for monogenic autosomal and X-linkage, mutation and selection, polygenic inheritance. Special emphasis will be given to segregation and linkage analysis. *Three lecture hours a week, spring.* (1982-1983 and alternate years.) Biostatistics staff.
- 305 RESEARCH IN GENETICS (3 or more). May be continued for credit two or more semesters. Hours and credit to be arranged. *Throughout the year.* Staff.
- 350 TRAINING IN GENETIC TEACHING (3). Prerequisites, two courses in genetics and permission of the instructor. Principles of genetic pedagogy. Students will be responsible for assistance in teaching genetics and will work under the supervision of the faculty with whom they will have regular discussion of methods, content and evaluation of performance. *Throughout the year.* Staff.
- 394 DOCTORAL DISSERTATION (3 or more). *Throughout the year.* Staff.
- 400 GENERAL REGISTRATION (0).

DEPARTMENT OF GEOGRAPHY

RICHARD J. KOPEC, *Chairman*

Professors

DAVID G. BASILE	(1)	Economic Geography, Latin America and Natural Resources
STEPHEN S. BIRDSALL	(5)	Transportation Geography, Social Geography and Africa
CLYDE E. BROWNING	(3)	Urban Geography and Quaternary Economic Geography
JOHN D. EYRE	(2)	Political Geography and Asia
RICHARD J. KOPEC	(4)	Climatology and Cartography
BARRY M. MORIARTY	(7)	Urban Geography, Economic Development, Industrial and Residential Location Theory

Associate Professors

JOHN W. FLORIN	(8)	Population Geography, Medical Geography, and Historical Anglo-American
MELINDA S. MEADE	(10)	Medical Geography, Population and Southeast Asia
PETER J. ROBINSON	(9)	Meteorology, Climatology and Soils Geography

Assistant Professors

ARTHUR J. HAWLEY	(6)	Food Resources, Water Resources and Remote sensing
G. JOSEPH MENELEY	(11)	Medical Geography, Location-Allocation Modelling, Geographic Methodology

The Department of Geography offers graduate work leading to the degrees of Master of Arts and Doctor of Philosophy. Faculty offices and some classroom facilities are located in Saunders Hall. An extensive sheet map collection is housed in the Geology Library and the Map Room of the main library. Library holdings in domestic and foreign geographical periodicals are strong.

Geographers are concerned with an analysis of the spatial aspects of cultural and physical phenomena, their interrelationships and their composite expression in the form of regions. They find employment in teaching and a number of professional and applied fields. Government agencies offer a variety of opportunities in such fields as cartography and map analysis, census work, air photo interpretation, resource and land-use surveys, and foreign area intelligence. Industrial concerns, banks, property development and management firms, research organizations, and federal, state, and municipal agencies employ sizeable numbers of geographers as

field investigators, location analysts, and planners. The expanding national recreation and travel fields also have job opportunities.

A student beginning graduate study in geography is normally required to hold a bachelor's degree in geography. However, a student who has achieved a good record as an undergraduate in another major field may, at the discretion of the department, be accepted for graduate study in geography. In such cases, some prerequisite course work is usually added to minimum M.A. requirements.

Graduate study is offered in a variety of systematic specialties. Under the guidance of an advising committee, students can select programs tailored to their interests from offerings within the department or from interdisciplinary curricula. Although the department stresses training in climatology, cartography, urban, economic, population and medical geography, students can elect topical and regional study programs from those listed under faculty specializations. Curriculum groupings are available which combine courses systematically related under such titles as Urban and Economic Locational Behavior, Population Problems, Health Ecology and Care, Physical Environment Research, Regional Development Studies, and Spatial Analysis Techniques. These groupings capitalize on courses of sister departments as well as those of nearby Duke University and North Carolina State University.

For the degree of Master of Arts a student must complete at least 30 hours of course work. Of this total a minimum of eighteen hours in geography (including Geography 190, 202, 393 and 1 seminar course) is required. The remaining courses (a minimum of six hours) must be taken outside of the department. The number and kind of such supporting courses will be established through consultation between the student and his or her graduate advisors.

For the degree of Doctor of Philosophy a student must complete at least 30 hours of course work (including Geography 202 and 3 seminars) in addition to Geography 394. The courses to be taken, in Geography or any other appropriate discipline, will be established through consultation between the student and his or her advisors. It is possible to do joint coursework leading to a Master of Public Health degree.

The student must demonstrate competence in a research skill, to be selected in consultation with the advisor. For the M.A., this requirement may be met by passing a reading examination in one foreign language (usually French, German, or Spanish); or by passing 2 courses, from a selected list, usually in Statistics, Mathematics or Computer Science, or Demography. Ph.D. students must demonstrate competence in two such skills.

Assistantships up to \$4,200 a year are available to qualified students. Duties consist primarily of preparation for and supervision of sections of introductory physical (Geography 38) and cultural (Geography 48) courses. Some additional funds (e.g., NSF and NDEA) are also available.

Courses for Graduates and Advanced Undergraduates

- 110 METEOROLOGY (3). Natural science credit. Prerequisite, Geography 38. Analysis of the weather elements in the atmosphere, emphasizing energy exchanges and controls, and the general atmospheric circulation. Observational techniques are considered and methods of weather prediction and control discussed. *Fall*. Robinson, Kopec.
- 112 MICROMETEOROLOGY (3). Natural science credit. Permission of instructor desirable. An introduction to the theory and practice of micrometeorology. Factors influencing rural environments are initially considered and agricultural problems emphasized. Man's role in changing both rural and urban microclimates is assessed. *Spring*. Robinson.
- 115 CLIMATOLOGY (3). Prerequisite, Geography 38 or permission of the instructor. A systematic-regional approach to the study of climates. Emphasis is given to the physical processes underlying the distributional patterns of climates and the impact of climate on social activity. *Spring*. Kopec, Robinson.
- 116 APPLIED CLIMATOLOGY (3). An investigation of the ways climatic information and techniques can be applied to societal problems, such as energy production, food production and health. Case studies utilizing North Carolina data will be discussed. *Fall*. Robinson, Kopec.
- 117 SOILS (3). Natural science credit. A study of the nature and geographic distribution of the soils of the world. *Three hours of lecture a week, in addition to field work, spring*. Robinson.
- 122 PHYSIOGRAPHY OF THE EASTERN UNITED STATES (3). Prerequisites, Geology 11, Geology 138, or permission of the instructor. Natural science credit. *Spring*.
- 132 THE WORLD'S FOOD SUPPLY (3). Can the world's growing population be fed? The answer is sought by examining (1) definitions of "food", (b) present world food-producing systems, and (c) problems in changing established food habits. *Fall*. Hawley.
- 143 ECOLOGICAL PLANT GEOGRAPHY (Botany 143) (3). Description of the major vegetation types of the world including their distribution, structure, and dynamics. The principle causes for the distribution of plant species and communities, such as climate, soils, and history will be discussed. *Spring*.
- 145 MEDICAL GEOGRAPHY (3). The human ecology of health is studied by analyzing the cultural/environmental interactions that lie behind world patterns of disease distribution, diffusion, and treatment, and the ways these are being altered by development. *Fall*. Meade.
- 148 FUNDAMENTAL CONCEPTS OF HUMAN GEOGRAPHY (3). A systematic study of the approaches, key concepts, and methods of human geography. Emphasis is given to the cultural landscape and location analysis within a thematic rather than a regional framework. *Spring*. Florin, Browning.
- 149 PROBLEMS IN AMERICAN SOCIAL GEOGRAPHY (3). A study of the spatial components of current social problems, such as poverty, race relations, environmental deterioration and pollution, and crime. *Fall or spring*. Birdsall; staff.
- 150 POPULATION GEOGRAPHY (3). A study of the spatial dimensions of population growth, density and movement and of the shifts in these patterns as they relate to changes in selected socio-economic and cultural phenomena. *Spring*. Florin, Birdsall, Meade.
- 151 URBAN GEOGRAPHY (3). A geographical study of the spatial structure and function of urban settlements. Emphasis is on the regional relations of cities and central place theory. *Spring*. Browning.

- 152 ECONOMIC GEOGRAPHY (3). An inquiry into the factors involved in the location of agriculture, manufacturing and central place activities within the context of population growth and economic development in different regions of the world. *Spring*. Moriarty, Basile, Meneley.
- 153 POLITICAL GEOGRAPHY (3). Geographic elements (nation formation; boundary, territorial and ethnic issues; and regional blocs) in contemporary international affairs. Case studies are in Eurasia and Africa. *Fall*. Eyre.
- 154 HISTORICAL GEOGRAPHY OF THE UNITED STATES (Folklore 154) (3). A study of selected past geographies of the United States with emphasis on the significant geographic changes in population, cultural, and economic conditions through time. *Fall*. Florin, Eyre.
- 156 NATURAL RESOURCES (3). An analysis of selected mineral and biological resources of the world with particular emphasis on the distribution, utilization, management policies and on their social and economic implications. *Spring*. Basile.
- 158 EUROPE TODAY (3). A survey by topic and country of Europe west of the Soviet Union. Those features that make Europe a distinct and important region today are emphasized. *Spring*. Hawley.
- 159 SOUTH AMERICA (3). A study of the resources and activities of continental South America and of those aspects of the physical and cultural environment which result in diversity as well as similarity. *Fall*. Basile, Browning.
- 160 MIDDLE AMERICA (3). An analysis of the environment, resources and activities of the mainland countries from Panama as well as the Caribbean islands. *Spring*. Basile, Browning.
- 161 THE SOUTH (3). Present-day southern United States, approached historically through a study of its physical, economic, and cultural environment. *Fall*. Browning.
- 166 EASTERN ASIA (3). Geographical structure of population, urbanization, agriculture, industrialization and regional links in China, Japan and Korea. *Fall*. Eyre.
- 167 TROPICAL ASIA (3). Geographical structure of population, urbanization, agriculture, industrialization and regional links in the nations of Southeast Asia and Southern India. *Spring*. Eyre, Meade.
- 168 AFRICA (3). Primary emphasis on the dynamic spatial organization of Africa south of the Sahara. Individual countries will be studied in view of their geographic characteristics and problems. *Spring*. Birdsall.
- 171 CARTOGRAPHY (3). Introduction to maps and map-making, stressing drafting and computer techniques, map design, and methods of representing data on maps. *One lecture and four laboratory hours a week, fall and spring*. Kopec.
- 172 ADVANCED CARTOGRAPHY (3). Prerequisite, Geography 171. Advanced study in map graphics. Application of graphic methods and material for illustrating spatial arrangements and relations of earth phenomena. *Fall*. Kopec.
- 173 COMPUTER CARTOGRAPHY (3). Introduction to computer graphics emphasizing the utility of the computer in cartography; the employment of current cartographic display hardware and software systems, and the application of computer mapping to geographic problems. *Spring or fall*. Kopec.
- 174 PROBLEMS IN CARTOGRAPHY (3). Mapping methods and techniques are applied to spatial problems. The utility of maps as problem-solving devices is emphasized. *Spring*. Kopec.
- 175 MEDICAL CARTOGRAPHY (3). Map graphics applied to problems in Medical Geography. Spatial analyses and planning in epidemiology and health delivery services through map applications are emphasized. *Spring or fall*. Kopec; staff.
- 178 INTERPRETATION OF AERIAL PHOTOGRAPHS (3). A fundamental review of the uses of aerial photographs in the social sciences. Emphasis is on detecting and identifying man-made objects on the earth's surface from the perspective of space. *Spring*. Hawley.

- 179 FIELD METHODS AND TECHNIQUES (3). The philosophy behind field study in geography and various techniques used to solve local sample problems are examined. Emphasis is on developing innovative approaches to problem solutions. *Fall*. Hawley.
- 183 INDUSTRIAL LOCATION (3). Factors in the regional location of manufacturing, location theory, measures of manufacturing, locational decision-making, and a survey of selected industries. *Fall*. Moriarty, Meneley.
- 185 TRANSPORTATION GEOGRAPHY (3). Transportation as a spatial factor in the economic and political integration of regions; also, regional variations in mode development, and application of transportation as a movement system. *Fall or spring*. Birdsall.
- 190 QUANTITATIVE METHODS IN GEOGRAPHY (3). Introduction to the application of statistical methods to geographic problems with some computer use in their solution. Attention given to analysis of areal data and areal sampling. *Fall*. Birdsall, Meneley.

Courses for Graduates

- 202 THE DESIGN OF GEOGRAPHIC RESEARCH (3). Basic elements of scientific inquiry, methods of spatial analysis, and selection and formulation of research topics. *Spring*. Birdsall.
- 205 ADVANCED QUANTITATIVE METHODS IN GEOGRAPHY (3). Application of selected multivariate statistical techniques to the analysis of geographic phenomena and problems. *Spring*. Moriarty, Meneley.
- 209 LOCATIONAL ANALYSIS OF HEALTH SERVICES (3). Examination of spatial components of the American Health Care Delivery System. Location and utilization decisions associated with personal health services, facilities, emergency services, and regionalization of services are examined in terms of both theoretical and empirical developments. *Spring*. Meneley.
- 211 SPECIAL WORK IN GEOGRAPHY (2 or more). Prerequisites, two courses in the one hundred bracket, or permission of the instructor. *On demand*. Staff.
- 251 URBAN MICROSPATIAL GEOGRAPHY (3). The course will analyze selected theories accounting for the spatial pattern of urban residential and non-residential land use. Analog growth and distribution models will be examined. *Fall*. Moriarty.
- 252 ADVANCED ECONOMIC GEOGRAPHY (3). Basile, Moriarty.
- 301 SEMINAR IN RURAL LAND USE (3). Basile, Hawley.
- 302 SEMINAR IN PRIMARY MATERIALS (3). Basile.
- 303 SEMINAR IN INDUSTRIAL LOCATION (3). Moriarty.
- 304 SEMINAR IN POLITICAL GEOGRAPHY (3). Eyre.
- 305 SEMINAR IN HISTORICAL GEOGRAPHY (3). Florin.
- 306 SEMINAR IN REGIONAL GEOGRAPHY (3). Staff.
- 307 SEMINAR IN URBAN GEOGRAPHY (3). Browning, Birdsall, Moriarty.
- 308 SEMINAR IN PHYSICAL GEOGRAPHY (3). Kopec, Robinson.
- 309 SEMINAR IN MEDICAL GEOGRAPHY (3). Meade, Florin, Meneley.
- 310 SEMINAR IN POPULATION GEOGRAPHY (3). Birdsall, Florin, Meade.
- 311 RESEARCH IN GEOGRAPHY (2 or more). *On demand*. Staff.

abcdefghi:

- a. Economic (Rural Land Use)
- b. Economic (Primary Materials)
- c. Economic (Industrial)
- d. Political
- e. Historical
- f. Regional

- g. Urban
- h. Physical
- i. Cartography

- 393 MASTER'S THESIS (3 or more). *Fall and spring*. Members of the graduate faculty.
- 394 DOCTORAL DISSERTATION (3 or more). *Fall and spring*. Members of the graduate faculty.
- 400 GENERAL REGISTRATION (0).

DEPARTMENT OF GEOLOGY

PAUL D. FULLAGAR, *Chairman*

Professors

J. ROBERT BUTLER	(1)	Igneous-Metamorphic Petrology
JOHN M. DENNISON	(2)	Paleozoic Stratigraphy
PAUL D. FULLAGAR	(4)	Isotope Geochemistry, Geochronology
ROY L. INGRAM	(5)	Sedimentation, Clay Mineralogy
A. CONRAD NEUMANN	(16)	Geologic Oceanography
JOHN J.W. ROGERS	(13)	Igneous Petrology, Crustal Evolution
JOSEPH ST. JEAN, JR.	(9)	Micropaleontology, Invertebrate Paleontology
DANIEL A. TEXTORIS	(11)	Sedimentary Petrology, Carbonates
WALTER H. WHEELER	(12)	Mesozoic-Cenozoic Stratigraphy

Associate Professors

JOSEPH G. CARTER	(15)	Paleoecology, Invertebrate Paleontology
P. GEOFFREY FEISS	(14)	Economic Geology
CHRISTOPHER S. MARTENS	(7)	Chemical Oceanography

Assistant Professors

JOHN M. BARTLEY	(19)	Structural Geology, Tectonics
LARRY K. BENNINGER	(17)	Geochemistry
ALLEN F. GLAZNER	(20)	Igneous Petrology
CHRISTINE A. POWELL	(18)	Geophysics, Seismology
RICHARD A. STRELITZ	(21)	Geophysics, Seismology

Emeritus Professor

WILLIAM A. WHITE

The Department of Geology offers graduate work leading to the degrees of Master of Science and Doctor of Philosophy. The Department of Geology also participates in the interdepartmental curricular program in Marine Sciences. Graduate students working for graduate degrees in Marine Sciences must meet the specific requirements of the Curriculum rather than those of the Department of Geology.

Admission and General Degree Requirements

Students applying for admission to graduate studies normally should have completed an undergraduate degree with a major in geology. Students with majors in other sciences, or engineering, or mathematics are given equal consideration for admission; however, such students should expect to spend one or more semesters taking basic geology courses for which graduate credit cannot be given.

All applicants must take the Graduate Record Examination. All foreign students whose native language is not English must also take the TOEFL examination.

Course requirements for all graduate degrees are determined for each student by the student's faculty committee. Specific requirements are varied to meet the needs and career objectives of the individual. All students must have had, or must take, physical geology, historical geology, elementary mineralogy, elementary petrology, structural geology, one year of college physics, mathematics through integral calculus, and a geology field course or equivalent professional field experience. Approval of the equivalent professional field experience must be given by the geology faculty.

All new graduate students must take a general written examination early in the first semester of residence. This examination covers subject matter normally given in basic courses in undergraduate geology curricula. The purpose of this examination is to assist the student and his advisor in course selection by identifying significant weaknesses in a person's previous training.

Master of Science

Requirements for the Master of Science degree are: general written examination; 30 semester hours, 6 of which may be credit for thesis; a written comprehensive examination taken after most of the course work has been completed; a thesis; and a final oral examination in defense of the thesis.

Doctor of Philosophy

Normally a person must have completed a master's degree before being admitted to the doctoral program. A person may be permitted to by-pass the master's degree after one year of residence upon demonstration of superior scholastic performance and research potential, recommendation of the person's graduate committee, and approval by the geology faculty.

Admission to the Ph.D. program after completing the M.S. degree in our department requires the approval of the geology faculty.

Requirements for the Ph.D. are: general written examination; a minimum of 45 semester hours of graduate credit (which includes 30 hours for M.S. degree), plus 3 to 15 hours credit for the dissertation; reading knowledge of one foreign language specified by the student's committee; a written comprehensive examination and an oral comprehensive examination taken after most of the formal course work has been completed; a dissertation; and a final oral examination in defense of the dissertation.

Facilities and Research Interests

The Department of Geology occupies the 50,000 square feet of floor space in Elisha Mitchell Hall constructed in 1963. The departmental library contains over 39,000 volumes and over 97,000 maps, and regularly receives 700 serial publications.

Laboratory equipment and special apparatus available include: seismological station; magnetometer; gravimeter; electrical resistivity apparatus; portable seismographs; teletype link to the North Carolina Research Triangle computer complex; minicomputer data-processing facility; solid-source mass spectrometer; X-ray diffractometer and spectrograph; alpha-ray spectrometer; gamma-ray spectrometer; console densitometer; magnetic mineral separator; petrographic, ore, and binocular microscopes; heating/freezing stage; universal stages; cathode luminescence; thin-sectioning and polishing equipment; outboard motor boats (14 ft. and 19 ft.); spectrophotometers; atomic absorption spectrophotometers; automatic titrator; photofluorometer; flame photometer; copy cameras; photomicrographic equipment, and a well-equipped darkroom; drafting and light tables; map-enlarging and reducing equipment; surveying equipment; and field vehicles.

The staff is prepared to direct the study and research of graduate students in: igneous and metamorphic petrology; geochemistry, economic geology, stratigraphy, paleontology and micropaleontology, paleoecology, sedimentation and clay mineralogy, geophysics (especially seismology), marine geology, structural geology, mineralogy, sedimentary petrology, isotope geology, and geochronology.

Financial Aid

About 23 graduate and teaching assistantships paying \$4400-\$4700 per school year (1981-1982 stipends) are available to graduate students. Some research assistantships supported by faculty research grants are available.

Graduate students in geology are considered by the Graduate School for several kinds of nonservice and limited-service fellowships. It is not necessary to apply for these as superior students recommended by the department are given full consideration by the Graduate School.

Application forms for admission and financial aid may be obtained from the Director of Graduate Admissions, Department of Geology 029A, University of North Carolina, Chapel Hill, NC 27514. To be considered for financial aid for the fall semester, applications must be completed by February 1.

Courses for Graduates and Advanced Undergraduates

- 102 MINERALOGY (4). Prerequisites, Chemistry 11 and Geology 11 or 41, or permission of the instructor. Study of minerals: crystals, chemistry, physical and optical properties, occurrences, uses. *Three lecture and three laboratory hours a week, fall.* Fullagar.
- 103 IGNEOUS AND METAMORPHIC ROCKS (4). Prerequisite, Geology 42 or 102, or permission of the instructor. This course is an introduction to the characteristics, nomenclature and origin of igneous and metamorphic rocks. The objectives are to learn to classify rocks, mainly on the basis of hand-specimen observations, and to interpret their genesis and history. *Three lecture and three laboratory hours a week, spring.* Butler, Glazner.
- 105 SEDIMENTARY ROCKS (2). Prerequisite, Geology 102 or permission of the instructor. Megascopic, and introduction to microscopic, description, classification, and origin of sedimentary rocks. *One lecture and two laboratory hours a week, spring.* Textoris, Ingram.
- 114 STRUCTURAL GEOLOGY (4). Prerequisite, Geology 11 or 41 and Mathematics 30, or equivalent. Mechanics, geometry, and occurrence of structural deformation of geologic materials. *Three lecture and three laboratory hours a week, fall.* Bartley.
- 115 ECONOMIC GEOLOGY (4). Prerequisites, Geology 103, 105, and 114. An introduction to metallic ore deposits. Emphasis is placed on their description, origin and distribution. *Three lecture and two laboratory hours a week, fall.* Feiss.
- 118 SEDIMENTATION (3). Prerequisite, Geology 105. Environments of deposition of sedimentary rocks. *Fall.* Ingram.
- 128 SUMMER FIELD COURSES IN GEOLOGY (4 each). Prerequisites, Geology 103.
- 129 105, 114. Six-week field course in geology emphasizing memory skills and field methods. *Equivalent to eight hours a week for one semester, first summer session only.* Staff.
- 132 INVERTEBRAE PALEONTOLOGY (4). Prerequisite, Geology 42 or the permission of the instructor. A survey of the major invertebrate phyla represented in the geologic record, with emphasis on basic skeletal morphology, classification, paleoecology, and biostratigraphic index genera. *Three lecture and three laboratory hours a week, fall.* St. Jean.
- 135 STRATIGRAPHY (3). Prerequisite, Geology 42 or 105 or 118. Principles of stratigraphy as demonstrated by classic examples from the geology of the United States. *Spring.* Wheeler, Dennison.
- 135L STRATIGRAPHY LABORATORY (1). Prerequisite or corequisite, Geology 135. Methods of showing columnar and stratigraphic sections. Applications of stratigraphy to interpretation of geologic maps. *Two laboratory hours a week, spring.* Wheeler, Dennison.
- 138 GEOMORPHOLOGY (3). Prerequisite, Geology 11 or 41. The origin of landforms. Includes those formed by weathering, mass wasting, streams, dissolution of limestone, coastal processes, glaciation, and wind. *Fall.* Dennison.
- 138L GEOMORPHOLOGY LABORATORY (1). Prerequisite or corequisite, Geology 138. *Two laboratory hours a week, fall.* Dennison.
- 142 GEOPHYSICS (3). Prerequisites, Physics 24, 25. Elementary seismic, gravity, magnetic and electric theory; earthquakes, gravity of the earth, geomagnetism, and telluric currents; seismic gravity, magnetic, electrical, and radioactivity prospecting and instrumentation. *Fall.* Powell.
- 142L GEOPHYSICS LABORATORY (1). Prerequisite or corequisite, Geology 142. *Three laboratory hours a week, fall.* Powell.

- 145 GEOCHEMISTRY (3). Prerequisites, Geology 11 or 41, Chemistry 21, or permission of the instructor. Introduction to the application of chemical principles to geological problems, with emphasis on isotope methods and elementary applications of thermodynamics. *Three lecture hours a week, spring.* Benninger.
- 146 PHYSICAL GEOCHEMISTRY (4). Prerequisites, Geology 145, Mathematics 32, or permission of the instructor. An introduction to physical geochemistry and chemical thermodynamics with special emphasis upon geological applications. *Three lecture and three laboratory hours a week, fall.* Benninger.
- 148 OPTICAL MINERALOGY (4). Prerequisites, Geology 102, 103, 105. Introduction to basic optical techniques of the petrographic microscope for identification of rock-forming minerals. *Two lecture and six laboratory hours a week, fall.* Butler.
- 151 GEODYNAMICS (3). Prerequisites, Geology 11 or 41, Mathematics 32, Physics 24, 25, Chemistry 21. Interior of the earth deduced from seismology, gravity, heat flow, magnetism; geophysics of continents and ocean basins; age of earth. *Fall.* Rogers.
- 162 ENERGY RESOURCES (3). Prerequisites, Geology 11 or 41, 42, or 135. Geology of oil, natural gas, uranium, hydropower, and geothermal energy. *Spring.* (1983-1984 and alternate years.) Dennison.
- 162L ENERGY RESOURCES LABORATORY (1). Prerequisite or corequisite, Geology 162. Laboratory problems and field trips related to Geology 162. *Three laboratory hours a week, spring.* (1983-1984 and alternate years.) Dennison.
- 165 GROUNDWATER GEOLOGY (3). Prerequisites, Geology 11 or 41, and Physics 24, 25. (Not offered 1982-1983.)
- 173 IGNEOUS AND METAMORPHIC PETROLOGY (4). Prerequisites, Geology 103, 148. Origin of magmas and evolution of igneous and metamorphic rocks, combined with petrographic study of selected suites and individual examples. *Two lecture and six laboratory hours a week, spring.* Butler.
- 176 VERTEBRATE PALEONTOLOGY (3). Prerequisite, Geology 42 or Zoology 41. Vertebrate fossil finds and their bearings on our understanding of vertebrate evolution. Some emphasis given to dinosaurs and primates. *Spring.* (1982-1983 and alternate years.) Wheeler.
- 180 GRAVITY AND MAGNETICS (4). Prerequisites, Mathematics 34, Physics 52 and 58. The study of the potential fields generated by density and magnetic susceptibility anomalies. Emphasis will be on the development of the analytical tools from first principles. Topics covered include multipole expansions, conversion to and from two dimensional profiles, pre-processing of data, and profile inversion. *Spring.* (1982-1983 and alternate years.) Strelitz.
- 185 SOLID EARTH GEOPHYSICS (3). Prerequisites, Mathematics 34, Physics 52. Treatment of the earth and its elastic, mechanical and thermal properties. Topics include the relationships between ray theory, wave theory and normal modes, earthquake sources and seismicity, anelasticity both in a microscopic and macroscopic level, and the role of convection in the Earth. Emphasis will be on the development of the techniques and their relationships through time. *Spring.* (1983-1984 and alternate years.) Powell.
- 188 GEOLOGICAL OCEANOGRAPHY (Marine Science 103) (4). Prerequisites, Geology 11 or 41, 42. The origin and bathymetry of ocean basins, the nature and history of deep-sea sedimentation, the structure and sediments of continental margins and the dynamic geomorphology of the coastal zone. Field trip to Outer Banks. *Three lecture and two laboratory hours a week, fall.* Neumann.
- 197 PALEOBOTANY (Botany 181) (5). Prerequisite, Botany 11 or Biology 21-21L, or permission of the instructor. An introduction to the morphology, stratigraphic occurrence, and evolutionary relationships of fossil plants. Both macrofossils and microfossils will be considered. *Two lecture and six laboratory hours a week, spring.* Gensel. (1982-1983 and alternate years.)

- 199 SPECIAL PROBLEMS IN GEOLOGY (1-4). Registration requires the approval of the department chairman. *Fall and spring*. Staff.

Courses for Graduates

- 201 PALEOZOIC STRATIGRAPHY (4). Prerequisites, Geology 132, 135. Paleozoic stratigraphy of United States, emphasizing facies, eustatic sea level changes, paleoclimatology, and sedimentary tectonics. A regional stratigraphic mapping project reconstructs sedimentary tectonics for a small interval of Paleozoic time. *Spring*. Dennison. (1982-1983 and alternate years.)
- 202 MESOZOIC-CENOZOIC STRATIGRAPHY (3). Prerequisites, Geology 132, 135. The Mesozoic-Cenozoic strata of the United States and their geologic settings. Triassic of eastern United States especially considered. Coastal plain of eastern U.S. omitted (see Geology 215). *Fall*. Wheeler. (1982-1983 and alternate years.)
- 202L MESOZOIC-CENOZOIC STRATIGRAPHY LABORATORY (1). Prerequisite or corequisite, Geology 202. *Fall*. Wheeler and Carter. (1982-1983 and alternate years.)
- 206 MARINE PALEOECOLOGY (4). Prerequisite, Geology 42 or 132, or equivalent. Principles and applications of paleoenvironmental analysis based on faunal content of sediments, including animal-sediment relationships, trace fossils, life habits of marine invertebrates, and analysis of marine benthic communities. *Spring*. Carter. (1982-1983 and alternate years.)
- 208 PALEOZOIC PALEONTOLOGY (4). Prerequisites, Geology 132, 135, or permission of the instructor. Evaluation of biostratigraphic techniques for chronoresolution in Paleozoic strata. Survey of important megain vertebrate index fossils. Term project with field collections investigates a selected correlation problem. *Spring*. Dennison. (1983-1984 and alternate years.)
- 212 MICROPALAEONTOLOGY I (4). Prerequisite, Geology 132 or permission of the instructor. Morphology, taxonomy, biostratigraphy, and paleoecology of the non-foraminiferian microfossils, including diatoms, dinoflagellates, coccoliths, spores and pollens, ebridians, chitinozoa, rudiolaria, tintintids, ostracodes, and conodonts. *Three lecture and three laboratory hours a week, spring*. (1983-1984 and alternate years.) St. Jean.
- 213 MICROPALAEONTOLOGY II (4). Prerequisite, Geology 132 or permission of the instructor. An in-depth study of the biology and paleontology of the Foraminiferida with emphasis on interpretative micropaleontology. *Three lecture and three laboratory hours a week, fall*. (1982-1983 and alternate years.) St. Jean.
- 215 COASTAL PLAIN GEOLOGY (3). Prerequisites, Geology 103, 105, 107. Stratigraphy, geomorphology, and structure of Coastal Plain from New Jersey to the Mississippi River. Course includes lectures, readings, and field trips. *Fall*. (1983-1984 and alternate years.) Wheeler.
- 221 SEDIMENTARY PETROLOGY (4). Prerequisites, Geology 105, 118, and 148, or permission of the instructor. Detailed microscopic studies of the description, classification, diagenesis, and origin of sedimentary rocks. *Three lecture and three laboratory hours a week, fall*. (1983-1984 and alternate years.) Textoris.
- 223 MARINE CARBONATE ENVIRONMENTS (4). Prerequisite, permission of the instructor. Chemical and biological origins of calcium carbonate, skeletal structure, and chemo-mineralogy, preservation and early diagenesis are studies in a variety of deep and shallow environmental settings, in order to understand limestone origin and carbonate facies variability. Field trip to Florida, Bahamas, or Bermuda. Lab exercises. *Three lecture and three laboratory hours a week, spring*. (1983-1984 and alternate years.) Neumann.
- 224 CARBONATE FACIES (3). Prerequisite, Geology 221 or permission of the instructor. Various aspects of the formation of limestone and dolostone, as determined by

- regional basin analysis coupled with the study of microfacies. *Fall*. (1982-1983 and alternate years.) Textoris.
- 225 CLASTIC FACIES (4). Prerequisite, Geology 118. Procedures in sedimentology. Detailed study of selected topics in clastic sedimentology. *Three lecture and three laboratory hours a week, spring*. (1983-1984 and alternate years.) Ingram.
- 227 CLAY MINERALOGY (4). Prerequisites, Geology 103 and 105. Includes X-ray diffraction studies of clay minerals. *Two lecture and four laboratory hours a week, spring*. (1982-1983 and alternate years.) Ingram.
- 236- GEOLOGICAL RESEARCH TECHNIQUES (1-4). Prerequisite, permission of the
237 instructor. An introduction to methods of obtaining, analyzing, and presenting geologic and paleontologic data. *Fall and spring*. Staff.
- 246 ADVANCED MINERALOGY (3). Prerequisites, Geology 102, 148, or permission of the instructor. Crystal chemistry, solid solution; synthesis, stability and occurrence of rock-forming minerals. *Fall*. (1982-1983 and alternate years.) Glazner.
- 250 MARINE AND SURFICIAL GEOCHEMISTRY (3). Prerequisites, Marine Science 105 or Geology 145 or Environmental Science 122 or Chemistry 180 and 181. Low temperature geochemical processes occurring in marine environments; sediment-water interactions, kinetics of chemical processes, results of organic material degradation, and mineral-water equilibria are emphasized. *Spring*. (1982-1983 and alternate years.) Martens.
- 257 ISOTOPE GEOCHEMISTRY (3). Prerequisites, Geology 102, 103, 105 and Chemistry 21. Survey of isotopic studies in geology; geochronology, crustal evolution, heat flow, paleotemperatures, origin of ore deposits. *Spring*. (1983-1984 and alternate years.) Fullagar.
- 264 IGNEOUS PETROLOGY (4). Prerequisites, Geology 148, 173. Studies in the origin, evolution, and emplacement of igneous rocks, using experimental, field, petrographic and chemical data. *Two lecture and six laboratory hours a week, spring*. (1983-1984 and alternate years.) Glazner.
- 265 METAMORPHIC PETROLOGY (4). Prerequisites, Geology 148, 173. Studies in the occurrence of metamorphic rocks in orogenic belts and their mineralogical, textural, and structural evolution. *Two lecture and six laboratory hours a week, fall*. (1983-1984 and alternate years.) Butler.
- 272 METALLIC ORE DEPOSITS (4). Prerequisites, Geology 115 or equivalent and Geology 146. An introduction to modern theories of ore genesis. Topics to be discussed include thermodynamic of aqueous sulfide systems, geothermometry, and geobarometry, stable and radiogenic isotopes, litho-geochemistry and the distribution of metals in the earth's crust. Laboratory will emphasize ore microscopy. *Three lecture and three laboratory hours a week, spring*. (1983-1984 and alternate years.) Feiss.
- 280 GEOPHYSICAL DATA ANALYSIS (3). Prerequisites, Mathematics 34, Physics 52, 58 and knowledge of linear algebra and differential equations. A study of reflection seismic data and how it is analyzed. The course combines techniques from seismology (wave and ray propagation in heterogeneous media with attenuation), statistical communications theory (Weiner and optional filters) and information theory (resolution and accuracy trade-offs). *Fall*. (1983-1984 and alternate years.) Strelitz.
- 281 APPLIED GEOPHYSICS: REFLECTION SEISMOLOGY (4). Prerequisites, Physics 24 and 25, Mathematics 32 and 33, or permission of the instructor. Time and frequency domain analysis of reflection records; synthetic seismograms and seismic stratigraphy; interpretation of reflection records in terms of geological structure. *Three lecture and two laboratory hours a week, spring*. (1982-1983 and alternate years.) Powell.
- 282 STRUCTURAL ANALYSIS (3). Prerequisites, Geology 114, 173. Geometrical properties and mechanical significance of rock fabrics; kinematic analysis of geologic structure. *Fall*. (1983-1984 and alternate years.) Bartley.

- 301 SEMINAR (1 or more). Will be offered as required. Staff.
301 SEMINAR IN STRATIGRAPHY (1 or more). Will be offered as required. Staff.
306 SEMINAR IN PALEOECOLOGY (1 or more). Will be offered as required. Staff.
310 SEMINAR IN PALEONTOLOGY (1 or more). *Fall*. 1982-1983 and as required.)
Carter.
320 SEMINAR IN SEDIMENTOLOGY (1 or more). Will be offered *Spring*. 1983 and
Fall, 1983 and as required. Staff.
345 SEMINAR IN GEOCHEMISTRY (1 or more). Will be offered as required. Staff.
357 SEMINAR IN ISOTOPE GEOLOGY (1 or more). Will be offered as required. Staff.
360 SEMINAR IN PETROLOGY (1 or more). Will be offered as required. Staff.
372 SEMINAR IN ECONOMIC GEOLOGY (1 or more). *Spring*. (1982-1983 and as
required.) Feiss.
380 SEMINAR IN GEOPHYSICS (1 or more). *Fall*. (1983-1984 and and as required.)
Strelitz.
381 SEMINAR IN SEISMOLOGY (1 or more). *Spring*. (1982-1983 and as required.)
Powell.
382 SEMINAR IN STRUCTURAL GEOLOGY (1 or more). *Fall*. (1982-1983 and as
required.) Bartley.
383 SEMINAR IN TECTONICS (1 or more). *Spring*. (1982-1983 and as required.)
Rogers.

Research Courses

- 392 RESEARCH IN GEOLOGY (2 or more).
393 MASTER'S THESIS (3 or more).
394 DOCTORAL DISSERTATION (3 or more).
400 GENERAL REGISTRATION (0).

DEPARTMENT OF GERMANIC LANGUAGES

SIDNEY R. SMITH, *Chairman*

Professors

RICHARD H. LAWSON	(12)	Germanic Linguistics, Twentieth Century Literature
SIEGFRIED MEWS	(5)	Nineteenth and Twentieth Century Literature, Comparative Literature
CHRISTOPH E. SCHWEITZER	(2)	Baroque, Eighteenth Century Literature, Goethe
SIDNEY R. SMITH	(6)	Germanic Linguistics, Scandinavian Languages
RIA STAMBAUGH	(3)	Late Medieval, Reformation, Folklore
PETRUS TAX	(4)	Old High and Middle High German Literatures, Netherlandic Language and Literature

Associate Professor

WALTER K. FRANCKE	(9)	Medieval German Literature, Modern German Literature, Pedagogy
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Assistant Professors

CRAIG MELCHERT	(16)	Indo-European Linguistics, Sanskrit
DAVID PIKE	(15)	Twentieth Century Literature, Literature and Politics
MARILYN SCOTT	(13)	Nineteenth and Twentieth Century Literature, German Lyric

Visiting Lecturer

HARRY BERGHOLZ	(11)	Nineteenth and Twentieth Century Scandinavian and German Literature
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Emeritus Professors

WERNER PAUL FRIEDERICH
JOHN G. KUNSTMANN

The Department of Germanic Languages offers a diversified graduate program leading to the Master of Arts and the Ph.D. degrees. Teaching and research interests of the faculty cover a wide spectrum within the discipline, providing students with opportunities to pursue interests in literature, historical linguistics, *Volkskunde*, Dutch, and Scandinavian studies. Students are exposed to a variety of approaches during their studies in the Department.

Candidates for the degree of Master of Arts normally take their entire program within the Department of Germanic Languages, with emphasis on either literature or linguistics. With special permission a student may minor in a second subject if it bears some reasonable relationship to Germanic Languages. Candidates for the degree of Doctor of Philosophy may take all twenty-one courses within the Department, or they may choose to take four or five of these in related fields. This flexibility allows for interdisciplinary specialties such as Medieval Studies, Comparative Literature, and Linguistics. Courses taken for the M.A. degree count toward the requirements for the Ph.D. Candidates for the M.A. and Ph.D. must certify a reading knowledge of French; candidates for the Ph.D. must also demonstrate a knowledge of Latin (or another language, if more appropriate for dissertation research). Prospective students should write to the Chairman with a request for the publication "Instructions for Graduate Students," which contains important information supplementary to what is found in this catalogue.

The goals of the program include helping the student to achieve competence in the German language, familiarity with representative literary works of various periods, greater awareness of new ideas and approaches, well-developed critical judgment, mastery of research tools, and solid competence as a teacher of German. Graduate students participate in a rigorous teaching methods course during their first year of teaching and are supervised and observed throughout their teaching appointment in the Department. Students are expected to demonstrate professional commitment by participating fully in Department events, including lectures, activities of the German Club (Delta Phi Alpha), and other programs of the Department.

The University Library has excellent holdings in German literature and language, with further materials available from the nearby Duke University Library (especially valuable for the Jantz Collection of Baroque literature). The Language Laboratory has not only instructional tapes but also much other recorded material such as German plays, German songs, and recordings of German dialects. A good collection of basic reference works and standard editions is available to students in the departmental Reading Room.

Since 1949 the Department has been publishing a monograph series entitled *The University of North Carolina Studies in the Germanic Languages and Literatures*. In its approximately one hundred volumes the results of research in a wide range of specialties in Germanic studies are made available to an international community of scholars. In addition to an ample number of Teaching Assistantships the Department offers annually its distinguished Kent James Brown Fellowship to qualified first-year students, and it provides generous Dissertation Year Fellowships to advanced doctoral students who need to pursue research in Europe or elsewhere.

In the following course listings the designation *fall* and *spring* is given if the course is taught on a completely predictable schedule. If no such designation is indicated, the course in question will be taught on demand or according to a regular rotation system within the Department, so that most such courses will be available approximately in alternate years. Students should consult the Department chairman for projected course schedules.

Courses without Credit for Graduate Students

- 101X ELEMENTARY GERMAN FOR GRADUATE STUDENTS (3). These courses are designed as a preparation for the reading knowledge examination for higher degrees. Passing of the examination at the end of 102X will certify that this requirement has been satisfied, although the course will not count for graduate credit. *Three hours a week, fall and spring.* Smith; instructors. (NOTE: 101X is *not* a prerequisite for 102X.)

Courses for Graduates and Advanced Undergraduates

- 100 ADVANCED GERMAN GRAMMAR (3). Prerequisite, German 21 and 31 or equivalent. Form and content, difficulties and peculiarities, from a structural and historical point of view. Required of candidates for advanced degrees in German. *Fall.* Stambaugh.
- 103 EXERCISES IN STYLISTICS (3). Prerequisite, German 21, 31 and 100, or equivalent and permission of instructor. A *rigorosum* in advanced oral and written composition. *Spring.* Stambaugh.
- 109 GERMAN FICTION IN THE NINETEENTH CENTURY (3). Prerequisite, German 21 and 31 or equivalent. Study of the major prose writers of the nineteenth century. Readings, lectures and reports. Mews.
- 111 GERMAN DRAMA IN THE NINETEENTH CENTURY (3). Prerequisite, German 21 and 31 or equivalent. Kleist, Grabbe, Büchner, Grillparzer, Hebbel, Raimund, Nestroy, among others. Readings, lectures, and reports. Mews.
- 115 THE GERMAN LYRIC FROM HÖLDERLIN TO THE PRESENT (3). Prerequisite, German 21 and 31 or equivalent. An analysis of the chief lyric poets, movements, and types of the past one hundred and fifty years. Mews, Scott.
- 121 GOETHE'S POETRY AND FAUST (3). Prerequisite, German 21 and 31 or equivalent. Close analysis of poems selected from all phases of Goethe's life and of the two parts of *Faust*. Schweitzer.
- 125 SPECIAL TOPICS IN GERMAN STUDIES (3). Study of literature or language on an announced theme, with subject matter, perspective, or combination of approaches not available in the regular offerings of the department. Staff.
- 131 GERMAN LITERATURE OF THE EIGHTEENTH CENTURY (3). Prerequisite, German 21 and 31 or equivalent. From the Enlightenment to *Sturm und Drang*. Schweitzer.
- 139 GERMAN ROMANTICISM (3). Prerequisite, German 21 and 31 or equivalent. Theoretical background and realization in poetry, prose, and drama. Schweitzer.
- 141 SCHILLER (3). Prerequisite, German 21 and 31 or equivalent. Discussion of the plays, representative poems, and selected essays against the intellectual background of his and our own times. Schweitzer.
- 152 GERMAN NOVEL FROM 1890 to 1945 (3). Prerequisite, German 21 and 31 or equivalent. A survey of German, Austrian, and Swiss novelists from 1890 to 1945, including writers such as Schnitzler, Thomas Mann, Heinrich Mann, Hesse, Kafka, Musil, and Broch. Lawson, Mews, Pike.

- 153 GERMAN DRAMA FROM 1890 TO 1945 (3). Prerequisite, German 21 and 31 or equivalent. A comprehensive study of German, Swiss, and Austrian drama from Naturalism to the end of World War II. News, Lawson, Pike.
- 154 DRAMA AND PROSE FICTION IN AUSTRIA, WEST GERMANY, AND SWITZERLAND SINCE 1945 (3). Prerequisite, German 21 and 31 or equivalent. Reading and discussion of works by such authors as Böll, Grass, S. Lenz, Handke, Frisch, Dürrenmatt, Hochhut, and Weiss, Mews, Pike.
- 155 GOETHE IN ENGLISH TRANSLATION (3). The poet within the Western tradition. Study of his masterpieces, including *Faust*. Discussion in English; readings in English or German. Schweitzer.
- 161 HISTORY OF THE GERMAN LANGUAGE (3). Development of sounds and forms from ancient times to present. Political, social, and literary forces influencing the language. Recommended for first semester of graduate study. Prerequisite, a good reading knowledge of German. Fall. Smith.
- 171 GERMAN CIVILIZATION (3). Major trends in intellectual, artistic, and political life from early times to the present. Tax.
- 191 TEACHING METHODS AND MATERIALS (3). For prospective teachers of German. Required for all graduate students. *Fall and spring*. Scott.
- BRECHT'S WORLD OF THE THEATRE (3). (See Comparative Literature 192.) Mews.

DUTCH

- 105 ELEMENTARY DUTCH (3). Prerequisite, reading knowledge of German or permission of the instructor. Rapid introduction to modern Netherlandic with emphasis on both speaking and reading. *Fall*. (Alternate years.) Francke, Tax.
- 106 INTERMEDIATE DUTCH (3). Prerequisite, Dutch 105 or equivalent. Reading of modern Dutch literature with discussions in Dutch. (Alternate years.) *Spring*. Francke, Tax.
- 158 THE GOLDEN AGE OF DUTCH LITERATURE (RENAISSANCE AND BAROQUE) (3). Prerequisite, permission of the instructor. Masterpieces of Dutch literature of Renaissance and mainly Baroque; literary relations with German and other literatures will be stressed. *Spring*. Tax, Francke.

SCANDINAVIAN

- 181 ELEMENTARY NORWEGIAN (3). Rapid introduction to modern Norwegian (*bokmaal*) with attention to both speaking and reading. *Fall*. (Alternate years.) Smith.
- 182 INTERMEDIATE NORWEGIAN (3). Prerequisite, Norwegian 181 or equivalent. Reading of twentieth-century short stories. Introduction to Danish and Swedish, with readings. *Spring*. (Alternate years.) Smith.
- 187 INTRODUCTION TO MODERN SCANDINAVIAN LITERATURE (3). An introduction to nineteenth-century and twentieth-century Scandinavian literature (in translation) with particular reference to the work of Ibsen and Strindberg, and modern fiction. *Spring*. Bergholz.
- 233 OLD NORSE (OLD ICELANDIC) (3 each). Grammar and reading from the prose
- 234 *Edda* and the Icelandic sagas. *Two semesters, on demand*. Smith.

SANSKRIT

- 111 ELEMENTARY SANSKRIT (3). Grammar and readings from the epic and didactic literature. *Fall and spring*. Melchert.
- 201 ADVANCED SANSKRIT (3). Extensive reading from the Dharmacastra, the Sutras, Brahmanas, and the Vedas. *On demand*. Staff.
- 202 ADVANCED SANSKRIT (3). Continuation of 201. *On demand*. Staff.

Courses for Graduates

- 201 MATERIALS AND METHODS OF RESEARCH (3). *Fall*. Tax.
- 202 GERMAN PALEOGRAPHY (3). A general introduction to codicological problems and a discussion of the different types of script used in German literature to about 1500; with practical exercises. *Spring*. (Alternate years.) Tax.
- 210 OLDER GERMAN LITERATURE TO 1050 (3). Tax.
- 221 GOTHIC (3). Smith, Lawson.
- 222 OLD HIGH GERMAN (3). Smith, Lawson.
- 223 COMPARATIVE GERMANIC GRAMMAR (3). Smith.
- 232 OLD SAXON (3). *On demand*. Smith.
- 233 OLD NORSE (OLD ICELANDIC) (3 each.) *On demand*. Smith.
- 234
- 235 MIDDLE HIGH GERMAN GRAMMAR (3). Prerequisite, German 161 (waived in special cases). Grammar and linguistic analysis of medieval German. Readings include one complete work and selections from the *Nibelungenlied*, didactic literature, and lyric poetry. *Spring*. Smith, Lawson.
- 236 MIDDLE HIGH GERMAN LITERATURE (3). Tax, Francke.
- 237 MIDDLE HIGH GERMAN POETRY (3). Tax, Francke.
- 240 READING COURSE (3). *Fall or spring*. Staff.
- 241 READING COURSE (3). *Fall or spring*. Staff.
- 250 LATE MEDIEVAL LITERATURE (3). previous study of German 235 is desirable. *Fall*. Stambaugh.
- 251 THE LITERATURE OF THE REFORMATION ERA (3). Stambaugh.
- 252 INTRODUCTION TO EARLY NEW HIGH GERMAN (3). Analysis and discussion of form and content of the new literary language in the age of Humanists and Reformers, documenting the change in ideas and ideals. Stambaugh.
- 253 GERMAN BAROQUE LITERATURE (3). Schweitzer.
- 270 GENERAL INTRODUCTION TO GERMAN VOLKSKUNDE (3). A reading knowledge of French is desirable but not necessary. Stambaugh, Tax.
- 340 SEMINAR IN OLDER GERMAN LITERATURE (3). *On demand*. Tax.
- 342 SEMINAR IN GERMAN VOLKSKUNDE (3). *On demand*. Stambaugh, Tax.
- 344 SEMINAR IN LATE MEDIEVAL AND REFORMATION LITERATURE (3). *On demand*. Stambaugh.
- 345 SEMINAR IN GERMAN LITERATURE (3). *On demand*. Schweitzer.
- 350 SEMINAR IN GERMAN LITERATURE (3). *On demand*. Mews.
- 355 SEMINAR IN GERMAN LITERATURE (3). *On demand*. Lawson.
- 361 SEMINAR IN LINGUISTICS (3). *On demand*. Smith.
- 393 MASTER'S THESIS (3 or more). *Fall and spring*. Staff.
- 394 DOCTORAL DISSERTATION (3 or more). *Fall and spring*. Staff.
- 400 GENERAL REGISTRATION (0).

DEPARTMENT OF HISTORY

R. DON HIGGINBOTHAM, *Chairman*

Professors

FRANK W. KLINGBERG	(71)	Civil War and Reconstruction
ELISHA P. DOUGLASS	(72)	The Federal Period, American Intellectual History to 1860, American Business History
GEORGE B. TINDALL	(75)	The South since Reconstruction
GEORGE V. TAYLOR	(30)	Europe in the Eighteenth Century and the French Revolutionary and Napoleonic Period, 1715-1815
ROBERT M. MILLER	(73)	American Social and Religious History, Intellectual History since 1860
STEPHEN B. BAXTER	(21)	English History 1485-1815: Political, Diplomatic, Constitutional and Economic History
HENRY C. BOREN	(13)	The Ancient World, particularly Roman History
PETER F. WALKER	(76)	Civil War and Reconstruction
JOEL R. WILLIAMSON	(79)	History of the South, Race Relations
JOHN M. HEADLEY	(31)	Renaissance, Reformation, Seventeenth Century Continental Europe
FRANK W. RYAN, JR.	(74)	American Intellectual, Cultural, and Psycho-History
JOSEF ANDERLE	(60)	Eastern Europe, Chiefly since 1815
R. DON HIGGINBOTHAM	(84)	Colonial and Revolutionary America
RICHARD A. SOLOWAY	(23)	Nineteenth Century Britain: Social, Intellectual, and Church History
SAMUEL H. BARON	(63)	Russian History: Early Modern Period, Late Nineteenth Century
JOHN K. NELSON	(78)	Social, Intellectual, Religious Development of America before the Revolution
JOHN E. SEMONCHE	(77)	American Legal and Constitutional History
DONALD G. MATHEWS	(87)	Ante-Bellum U.S., American Religious History
LAMAR J.R. CECIL, JR.	(32)	Germany, Continental Europe, the European Nobility, 1800-1922
WILLIAM S. POWELL	(89)	North Carolina History
GERHARD L. WEINBERG	(35)	Modern Germany, Diplomatic History
SAMUEL R. WILLIAMSON, JR.	(34)	Diplomatic and Strategic History since 1870
RICHARD W. PFAFF	(16)	English Medieval History: Ecclesiastical, Cultural and Political History
MICHAEL R. MCVAUGH	(15)	History of Science
PETER G. FILENE	(83)	Twentieth Century: American Social and Cultural History
JOSEPH S. TULCHIN	(42)	Argentina and Chile, Caribbean Area, Inter-American Relations

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| FREDERICK O. BEHREND | (14) | Medieval Europe |
| GILLIAN T. CELL | (22) | British Empire, Tudor and Stuart England |
| HERBERT L. BODMAN, JR | (50) | Islamic Civilization, Ottoman Empire |
| ROGER W. LOTCHIN | (81) | Urban Political History, 1800 to the Present |
| JAMES R. LEUTZE | (86) | U.S. Military History |
| OTIS L. GRAHAM, JR. | (98) | Twentieth Century U.S. History |
| NELL I. PAINTER | (96) | Recent U.S. and Afro-American History, 1865 to the Present |
| COLIN A. PALMER | (95) | Afro-American, Colonial Latin American and the Caribbean |
| ROBERT E. GALLMAN | (99) | Economic History |
| JOHN F. KASSON | (88) | American Intellectual and Cultural History, Technology and Society, Art and Literature |

Associate Professors

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| DAVID M. GRIFFITHS | (62) | Russia in the Eighteenth Century: Social and Intellectual, Marxism |
| LAWRENCE D. KESSLER | (51) | Chinese History: Seventeenth Century Political and Social, Revolutionary Experience since 1919, Modern U.S.-Chinese Relations |
| WILLIAM L. BARNEY | (92) | The Political History of Nineteenth Century America |
| W. JAMES MCCOY | (17) | Ancient, particularly Greek History |
| JACQUELYN D. HALL | (90) | American History, Southern Oral History |
| E. WILLIS BROOKS | (61) | Russia in the Nineteenth Century: Social, Administrative, Intellectual |
| THOMAS Q. REEFE | (53) | African History, Emphasis on Central Africa |
| MICHAEL H. HUNT | (97) | U.S. Diplomatic Emphasis since 1890; American Foreign Relations |
| MELISSA M. BULLARD | (38) | Renaissance, Mediterranean and Early Modern Europe |

Assistant Professors

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| W. MILES FLETCHER | (52) | Japanese History |
| HARRY L. WATSON | (93) | North Carolina History |
| LEON R. FINK | (94) | American Labor History, 19th-20th Century Social History |
| GILBERT M. JOSEPH | (44) | Modern Mexico, Brazil and the Caribbean, Colonial Spanish America |
| CARL E. PLETSCH | (39) | Modern European Intellectual History |
| DONALD M. REID | (36) | Modern French History |
| JUDITH M. BENNETT | (37) | History of Women in Europe |

Emeritus Professors

- JAMES L. GODFREY
 CARL H. PEGG
 CORNELIUS O. CATHEY

J. ISAAC COPELAND
HAROLD A. BIERCK
GEORGE E. MOWRY
J. CARLYLE SITTERSON

The Department offers work leading to the Master of Arts and Doctor of Philosophy degrees in each of eight fields of history: Ancient, Medieval, United States, Latin American and/or Inter-American, Modern European, English, Russian, and History of Science. Students working in the history of Eastern Europe may do so in the Modern European field or the Russian field, and those working in the history of Medieval England may do so in either the Medieval field or the English field.

The courses required for the Master of Arts degree include three hours of historiography (History 201 or 202), six hours of seminar (300-level courses), six hours of thesis, and five other courses, of which as many as three may be taken in fields other than that in which the student is pursuing a degree, or if desirable, in other disciplines. If in recognition of prior work a student is excused from historiography, he or she should substitute for it another course in his or her field. The student must also pass a reading knowledge examination in an appropriate foreign language.

All courses except thesis taken here for the M.A. may be credited toward a doctoral program, as well as graduate courses taken elsewhere that the Graduate School approves for transfer credit. The candidate for the Ph.D. must complete four semesters of residence credit, of which at least two must be in residence here. During the four semesters at least twelve courses must be taken, not counting credit toward thesis and/or dissertation. Most students, however, will be expected to take more than twelve courses, and they are encouraged to take courses at the 200 level. Of the required courses one must be historiography. Ordinarily four seminars, including two taken in fulfillment of requirements for the M.A. degree, must be taken for the Ph.D. degree; but in exceptional cases the graduate faculty in a particular doctoral field may reduce the requirement to three. In any case, two must be taken in Chapel Hill. Of the twelve or more courses, up to three may be in supporting disciplines outside the Department if such courses are deemed appropriate by the student's advisor. The student must also present a minor field within the Department. This requirement may be satisfied by taking three additional courses at the 100 or 200 level or by passing a written examination on the minor field prior to taking the comprehensive examination in the major. A reading knowledge of two foreign languages is required for the Ph.D. In certain areas of history, students may substitute either a research skill or a coherent program of at least nine hours of graduate work outside the Department for the second language.

The student must pass a written comprehensive examination on the major field and an oral examination on the major and such supporting courses as the student may submit. The final requirements are a dissertation and a final oral examination which is usually limited to the dissertation and its historical setting.

Every graduate student in the Department without an M.A. is considered a candidate for that degree. As the student nears completion of two semesters of residence (or eighteen hours of course credit), progress will be reviewed by the staff of the field in which he or she is working, and it will be recommended either that the student prepare directly for the doctorate or take an M.A. The great majority of candidates are expected to take the M.A. When a student completes an M.A., the examining committee will determine whether he or she may proceed toward the doctorate. A student admitted to the Department with an M.A. from another university will be reviewed by the staff of his or her field when nearing two semesters of study here. At that time it will be determined whether the student will be advised to proceed further. The student who has not been allowed to bypass the M.A. and who has not completed the requirements for it after five semesters in residence will not be permitted to enroll for further course work until he or she does so. The doctoral student must complete required course work by the end of the seventh semester in residence (including the semesters of course work for the M.A.) and take the comprehensive examinations by the end of the eighth semester. These time limits may be waived, but only in exceptional circumstances.

Fellowships and Assistantships

Three University teaching fellowships, one or two Waddell Memorial Fellowships, and several appointments as preceptors and graduate assistants are available annually on a competitive basis to graduate students in history.

Publications

The James Sprunt Studies in History and Political Science are published under the direction of the chairmen of the History and the Political Science Departments. Established by the late Dr. James Sprunt, of Wilmington, North Carolina, the series has at present reached fifty-three volumes. The contents have in the main concerned North Carolina state and colonial history and government, but by recent action the series has been enlarged to embrace other areas of history and political science. Publication in the Sprunt Studies is open to students as well as specialists.

Library and Research Facilities

The Library has a number of special collections of great value, and the University itself is conveniently situated close to a number of other research centers, particularly the Duke University Library and the North Carolina State Department of Archives and History.

Notable among the Library's special collections are the Southern Historical Collection (one of the most important in the country devoted to the subject), and the North Carolina Collection. Both are extremely rich in manuscripts, diaries, pamphlets, and newspapers. Other outstanding collections are: the Peabody Collection (for international law and diplomacy); the William Henry Hoyt Collection (devoted to the Napoleonic period); and the Bowman Gray Collection (with materials on World Wars I and II). In addition the Library has extensive working collections in all the doctoral fields.

Courses for Graduates and Advanced Undergraduates

- 101 ISLAM: AN HISTORICAL INTRODUCTION (Religion 101)(3). A study of Islam in the historical context of its growth from the prophecy of Muhammad to a major force in a world civilization. *Fall*. (Alternate years.) Bodman.
- 103 THE THEORY AND PRACTICE OF ORAL HISTORY: A FIELD WORK APPROACH (Folklore 103) (3). An introduction to the use of interviewing as a method of creating and interpreting historical evidence. Field work focuses on an aspect of North Carolina social history. *Fall*. Hall.
- 105 RESISTANCE MOVEMENTS AND NATIONALISM IN AFRICA (3). An attempt to define the features of various movements in Africa during the nineteenth and twentieth centuries which sought to resist foreign domination in the cultural and political spheres. *Spring*. (Alternate years.) Reefer.
- 106 ANCIENT GREEK ATTITUDES TOWARDS PEACE, WAR, AND DEFENSE (Peace, War, and Defense 106) (3). An examination of ancient Greek attitudes towards peace, war and defense from the 16th to the 3rd century B.S. *Spring*. McCoy.
- 107 HISTORY OF ROME, 133-27 B.C. (3). Emphasis on the decline of the Republican Oligarchy. Conducted in considerable part by student reports and classroom discussion. *Fall*. Boren.
- 108 ALEXANDER AND THE HELLENISTIC WORLD (3). History 52 recommended. The rise of Macedonia; the careers of Philip II and Alexander; the Hellenistic Age in the fourth, third, and second centuries B.C. *Fall*. (Alternate years.) McCoy.
- 109 GREEK AND ROMAN HISTORICAL LITERATURE (Classics 109) (3). The study in English translation of selections from Herodotus, Thucydides, Livy, Tacitus, and others with consideration of their literary qualities and their readability as historians. *Fall*. (Alternate years.) McCoy.
- 110 THE AMERICAN COLONIAL EXPERIENCE (3). Not open to graduate majors in American history. Major topics: European reconnaissance; founding of new societies; character and structure of institutions; thought and feeling from Cotton to Franklin; privilege and cost of empire. *Fall*. Nelson, Higginbotham.
- 111 REVOLUTION AND NATION-MAKING IN AMERICA, 1763-1815 (3). Not open to graduate majors in American history. Major topics: constitutional conflict in the

- British empire; independence and war; Confederation and Constitution; growth of political parties and nationality in a period of domestic change and international conflict. *Spring*. Higginbotham, Nelson.
- 112 UNITED STATES HISTORY, 1815-1848 (3). A study of the awakening of American national life and the problems that accompanied it. An analysis of political and economic development provides the basis from which to investigate the search for social order and justice that focused on the slavery controversy, the reform movements, social experimentation and the crisis of the Mexican War. Not open to graduate majors in American history. *Fall*. Barney.
- 113 UNITED STATES HISTORY, 1848-1900 (3). Not open to graduate majors in American history. An examination and interpretation of American history from the Mexican War to the beginning of the twentieth century. *Fall*. Klingberg. *Spring*. Walker.
- 114 UNITED STATES HISTORY, 1900-1932 (3). Not open to graduate majors in American history. This course deals with the political, diplomatic, social, and intellectual experiences of the American people from the Spanish-American War to the Great Depression. *Both Semesters*. Miller, Graham.
- 115 UNITED STATES HISTORY SINCE 1932 (3). Not open to graduate majors in American history. Diverse developments as interpreted within the framework of certain broad and open-ended themes: particularly, individual freedom, social welfare, mass culture, and community. *Fall*. Filene. *Spring*. Graham.
- 116 ECONOMIC RIVALRIES AND MODERN WARS (Peace, War and Defense 116) (3). Through a series of case studies from the Sino-Japanese War of 1894 to the Vietnam war, this course will examine the role of economic factors in causing hostilities and in shaping peace. *Spring*. (Alternate years.) Staff.
- 117 THE PROMISE OF URBANIZATION: AMERICAN CITIES IN THE NINETEENTH AND TWENTIETH CENTURY (3). A survey of the development of American cities since 1815 and their influence upon American history. *Spring*. Lotchin.
- 118 WAR AND CONTEMPORARY SOCIETY 1914-1965 (3). A study of three modern wars including the strategy and technology involved as well as an analysis of their social and political effects. *Fall*. Leutze.
- 119 THE MEDIEVAL UNIVERSITY (3). The origins and development of the university during the period 1100-1400; types of organization, curricula and degrees, intellectual life, town-gown and student-master relationship. (Alternate years.) *Spring*. McVaugh.
- 120 THE MEDIEVAL CHURCH (Religion 133) (3). The nature and workings of the Western church between roughly 600 and 1300. Emphasis on the church 'from within'; organization, missionary strategies, liturgy, monasticism, popular religion. *Spring*. (Alternate years.) Pfaff.
- 121 MEDIEVAL THOUGHT AND LEARNING (3). A survey of the educational traditions and major (Latin) writers in Western Europe from late Roman times through the thirteenth century. *Fall*. (Alternate years.) Behrends.
- 122 EUROPE IN THE EARLY MIDDLE AGES (3). A survey of the Mediterranean World and northern Europe from the Later Roman Empire until the end of the ninth century. *Fall*. (Alternate years.) Behrends.
- 123 HISTORY OF SPAIN (3). A survey of Spanish history from the Islamic invasion to Napoleon. Particular attention will be given to the period of the Habsburgs 1516-1700. *Spring*. (Alternate years.) Headley.
- 124 THE RENAISSANCE (3). The focus is on Italy 1300-1550, the emphasis on cultural and intellectual topics examined in their social and political context. *Two lectures, one discussion per week, fall*. Headley.

- 125 INTELLECTUAL HISTORY OF EUROPE, EARLY PERIOD (3). The course examines the gradual erosion of and criticism within the classical-Christian tradition that led to the emergence of a new mentality by the end of the seventeenth century. *Two lectures, one discussion per week, fall.* Headley.
- 126 INTELLECTUAL HISTORY OF EUROPE, MODERN PERIOD (3). The main developments in European thought from the Enlightenment to the twentieth century, with some attention to social context. Readings from such authors as Voltaire, Rousseau, Kant, Smith, Bentham, Hegel, Marx, Darwin, Nietzsche, Freud, Sartre, and Levi Strauss. *Spring.* Pletsch.
- 127 MEDITERRANEAN SOCIETIES AND ECONOMIES IN THE RENAISSANCE WORLD (3). A picture of Mediterranean social and economic life 1300-1600, with special focus on rural and urban society, family structure, patronage, work and wages, public and private finance. *Spring.* Bullard.
- 128 EUROPE UNDER THE OLD REGIME, 1715-1787 (3). The aristocratic Old Regime societies in confrontation with the modernizing forces of royal absolutism, Enlightenment ideology, and economic change. *Spring.* Taylor.
- 129 FRANCE FROM 1787 TO 1870 (3). The French people from the Old Regime to the Commune: cultural and social sources of political instability, the revolutionary tradition, liberal and conservative movements, industrialization. *Fall.* Reid.
- 130 FRANCE SINCE 1870 (3). French society and culture from the Paris Commune of 1871 to the student revolt of May 1968. *Spring.* Reid.
- 131 THE REFORMATION (Religion 134) (3). Examines a movement of religious reform that shattered Latin Christendom and contributed many of the conditions of Early Modern Europe. Emphases: religious, political, social. *Spring.* Headley.
- 132 EUROPE IN THE SEVENTEENTH CENTURY (3). The century marks the watershed in the European development. Emphases: state-craft, the emerging state-system, the new scientific world view, the impact upon European society. *Spring.* (Alternate years.) Headley.
- 133 THE FRENCH REVOLUTION, 1787-1815 (3). Collapse of the old regime, crisis of 1789, the first and second revolutions, the Terror in theory and practice, Thermidorean reaction, Directory, Napoleon and Napoleonic France, Revolutionary and Napoleonic imperialism. *Spring.* Taylor.
- 134 EUROPE, 1815-1871 (3). The social, political and economic structure of the governing elite and its attempts to subvert or accommodate the rising forces of industrialism and nationalism. *Spring.* (Alternate years.) Cecil.
- 135 EUROPE, 1871-1918 (3). Emphasizes the disintegration of Europe, culminating in the First World War and the fall of the continental empires. *Fall or spring.* (Alternate years.) Cecil.
- 136 EUROPE SINCE 1918 (3). The main currents in European history since the First World War. Special attention will be given to the interaction between national and international events and developments and to the emergence of the European communities. *Fall.* Weinberg.
- 137 MEDIEVAL ENGLAND (3). A consideration of England's origin, unification, and development as a national monarchy. Primary emphasis is on political, ecclesiastical, and cultural aspects. *Spring.* Pfaff.
- 138 TUDOR AND STUART ENGLAND, 1485-1660 (3). A lecture course, open to juniors, seniors, and graduate students. *Fall.* Baxter, Cell.
- 139 ENGLAND IN THE EIGHTEENTH CENTURY, 1660-1815 (3). A lecture course, open to juniors, seniors, and graduate students. *Spring.* Baxter.
- 140 GREAT BRITAIN IN THE NINETEENTH CENTURY, 1815-1901 (3). Emphasizes the social and economic foundations of the political, intellectual, religious, and cultural history of Victorian Britain. *Fall.* Soloway.

- 141 GREAT BRITAIN IN THE TWENTIETH CENTURY (3). Explores the economic and social foundations of British political, intellectual and cultural history from 1901 to the present. *Spring*. Soloway.
- 142 THE MAKING OF THE MODERN BRITISH CONSTITUTION (3). A study of the rise of political and economic institutions. Emphasis is placed on the common law, the courts, parliament, the crown, and the major developments of government. *Fall*. (Alternate years.) Cell.
- 143 U.S. FOREIGN RELATIONS TO 1914 (3). General coverage of the first century and a half of U.S. foreign relations—from the initial search for independence and security to the culminating adventure in empire. *Fall*. Hunt.
- 144 U.S. FOREIGN RELATIONS, 1914 TO THE PRESENT (3). A general survey of the emergence of the U.S. as a superpower with global rather than merely continental or hemispheric responsibilities. *Spring*. Hunt.
- 145 INTELLECTUAL AND CULTURAL HISTORY OF THE U.S., 1630-1860 (3). A survey of leading political, social, and religious ideas which played roles in the intellectual development of the nation and created a distinctive American thought. *Fall*. (Alternate years.) Staff.
- 146 INTELLECTUAL AND CULTURAL HISTORY OF THE U.S., 1860 TO PRESENT (3). This course deals with the changes and continuities in the American character, mind, and society over the past century. *Spring*. Miller.
- 147 AMERICAN CONSTITUTIONAL HISTORY TO 1876 (3). In a classroom environment characterized by discussion, simulation and interaction, the antecedents, formation and interpretation of the Constitution are confronted in a broad historical matrix. *Fall*. Semonche.
- 148 AMERICAN CONSTITUTIONAL HISTORY SINCE 1876 (3). Utilizing a classroom environment similar to 147, constitutional adjustment and change are related to psychological, political, social and economic factors and to Supreme Court members. *Spring*. Semonche.
- 149 RELIGION, IDEOLOGY AND SOCIAL MOVEMENTS IN U.S. HISTORY (Religion 149) (3). Prerequisite, Introductory History or Religion course. A study of religion, collective action and collective violence in U.S. history. *Fall*. (Alternate years.) Mathews.
- 150 HISTORY OF SCIENCE FROM THE GREEKS TO NEWTON (3). Examines the transformation of scientific ideas from the casual, purposive system of Aristotle and Galen into the mechanical and mathematical synthesis of the Scientific Revolution. *Fall*. McVaugh.
- 151 HISTORY OF SCIENCE: FROM NEWTON TO THE TWENTIETH CENTURY (3). A survey of the development since 1700 of the various branches of modern science, leading eventually to the question whether scientific objectivity can really exist. *Spring*. McVaugh.
- 152 TOPICS IN THE HISTORY OF SCIENCE (3). Takes up a different subject every year, ranging in the past from Isaac Newton to modern psychology. Presupposes some familiarity with the history of science. *Spring*. (Alternate years.) McVaugh.
- 153 THE EVOLUTION OF PHYSICAL IDEAS (Physics 115) (3). Prerequisite, Physics 25 and Mathematics 15 (or by permission.) *Spring*. Haisley.
- 154 POPULAR CULTURE AND AMERICAN HISTORY (3). Study of the popular arts and entertainments of the 19th and 20th centuries and the ways in which they illuminate the values, assumptions, aspirations, and fears of American society. *Fall or spring*. (Alternate years.) Kasson.
- 155 SLAVERY IN THE NEW WORLD (3). A comparative approach to the institution of slavery in North America, Latin America and the Caribbean. *Fall*. Palmer.

- 156 HISTORY OF INTERNATIONAL RELATIONS, 1870-1919 (3). Examines the interaction of the European alliances, the impact of imperialism on international politics, the outbreak of World War I, and the diplomacy and peacemaking of that war. *Fall*. (Alternate years.) S. Williamson.
- 157 HISTORY OF INTERNATIONAL RELATIONS, 1919 TO THE PRESENT (3). A study of the "new diplomacy," totalitarian foreign policy in the 1930's, the diplomacy of World War II, the Cold War, and the re-emergence of the multipolar balance of power. *Spring*. (1974-1975 and alternate years.) S. Williamson.
- 158 THE BRITISH EMPIRE, 1485-1857 (3). An interdisciplinary approach to such problems as the reasons for expansion, culture contact in an imperial situation, founding of new societies, institutional transfer, and constitutional change. *Fall*. Cell.
- 159 THE BRITISH EMPIRE AND COMMONWEALTH, 1857 TO THE PRESENT (3). An interdisciplinary approach to such problems as the "new imperialism," the scramble for Africa, the impact of war on empire, the development of colonial nationalism, and the coming of independence. *Spring*. Cell.
- 160 WOMEN IN AMERICAN HISTORY (Women's Studies 160) (3). An analytic survey of the changing roles of women from colonial times to the present. *Spring*. Filene, Hall.
- 161 NORTH CAROLINA I, 1524-1835 (3). Events and developments occurring in North Carolina from the first discovery to the constitutional changes of 1835 along with some attention to the role of the state and its citizens in the history of the United States as a whole. *Fall and spring*. Powell, Watson.
- 162 NORTH CAROLINA II, 1835 TO THE PRESENT (3). Events and developments occurring in North Carolina from approximately 1835 to the present along with some attention to the role of the state and its citizens in the history of the United States as a whole. *Fall and spring*. Powell, Watson.
- 163 THE OLD SOUTH (3). Economic, cultural, and social history of the antebellum South. The region's political history will serve as a supporting part of the study. *Fall and spring*. J. Williamson, Ryan, Walker.
- 164 THE SOUTH SINCE RECONSTRUCTION (3). A survey of the South during the past 100 years, covering developments in politics, economics, culture, and society. Course begins at the end of Reconstruction. *Fall and spring*. Tindall.
- 165 HISTORY OF AFRO-AMERICANS TO 1865 (3). Survey of Afro-American history from origins to abolition of slavery. Examination of role of Blacks in U.S. history to 1865. Focus on unique subculture of Afro-Americans. *Fall*. Staff.
- 166 HISTORY OF AFRO-AMERICANS, 1865 TO PRESENT (3). Examination of role of Blacks in U.S. history after 1865. Focus on Black sub-culture. Analysis of theories about the Black experience in America. *Spring*. Staff.
- 167 RACE RELATIONS IN AMERICA (3). An intensive study of the historical background of current race relations. Black-white relations in the South, in the urban North, and in Latin America. *Fall and spring*. J. Williamson.
- 168 HISTORY OF AMERICAN BUSINESS (3). A survey of the rise and development of the major financial, commercial, manufacturing and transportation enterprises which transformed the United States from an agricultural into a leading industrial nation. *Spring*. Douglass.
- 169 THE WORKER AND AMERICAN LIFE (3). From the experience of colonial artisans to contemporary factory and office workers, organized and unorganized, this course examines the effect of the industrial revolution on the American social and political landscape. *Spring*. Fink.
- 170 TECHNOLOGY AND AMERICAN CULTURE (3). Technology's impact on American thought and society and the responses it has engendered. Topics will include: the

- factory town; search for utopia; impact of Henry Ford; war and depersonalization. (Alternate years.) *Fall or spring*. Kasson.
- 171 ARGENTINA IN THE 20TH CENTURY (3). A survey of political events in the 20th century focusing on the experiments in democracy, the Radical Party, and the rise of militarism. *Spring*. Tulchin.
- 172 THE DEVELOPMENT OF LATIN AMERICAN SOCIETY (3). Prerequisite, some contact with Latin America through courses or personal experience. Selected aspects of Latin American social history, such as race relations, land tenure, labor systems, violence and social upheaval. *Spring*. (Alternate years.) Joseph.
- 174 HISTORY OF MEXICO, 1810 TO PRESENT (3). From Hidalgo and Independence through the fate of the Party. Stress of success or failure of the Revolution of 1910. Student participation is encouraged. *Fall*. (Alternate years.) Joseph.
- 175 INTER-AMERICAN RELATIONS (3). Political, diplomatic and economic relations in the Western Hemisphere from the independence of Latin America to the present. Special consideration to the concept of informal empire, power relationships and policy formulation. *Spring*. (Alternate years.) Tulchin and Joseph.
- 177 LATIN AMERICAN URBAN HISTORY (3). Focuses on the structure and function of cities as well as their place in the historical evolution of Latin American society, from the Pre-Columbian era to the present. *Spring*. Tulchin.
- 179 HISTORY OF BRAZIL (3). This course is concerned primarily with the creation of a new society through race mixture and culture change, and with the political and economic development of Brazil. *Fall*. Joseph.
- 180 RUSSIA AND THE WEST IN THE EIGHTEENTH CENTURY (3). A comparative approach, centering on Russia's contacts with the West, the resulting interaction, and the efforts of Russians to define the unique nature of their own society. *Spring*. (Alternate years.) Griffiths.
- 181 RUSSIA, 1796-1917 (3). The diplomatic, military, and ideological confrontations with the West; the decline and fall of the Russian autocracy; the evolution of reform thought and revolutionary opposition. *Spring*. Brooks.
- 182 HISTORY OF THE SOVIET UNION (3). A close study of the revolution of 1917 and the subsequent political, social, economic and cultural transformation of Russia. The Marxian dream and Soviet totalitarianism. *Fall*. Baron.
- 184 HISTORY OF SOCIALIST THOUGHT (3). An examination of the origins and development of Marxist ideas, and their application to specific historical conditions: in Germany, Russia, China, Algeria, Cuba, and modern industrial society. *Spring*. Griffiths.
- 185 RUSSIA FROM IVAN THE TERRIBLE TO PETER THE GREAT (3). The evolution of a distinctive Muscovite society and culture. Territorial expansion; the rise of autocracy, serfdom, and the compulsory service-state; popular rebellions and the church schism; relations with the West. *Spring*. Baron.
- 186 INTELLECTUAL HISTORY OF IMPERIAL RUSSIA (3). Interpretive lectures examine the most significant ideas and personalities and major social trends in modern Russia, emphasizing the decline of serfdom, growth of capitalism (and Marxism), and the impact of the West on Russia. *Fall*. Brooks.
- 187 HISTORY OF CZECHOSLOVAKIA (3). A case study of a small nation in the world of super-powers. *Spring*. Anderle.
- 188 THE RISE AND FALL OF THE HAPSBURG EMPIRE, 1526-1918 (3). A study of the development of this multinational empire, its special role in the fortunes of Central Europe, and its demise under the impact of modern nationalism and great power conflicts. *Spring*. Anderle.
- 189 EAST EUROPEAN COMMUNISM (Political Science 139) (3). An examination of Communist regimes of Eastern Europe, their origins and development since World War II, their cohesion and conflict. *Fall*. Anderle.

- 190 THE MODERN MIDDLE EAST: A CULTURAL HISTORY (3). The ideological conflict between traditional Islamic values and the appeal of Western civilization to Middle Eastern intellectuals and politicians over the past two centuries. (Alternate years.) *Fall*. Bodman.
- 192 TRADITIONAL CHINA AND ITS COLLAPSE (3). Examines traditional social, political, and cultural patterns and its fortunes of the Ch'ing dynasty (1644-1911) to its demise under the twin burdens of internal decay and foreign aggression. *Spring*. Kessler.
- 193 ORIGINS OF THE CHINESE REVOLUTION (3). The struggle for revolutionary change in China from the turn of the century to the establishment of the People's Republic in 1949. *Fall*. Kessler.
- 195 JAPAN AS AN INTERNATIONAL POWER SINCE 1920 (3). A study of political and social developments, the significance of the Pacific War in Japanese history, Japan's role in Asia, her relationship to the United States, and future prospects for Japan. *Fall*. Fletcher.
- 196 HISTORY OF EUROPEAN SOCIAL THEORY (3). Prerequisite, previous work in European history or permission of instructor. To read and analyze a number of classic authors in European social thought, viz., Smith, Marx, Weber, Durkheim, Freud. *Fall*. Pletsch.
- 198 GERMANY, 1815-1918 (3). The nature of Prussian society, the rivalry between Prussia and Austria for the command of German affairs, and the quality of Prussian leadership in the German Empire of 1871. *Fall*. (Alternate years.) Cecil.
- 199 HISTORY OF GERMANY SINCE 1918 (3). Politics and culture in the Weimar Republic. Nazi totalitarianism, and the reshaping of East and West Germany since World War II. *Spring*. Weinberg.

Courses for Graduates

- 201 EUROPEAN HISTORIOGRAPHY (3). Introductory methodology, required for students in Ancient, Medieval, Modern European and English History. Historical inquiry, nature and location of evidence, external criticism, factual inference, explanation and interpretation, writing, teaching, criticism of historical work. *Fall*. Taylor.
- 202 AMERICAN HISTORIOGRAPHY (3). Required of all graduate majors in American history. *Fall*. Nelson, Ryan.
- 204 READINGS IN RUSSIAN AND EAST EUROPEAN HISTORY (3). A sequence of four courses on the several periods and the main themes of Russian and East European History. *Fall and spring*. Anderle, Baron, Brooks, Griffiths.
- 206 PROBLEMS IN GREEK HISTORY, 600-323 B.C. (3). Prerequisite, consent of instructor. (Alternate years.) *Spring*. McCoy.
- 208 HISTORY OF ROME, 27 B.C.-180 A.D. (Alternate years.) *Spring*. Boren.
- 215 READINGS IN THE HISTORY OF THE MIDDLE EAST (3). *On demand*. Bodman.
- 217 READINGS IN URBAN HISTORY (3). *Spring*. (Alternate years.) Lotchin.
- 219 EUROPE IN THE SIXTEENTH CENTURY (3). *Spring*. (Alternate years.) Headley.
- 224 FRANCE, THE GERMAN EMPIRE AND THE PAPACY IN THE HIGH MIDDLE AGES (3). Prerequisite, reading knowledge of French or German. *Fall*. (Alternate years, on demand.) Behrends.
- 235 READINGS IN EUROPEAN SOCIAL HISTORY (3). *Spring*. (Alternate years.) Reid.
- 236 EUROPE BETWEEN THE TWO WORLD WARS (3). *Fall*. (Alternate years.) Weinberg.
- 238 POLITICAL AND INTELLECTUAL HISTORY OF ENGLAND UNDER THE TUDORS AND THE STUARTS (3). Prerequisite, History 138. *Fall*. Baxter.

- 239 MEDIEVAL ENGLAND (3). Prerequisite, History 137 or equivalent. *Fall*. (Alternate years.) Pfaff.
- 240 STUDIES IN MODERN ENGLISH HISTORY (3). Directed readings in 19th and 20th century English history. Topics will vary from year to year. *Fall or spring*. (Alternate years.) Soloway.
- 241 STUDIES IN 20TH CENTURY ENGLAND (3). Directed readings in 20th century English history. Topics will vary from year to year. *Fall or spring*. (Alternate years.) Soloway.
- 242 ENGLAND IN THE EIGHTEENTH CENTURY (3). Directed readings in English 18th Century history; the topics selected, political, economic, diplomatic, social, or intellectual, will vary on demand. *Spring*. (Alternate years.) Baxter.
- 244 PROBLEMS IN THE DIPLOMATIC HISTORY OF THE UNITED STATES (3). *Fall*. (Alternate years.) Hunt.
- 245 HISTORY AND THE SOCIAL SCIENCES (3). The relationship of the social sciences to history, logic of inquiry, use of quantitative methods, introduction to the computer. *Spring*. (On demand.) Tulchin.
- 249 CIVILIZATION IN THE AMERICAN COLONIES, 1607-1775 (3). *Fall*. (Alternate years.) Nelson.
- 250 THE AMERICAN REVOLUTIONARY ERA, 1763-1789 (3). *Spring*. (Alternate years.) Higginbotham.
- 251 THE FEDERAL PERIOD, 1789-1820 (3). Readings, discussion, and book lists designed to give familiarity with the historiographical problems, research opportunities, and bibliography of the period. *Spring*. (Alternate years.) Staff.
- 252 THE MIDDLE PERIOD, 1815-1860 (3). An analysis of the material and ideological transformations within the antebellum republic which climaxed in the sectional crisis of the 1850's. *Fall*. (Alternate years.) Barney.
- 253 PROBLEMS IN U.S. SOCIAL HISTORY (3). Studies of basic problems in social history of the United States with special attention to the historiographical issues raised by a systematic study of society with regard to social structure, ideology, collective action, community, and change. *Fall*. Barney, Fink, Hall, Mathews, Watson.
- 254 CIVIL WAR AND RECONSTRUCTION, 1860-1876 (3). *Spring*. Klingberg.
- 255 FOUNDATIONS OF MODERN AMERICA (3). *Fall*. (Alternate years.) Miller.
- 256 RECENT AND CONTEMPORARY UNITED STATES (3). *Fall or spring*. Graham.
- 257 TOPICS IN THE HISTORY OF INTERNATIONAL RELATIONS (3). An intensive examination of different aspects of international relations, with special emphasis on the period since 1848 and the diplomacy of the European state system. *Fall*. (Alternate years.) S. Williamson.
- 258 TOPICS IN BRITISH HISTORY AND IN BRITISH IMPERIAL HISTORY (3). *Spring*. (Alternate years.) Cell.
- 264 READINGS IN THE SOUTH SINCE RECONSTRUCTION (3). Readings, reports, and discussions on selected topics with a view to gaining familiarity with the literature of the field. *Fall*. Tindall.
- 265 PROBLEMS IN AFRO-AMERICAN HISTORY (3). Graduate students will compile bibliographies and read important contributions to various aspects of Afro-American history, stressing shifts in Afro-American historiography and including very recent works. *Fall*. Painter.
- 269 TOPICS IN AMERICAN CULTURAL HISTORY (3). *Fall*. (Alternate years.) Kasson.
- 270 PROBLEMS IN LATIN AMERICAN HISTORY (3). *Spring, fall, on demand*. Tulchin, Joseph.
- 271 LATIN AMERICAN HISTORIOGRAPHY (3). *Spring, on demand*. Tulchin, Joseph.

- 290 TOPICS IN HISTORY FOR GRADUATES (3). *Fall or spring*. Staff.
- 298 READINGS IN THE HISTORY OF EUROPE SINCE 1789 (3). *On demand*. Staff.
- 299 INDEPENDENT STUDY FOR GRADUATE STUDENTS (3). Independent reading programs for graduate students whose needs are covered by no course immediately available. Consent of instructor required. For students physically resident in Chapel Hill. *Fall or spring*. Staff.
- 301 ANCIENT HISTORY (3). Conference and reports. *Spring*. Boren, McCoy.
- 311 MEDIEVAL HISTORY (3). (A reading knowledge of Latin is required.) Conference and reports. *Fall*. (Alternate years, on demand.) Behrends.
- 312 MEDIEVAL ENGLAND: SEMINAR (3). Prerequisite, previous work in English Medieval History and some knowledge of Latin. *Spring*. Pfaff.
- 316 SEMINAR IN MODERN BRITISH AND BRITISH IMPERIAL HISTORY (3). Conferences and reports. *Spring*. (Alternate years.) Cell.
- 318 EUROPEAN INTELLECTUAL HISTORY (3). The study of beliefs and values in modern European societies. (Alternate years.)
- 319 EARLY MODERN EUROPEAN HISTORY (3). Conference and reports. *Fall*. (Alternate years.) Headley.
- 321 RECENT EUROPEAN HISTORY (3). Conference and reports. *Spring*. (Alternate years.) Weinberg.
- 322 TUDOR-STUART ENGLAND (3). Conference and reports. *Spring*. Baxter.
- 323 SEMINAR: MODERN ENGLAND (3). *On demand*. Soloway.
- 324 SEMINAR IN MODERN EUROPEAN HISTORY (3). Conference and reports. *Fall*. Cecil.
- 325 SEMINAR IN MODERN RUSSIAN HISTORY (3). Conference and reports. *Fall*. Baron, Griffiths.
- 326 SEMINAR IN SLAVIC HISTORY (3). *Spring*. Staff.
- 327 SEMINAR IN INTERNATIONAL RELATIONS SINCE 1848 (3). An investigation of European and international politics/relations since 1848. A reading knowledge of French or German is desirable. *Fall*. (Alternate years.) S. Williamson.
- 330 THE AMERICAN REVOLUTION, 1763-1789 (3). *Fall*. Higginbotham.
- 331 AMERICAN COLONIAL HISTORY (3). Conference and reports. *Spring*. (Alternate years.) Nelson.
- 332 THE EARLY NATIONAL PERIOD, 1783-1815 *Fall*. Staff.
- 333 THE NATIONAL PERIOD, 1815-1860 (3). *Spring*. (Alternate years.) J. Williamson.
- 334 SEMINAR IN NINETEENTH AND TWENTIETH CENTURY AMERICAN URBAN HISTORY (3). *Spring*. (Alternate years.) Lotchin.
- 335 RECENT HISTORY OF THE UNITED STATES (3). *Fall*. Graham.
- 336 CIVIL WAR AND RECONSTRUCTION (3). Conference and reports. *Spring*. Klingberg.
- 338 THE SOUTH SINCE RECONSTRUCTION (3). *Spring*. Tindall.
- 339 SOCIAL AND INTELLECTUAL HISTORY OF THE UNITED STATES (3). *Spring*. (Alternate years.) Miller.
- 340 SEMINAR IN AMERICAN CONSTITUTIONAL HISTORY (3). *On demand*. Semonche.
- 341 SEMINAR IN US SOCIAL HISTORY (3). Seminar emphasizing topics, methods, theories and research in the history of American society. *Spring*. Barney, Fink, Hall, Mathews, Watson.
- 342 SEMINAR IN AFRO-AMERICAN HISTORY (3). Graduate students already well read in Afro-American history will write original research papers in the field. *Spring*. Painter.
- 343 SEMINAR IN MID-NINETEENTH CENTURY AMERICAN HISTORY (3). *Spring*. (Alternate years.) Walker.

- 344 SEMINAR IN THE DIPLOMATIC HISTORY OF THE UNITED STATES (3).
Fall. (Alternate years.)
- 350 SEMINAR IN THE HISTORY OF SCIENCE (3). *On demand.* McVaugh.
- 371 SEMINAR IN LATIN AMERICAN HISTORY (3). *Fall.* Tulchin, Joseph.
- 390 SEMINAR IN HISTORY (3). Given on demand and as resources permit, in fields which lack another regularly scheduled seminar offering. *Fall and spring.* Staff.
- 393 MASTER'S THESIS (3 or more). *Fall and spring.* Members of the graduate faculty.
- 394 DOCTORAL DISSERTATION (3 or more). *Fall and spring.* Members of the graduate faculty.
- 400 GENERAL REGISTRATION (0).

SCHOOL OF JOURNALISM

RICHARD R. COLE, *Dean*

Professors

JOHN B. ADAMS	(15)	Press Law
THOMAS A. BOWERS	(17)	Advertising, Mass Media and Society
RICHARD R. COLE	(18)	International Communication, Mass Communication and Society
PHILIP MEYER	(29)	New Technology in Mass Communi- cations, Issues in Media Management
JAMES J. MULLEN	(19)	Advertising, Communication Theory
VERMONT C. ROYSTER	(21)	History of Journalism
DONALD L. SHAW	(23)	Social Effects of Mass Communication; Communication, Culture and Technology

Associate Professors

MARGARET A. BLANCHARD	(30)	History, Law
CAROL REUSS	(27)	Mass Media and Society, Law
ROBERT L. STEVENSON	(25)	Communications Theory and Research Methods, International Communication

Assistant Professors

WILLIAM F. CHAMBERLIN	(26)	History, Law, Media and Government
JANE DELANO BROWN	(28)	Communication Theory and Methodology, Social Effects of Mass Media

Lecturers

HARRY AMANA
RICHARD J. BECKMAN
RALEIGH MANN
JAMES H. SHUMAKER

Emeritus Professors

KENNETH R. BYERLY
NORVAL NEIL LUXON

The School of Journalism offers a program of study leading to the degree of Master of Arts. It is also the administrative center for an inter-departmental program leading to the Ph.D. degree with a major in Mass Communication Research. Its graduate courses may also be used as a minor by candidates for the degrees of Master of Arts and Doctor of Philosophy in other fields.

The M.A. Program

The journalism M.A. is designed to meet the needs of: (1) journalism graduates who wish to continue their education and preparation for a professional career; (2) holders of the degree of Bachelor of Arts with majors in fields other than journalism who wish to enter the communications field; (3) experienced journalists who want more education in a specialized field; (4) experience journalists who wish to prepare themselves for journalism teaching; and (5) individuals primarily interested in training in media research.

Admission to the M.A. program is subject to admission to the Graduate School. Complete information and application forms are available from the Graduate School Office, 200 Bynum Hall.

Generally, admission to the M.A. program in the School of Journalism is limited to students who have:

1. Been graduated by approved colleges or universities.
2. Undergraduate grade-point averages of at least 3.0 (A = 4.0) in the major and at least 3.0 in the last two years overall.
3. Acceptable scores on the Graduate Record Examination.
4. Three recommendations from appropriate persons.
5. Submitted statements (typewritten) of career intent, showing how they plan to make effective use of graduate training in journalism and mass communication.

Applicants should be aware that applications far exceed the number of admissions and that each year many qualified applicants are rejected because of limited space in the program.

Applicants for fall admission who apply for financial aid must submit all their materials to the Graduate School by February 1, and *all* applicants for fall admission should have their applications in as soon as possible. All applicants for spring admission must have their applications submitted by October 1. Only a few persons are admitted for graduate study in journalism beginning in the spring semester.

There are two routes to the degree of Master of Arts in Journalism. The first, the News-Editorial Curriculum, is oriented toward practice in the journalism field. The second, the General Curriculum, is intended for students interested in mass communication research, advertising, journalism history or law, international communication or other fields related to journalism. Students who intend to continue work toward the Ph.D. degree should follow the General Curriculum.

Both curricula require candidates to demonstrate above-average competence and knowledge associated with four journalism courses:

- Journalism 53 News Writing
- Journalism 54 Reporting
- Journalism 57 News Editing

A fourth course: Journalism 56, 60, 80, 154, 156 or 180, or, for students in the General Curriculum, an appropriate methods course.

Such competence can be demonstrated:

1. By taking these courses at Chapel Hill and receiving a grade of at least B or P. Students without journalistic experience or without journalism courses at another school are required to take the courses at Chapel Hill. As such, the courses do not count toward M.A. degree requirements. Students who receive grades of below B or P are ineligible to continue graduate studies.
2. By passing exemption examinations. Students with journalistic experience or with journalism courses from another school must pass the examinations in order to be exempted. The examinations are given before the beginning of each semester.

The News-Editorial Curriculum. This program consists of six or seven journalism courses plus three or four supporting courses to make a total of ten (30 credit hours). The required journalism courses are Journalism 151, 164, 262, 281 and 393 (thesis). The thesis may be either a traditional master's thesis or a series of publishable articles on a topic requiring considerable depth of investigation or enterprise on the part of the candidate. In addition, students will undertake a supporting program of three or four courses (four, when there are six journalism courses; three, when there are seven). The supporting program is to be determined by the student and advisor with the agreement of the student's committee. Normally, this group of courses would be in but one discipline, but the committee may make exceptions when the student supplies adequate justification.

The General Curriculum. Because this program must serve the needs of students with a wide variety of interests, it has exceptional flexibility. Students interested in mass communication research, journalism history or law, international communication or other fields related to journalism may tailor a program, with the help of their advisors and committees, to their particular needs. This curriculum, too, consists of either six or seven journalism courses and three or four supporting courses, but only Journalism 151, 164 and 393 (thesis) are specifically required. The balance of three or four journalism courses plus the supporting courses will depend on the student's objectives and must be approved by the student's committee. For most students in this curriculum, the thesis would be the product of research on a topic approved by the student's committee. The series of articles (a thesis option in the News-Editorial Curriculum) would *not* be an acceptable option in the General Curriculum.

All M.A. students, regardless of curriculum, must:

1. Pass the School's spelling-grammar examination in the first semester of residence.
2. Take two special examinations: A written comprehensive examination and an oral examination.

3. Select a committee to supervise the M.A. work. The committee consists of the student's advisor, another member of the journalism faculty, and a representative from the supplementary field or a third journalism member.

In addition, it is expected that at least four of the student's courses in the M.A. program be at the 200 level or above.

There is no foreign-language requirement for the M.A. in Journalism.

Students with an appropriate undergraduate degree should expect to take at least one calendar year to get the M.A. Those who have to take additional courses need longer.

See pages 98-101 for general requirements for the Master of Arts degree.

The Ph.D. Program

The Ph.D. with a major in Mass Communication Research is designed to meet the needs of: (1) outstanding graduate students who wish to prepare for teaching and research positions in colleges and universities; (2) outstanding graduate students who wish to prepare for research jobs in the mass communication industry, in advertising agencies, in market and opinion research firms, in business, and in government.

The Ph.D. program is interdisciplinary and is tailored to the particular needs of each student. In journalism, the student is expected to attain a high degree of competence in research methodology. The student is also expected to master a broad range of knowledge concerning mass communication in modern society. In addition to the methods courses in journalism, the student must take at least two statistics courses and additional methods courses in other disciplines. The balance of the program will include supplementary courses in the area(s) of specialization in departments other than journalism and a dissertation on a topic in mass communication. The specific content of a given program will be determined by the student and his or her committee and will vary with the background, preparation, and goals of the student.

The student's committee is composed of at least five graduate faculty members. Three or more are from the School of Journalism, and two or more are from cooperating departments.

A comprehensive written examination and an oral examination are required at or near the end of the course work, and there is a final oral examination on the dissertation.

A Ph.D. student is required to demonstrate competency in one foreign language *or* in an approved research tool area (exception: all candidates with an emphasis in international communication must fulfill the foreign-language requirement).

The general Graduate School requirements on residence and examinations will be followed.

Fellowships and Assistantships

Vermont Royster-Dow Jones Fellowships and Assistantships, with a stipend of at least \$4,000 each are awarded to outstanding students. Several graduate assistantships, paying \$3,500 or more a year for a set number of hours a week, are available on a competitive basis. There are blanks on the Graduate School application form to indicate interest in assistantships. In addition, prospective graduate students in journalism are eligible for the all-university fellowships awarded annually.

Courses for Graduates and Advanced Undergraduates

- 101 THE MASS MEDIA AND U.S. HISTORY (3). An examination of the development of the mass media in the context of U.S. History. Emphasis will be on major developments and trends within a chronological framework. *Fall*. Shaw, Blanchard.
- 111 THE PRESS IN CONTEMPORARY SOCIETY (3). A study of the structure and performance of the press as it interacts with other contemporary social institutions, with emphasis on the effects on society and media personnel. *Fall and spring*. Reuss; staff.
- 146 INTERNATIONAL COMMUNICATION AND COMPARATIVE JOURNALISM (Political Science 146) (Radio, Television and Motion Pictures 146) (3). Development of international communication; the flow of news; the role of communication in international relations; communication in the developing nations; comparison of press systems. *Fall and spring*. Cole, Stevenson.
- 151 INTRODUCTION TO MASS COMMUNICATION RESEARCH (Radio, Television, and Motion Pictures 151) (Speech 151) (3). Fundamentals of communication research techniques (content analysis, historiography, survey research, experimental design), including an overview of computer applications, statistics, theory development, and trends in the published literature. *Fall and spring*. Stevenson, Brown.
- 154 ADVANCED REPORTING (3). Prerequisites, Journalism 53 and 54 or permission of instructor. Rigorous, in-depth instruction and critiques of students' news and feature assignments done with different reporting methodologies, including interviewing, official records, direct and participant observation and survey research (The Carolina Poll). *Fall and spring*. Meyer.
- 156 MAGAZINE WRITING AND EDITING (3). Prerequisites, Journalism 53 and 57; permission of instructor required. Instruction and practice in planning, writing and editing copy for magazines. *Fall and spring*. Reuss.
- 157 ADVANCED EDITING (3). Prerequisites, Journalism 57 and permission of instructor. Concentration on the editing and display of complex news and feature stories and other print media content with a significant emphasis on newspaper design and graphics. *Spring*. Mann; staff.
- 164 MASS MEDIA LAW AND ETHICS (3). Legal and extra-legal limitations on press freedom, focusing on significant legal constraints affecting the news process, including libel, privacy, free press/fair trial, contempt of court, copyright, access law. *Fall and spring*. Adams, Chamberlin.
- 165 PROCESS AND EFFECTS OF MASS COMMUNICATION (3). Mass communication as a social process, incorporating literature from journalism, social psychology, sociology, political science, history. To acquaint students with factors in message construction, dissemination and reception by audiences. *Fall and spring*. Brown, Shaw.

- 170 PRINCIPLES OF ADVERTISING (3). A survey of the economics, psychology, philosophy, and history of advertising, with particular reference to research bases, copy, layout, media planning, production, and testing of advertisements. *Fall and spring*. Mullen, Bowers.
- 171 ADVERTISING COPY AND COMMUNICATION (3). Prerequisite, Journalism 170 or Business Administration 161, or equivalent. Application of findings from social science research; social responsibility of the copywriter and advertiser; preparation of advertisements for the mass media; research in copy testing. *Fall and spring*. Mullen.
- 172 ADVERTISING MEDIA (3). Prerequisite, Journalism 170 or Business Administration 161, or equivalent. The media planning function in advertising for both buyers and sellers of media; the relationships among media, messages, and audiences; research studies in media analysis. *Fall and spring*. Mullen, Bowers.
- 173 ADVERTISING CAMPAIGNS (3). Prerequisite, Journalism 171 or 172. Planning and executing advertising campaigns; types and methods of advertising research; the economic function of advertising in society. *Fall and spring*. Mullen.
- 174 ADVANCED BROADCAST NEWS REPORTING (Radio, Television and Motion Pictures 174) (3). Prerequisite, RTVM 73. Examination and application of in-depth broadcast news reporting techniques, especially investigative reporting, special events coverage, and the documentary. Students film and produce radio and television programs of actual news events. *Two lecture and two laboratory hours per week, spring*. Staff.
- 175 BUSINESS AND ORGANIZATIONAL COMMUNICATION (3). Internal and external public relations concepts and practices for businesses and other organizations, with emphasis on identification and analysis of their publics and design, execution and assessment of appropriate communication strategies. *Fall and spring*. Reuss.
- 178 RETAIL ADVERTISING (3). Prerequisite, Journalism 170 or equivalent. Principles and practice of retail advertising in all media, with emphasis on selling, writing and layout of retail advertising for the print media. *Spring*. Bowers.
- 180 ADVANCED PHOTOJOURNALISM (3). Prerequisites, Journalism 80 and permission of instructor. Examination and application of documentary photojournalism techniques, including market survey and topic analysis, assigned shooting and picture editing and layout and design techniques. *Spring*. Beckman.
- 191 PROSEMINAR IN CONTEMPORARY JOURNALISM (1-3). Journalism seniors and graduate students only; permission of instructor required. Small classes on various aspects of journalism with subjects and instructors varying each semester. One to three seminar hours a week. *Fall and spring*. Staff.

Courses for Graduates

- 251 MEDIA RESEARCH METHODS (Radio, Television and Motion Pictures 251) (3). Prerequisite, Journalism 151 or equivalent. Advanced work in experimental design in communication research, audience surveys, and content analysis. *Spring*. Stevenson, Brown.
- 262 SPECIALIZED REPORTING (3). Prerequisites, graduate standing and permission of instructor. Reporting of complicated topics, using in-depth backgrounding, investigative reporting techniques, story conferences and documents and other research data. *Spring*. Adams, Royster, Reuss; staff.
- 281 EXECUTIVE MANAGEMENT OF NEW OPERATIONS (3). Prerequisites, graduate standing and permission of instructor. Planning and policy functions of management in the news-editorial department, including problems of budgeting, personnel management and labor relations. The course also covers management coordination among advertising, circulation and production functions. *Fall*. Meyer; staff.

- 301 SEMINAR IN MASS COMMUNICATION HISTORY (3). Readings, discussion and projects in mass communication history. *Spring*. Shaw, Blanchard.
- 311 SEMINAR IN MASS COMMUNICATION AND SOCIETY PERSPECTIVES (3). Prerequisites, graduate standing and permission of instructor. Readings, discussion and papers on the roles and responsibilities of mass communication in society. *Spring*. Reuss; staff.
- 318 SEMINAR IN THEORIES OF COMMUNICATION (3). Prerequisites, Journalism 165 or a course in Social Psychology. Students will prepare analytical papers on theories of communication based upon extensive review of behavioral science literature. *Fall*. Brown, Shaw; staff.
- 340 SEMINAR IN MEDIA ANALYSIS (Psychology 340) (3). Students will participate in the design and execution of media research projects. *Spring*. Staff.
- 345 READING AND RESEARCH (3)., Prerequisite, permission of instructor. Advanced reading or research in selected field. *Fall and spring*. Staff.
- 346 SEMINAR IN INTERNATIONAL COMMUNICATION (Political Science 346) (3). Prerequisite, Journalism 146 or permission of instructor. *On demand*. Cole, Stevenson.
- 364 SEMINAR IN MASS COMMUNICATION LAW AND ETHICS (3). Prerequisite, Journalism 164 or permission of instructor. Readings, discussion and projects in major issues of mass communication law, including libel, privacy, access, court-press relations, the First Amendment and regulation of telecommunications. *Fall*. Adams, Chamberlin.
- 393 MASTER'S THESIS (3). *Fall and spring*. Staff.
- 394 DOCTORAL DISSERTATION (3 or more). *Fall and spring*. Staff.
- 400 GENERAL REGISTRATION (0).

SCHOOL OF LIBRARY SCIENCE

EDWARD G. HOLLEY, *Dean*

Professors

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|----------------------|------|--|
| LESTER E. ASHEIM | (4) | Communication and Libraries, Comparative Librarianship, Education for Librarianship |
| ROBERT N. BROADUS | (16) | Collection Development, Library Buildings and Equipment |
| RAYMOND L. CARPENTER | (1) | Research Methods, Information Services for the Social Sciences |
| BUDD L. GAMBEE | (3) | Administration of Non-Book Materials in Libraries |
| JAMES F. GOVAN | (20) | University Librarian |
| EDWARD G. HOLLEY | (5) | Academic Libraries, Library Administration, Library History |
| MARY E. KINGSBURY | (7) | Children's Literature, Storytelling |
| HAYNES McMULLEN | (8) | History of Books and Libraries, Literature of the Humanities, Popular Materials in Libraries |
| MARY W. OLIVER | (19) | Law Librarianship |

Associate Professors

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|-------------------|------|---|
| MARTIN DILLON | (2) | Automating Information Systems, Natural Language Analysis |
| MARILYN L. MILLER | (18) | Materials and Programs for Children and Young People in School and Public Libraries |
| KAY MURRAY | (17) | Public Services; Reference and Bibliography; Library in Society |
| FRED W. ROPER | (10) | Reference; Bibliography; Medical, Scientific and Technical Librarianship |

Assistant Professors

- | | | |
|--------------------|------|--|
| MILDRED H. DOWNING | (25) | Cataloguing and Classification, Information Science, Research Methods in Librarianship |
| BARBARA B. MORAN | (30) | Academic Libraries and Management |
| SUSAN STEINFIRST | (15) | Services for Young Adults, Children's Literature, History of Children's Literature |

Adjunct Professors

- | | | |
|-----------------|------|---|
| JOE A. HEWITT | (21) | Theory of Classification, Technical Services |
| CAROLYN WALLACE | (29) | Organization and Administration of Archives and Manuscripts Collections |

Adjunct Associate Professor

PAUL S. KODA (24) Rare Books, Bibliography

Adjunct Instructor

RIDLEY R. KESSLER, JR (23) Public Documents, Reference

Emeritus Professors

SUSAN GREY AKERS

LUCILLE KELLING HENDERSON

GERTRUDE LONDON

JERROLD ORNE

The program of the School of Library Science is designed to prepare candidates for positions as professional librarians in all types and varieties of libraries—academic, public, school, special—and information systems, as well as to encourage their participation in the advancement of librarianship through study and research. The School offers graduate instruction leading to the degrees of Master of Science in Library Science and Doctor of Philosophy.

The master's program provides an integrated core curriculum in the fundamental aspects of librarianship and additional courses to equip the candidate for significant contributions within the chosen field of emphasis. The construction of this sequence is dependent upon the previous training and experience of the student and is determined through conferences between the student and his or her faculty advisor.

The basic requirement for admission to the master's program is a bachelor's degree from a recognized college or university. The student's undergraduate work should evidence a balanced distribution of courses in the sciences, the social sciences, and the humanities; quantitative training is increasingly important. Unconditional admission involves meeting the requirements for admission to the Graduate School, as described on page 49-51 and submission of acceptable scores on the Aptitude Test of the Graduate Record Examination. After enrollment, each student will be required to complete a twelve-semester hour introduction to librarianship, a course in research methods, and a supervised field experience. These courses will be supplemented by additional courses in librarianship and other subject fields as recommended by the School. The degree candidate will normally be expected to complete forty-eight semester hours of graduate study. For details regarding the entrance requirements and curriculum provisions for the master's program, see the separate *Catalog* of the School of Library Science.

Students interested in the doctoral program should request further information from Fred W. Roper, Associate Dean, The School of Library

Science, Manning Hall 026—A, The University of North Carolina at Chapel Hill, Chapel Hill, N.C. 27514.

The School of Library Science occupies three floors of Manning Hall. The building, constructed in 1922, was completely renovated and air conditioned in 1970. The School's quarters afford ample space to house a special children's collection and an audiovisual laboratory, in addition to offices, classrooms, and the Library Science Library.

Courses for Graduates and Advanced Undergraduates ^{1,2}

- 101 INTRODUCTION TO LIBRARIANSHIP, I (6). The relationship between the library and its environment; the computer in the library; library materials. *Six hours a week, fall semester.* Staff.
- 102 INTRODUCTION TO LIBRARIANSHIP, II (6). Prerequisite, Library Science 101. The process of presenting materials to the public; planning for libraries and administering them. *Six hours a week, fall semester.* Staff.
- 103 INFORMATION SYSTEMS IN LANGUAGE RESEARCH (Computer Science 119X) (3). Prerequisite, a knowledge of PL/1 programming equivalent to that required in Library Science 101 and 102 or one of Computer Science 14, 16, 214X, 216X. Concepts of information and information processing as they relate to language research in the humanities and social sciences. Hardware and software systems for language research. Programming projects required. *Three hours a week, fall and spring semesters.* Dillon.
- 105 HISTORY OF BOOKS AND PRINTING (3). A study of the origin and development of the book from earliest times to the nineteenth century. *Three hours a week, spring semester.* Gambee.
- 107 CONTEMPORARY PUBLISHING AND THE BOOK INDUSTRY (3). Present-day techniques in the production and distribution of the communications materials commonly acquired by libraries, studied in the context of their historical development particularly during the nineteenth and twentieth centuries. *Three hours a week, fall semester.* Gambee.
- 108 HISTORY OF LIBRARIES (3). The history of libraries and librarianship from ancient times to the present. *Three hours a week, spring semester.* McMullen.
- 115 NATURAL LANGUAGE PROCESSING (Computer Science 171) (3). Prerequisite, one of Computer Science 14, 16, 214X, 216X. Physiological, psychological, syntactic and semantic models of natural language; emphasis upon implementation on the computer and related hardware of syntactic and semantic formalizations. *Three hours a week, fall semester.* Staff.
- 120 HISTORY OF CHILDREN'S LITERATURE (3). A survey of children's literature in English from the Middle Ages through the nineteenth century. *Three hours a week, spring semester.* Steinfirt.
- 122 SELECTION OF BOOKS AND RELATED MATERIALS FOR YOUNG PEOPLE (3). A survey of library materials particularly suited to the use of the adolescent reader. *Three hours a week, fall semester.* Steinfirt.
- 123 SELECTION OF BOOKS AND RELATED MATERIALS FOR CHILDREN (3). A survey of library materials for children including both classic and modern titles, with attention to the work of illustrators of books for children. *Three hours a week, spring semester.* Kingsbury.

1. The listing of a course in the catalog does not obligate the University to give the course in any particular year.

2. Students in other graduate programs may enroll in these courses with permission of the instructor.

- 125 NON-BOOK MATERIALS AS LIBRARY RESOURCES (3). Principles of selecting, acquiring, organizing, storing, and servicing non-book materials in libraries of all types and in materials centers. Emphasis is given to those media increasingly important in library collections; motion pictures, filmstrips, slides, microfilms, disc and tape recordings, pictures, and maps. *Three hours a week, fall semester.* Gambee.
- 145 ADMINISTRATION OF THE SCHOOL LIBRARY MEDIA CENTER (3). Administration of elementary and secondary school library media programs. Considers program planning and evaluation, policies and procedures for management, staffing, facilities, and budgeting. *Three hours a week, fall and spring semesters.* Miller.
- 172 INFORMATION RETRIEVAL (Computer Science 172) (3). Prerequisite, one of Computer Science 14, 16, 214X, 216X. Study of information retrieval and question answering techniques, including document classification, retrieval and evaluation techniques, handling of large data collections, and the use of feedback. *Three hours a week, spring semester.* Weiss.

Courses for Graduates

- 201 METHODS OF INVESTIGATION AND RESEARCH IN LIBRARIANSHIP (3). An introduction to research methods and their application to librarianship; designed to prepare students to select, formulate, and develop problems as well as to judge the published reports of the investigation of others. *Three hours a week, fall and spring semesters.* Moran.
- 204 COMPARATIVE LIBRARIANSHIP (3). Library and information system characteristics in selective European and developing countries; world trends and international cooperation in library organization and service. *Three hours a week, spring semester.* Asheim.
- 210 LEGAL BIBLIOGRAPHY (3). An introduction to the literature of Anglo-American jurisprudence. Emphasis will be placed on the use of reports, statutes, administrative regulations and decisions, treatises, periodicals, and indexes as bibliographical tools. *Alternate summers.* Staff.
- 211 REFERENCE MATERIALS (3). Prerequisites, Library Science 101 and 102. Evaluation and use of a variety of reference materials with some attention to special subjects; the development of reference collections for particular clientele. *Three hours a week, fall and spring semesters.* McMullen and Roper.
- 215 BIBLIOGRAPHY (3). A study of the chief national and trade bibliographies in English and foreign languages. *Three hours a week, spring semester.* Broadus.
- 216 REFERENCE SERVICES (3). Prerequisites, Library Science 101 and 102. An examination of the managerial and professional responsibilities involved in providing reference services. Partial contents: policy development, methods of evaluation, interpersonal communication, ethics of information services, search strategy. *Three hours a week, spring semester.* Murray.
- 220 STORYTELLING: MATERIALS AND METHODS (3). Prerequisite, permission of instructor. The storyteller as an agent in the transmission of culture. Experience in selecting, adapting, and presenting materials from the oral tradition and modern literary sources. Opportunity for more intense study by each student of the customs and folklore of a single culture. *Three hours a week, spring semester.* Kingsbury.
- 221 READING INTERESTS AND GUIDANCE OF CHILDREN AND YOUNG ADULTS (3). Prerequisites, Library Science 122 and 123, or equivalent. Reading habits and interests of children and young adults; emphasis on readability factors, selection of readable materials, and the design of group guidance activities. *Three hours a week, fall semester.* Miller.

- 222 SCIENCE LITERATURE (3). A survey of the literature in the physical and biological sciences, with attention to landmark books, major bibliographic and fact sources, and contemporary book and non-book materials in the sciences. *Three hours a week, spring semester.* Staff.
- 223 SOCIAL SCIENCE LITERATURE (3). A survey of the literature in the various subject areas of the social sciences; includes background movements, leaders, classics, bibliography, and sources of materials. *Three hours a week, spring semester.* Carpenter.
- 224 HUMANITIES LITERATURE (3). A survey of the literature of the various subject areas in the humanities. *Three hours a week, fall and spring semesters.* McMullen.
- 225 LITERATURE OF THE HEALTH SCIENCES (3). Prerequisites, LIBS 101 and 102. An introduction to the literature of the health sciences; nature of the literature; problems in its organization; and current techniques and tools for its control. *Three hours a week, spring semester.* Roper.
- 226b LEGAL RESEARCH AND WRITING (3). Prerequisite, Library Science 228, or equivalent. Training, including research problems in the use of law books and legal materials. *Three hours a week, fall semester.* (Not offered in 1981-82.) Oliver.
- 228 PUBLIC DOCUMENTS (3). A survey of the major publications of the United States federal government, United Nations, United States state governments, and British government, with attention to the selection, classification, and administration of a document collection. *Three hours a week, fall semester.* Kessler.
- 231 THEORY OF LIBRARY ADMINISTRATION (3). Administrative theory and practice as it applies to the organization and operation of libraries; includes a study of the government of the library; the planning, organization, direction, and control of its activities; public relations; personnel; and finance. *Three hours a week, fall semester.* Carpenter.
- 232 ANALYSIS AND DESIGN FOR LIBRARY MANAGEMENT (3). Application of systematic analytical methods to the problems of management and organization. Emphasis on the use of selected techniques in designing the solutions to problems in library information service. *Three hours a week, fall and spring semesters.* Staff.
- 235 LIBRARY BUILDINGS AND EQUIPMENT (3). Prerequisites, Library Science 101 and 102. The planning of buildings for all types of libraries; selection and purchase of equipment; analyses of existing examples of good and bad results. *Three hours a week, fall semester.* Broadus.
- 241 ADMINISTRATION AND SUPERVISION OF PUBLIC SCHOOL LIBRARY SYSTEMS (3). The principles and problems in system-wide school library service, together with the functions and duties of coordinators and supervisors of school libraries. *Three hours a week, spring semester.* (Not offered in 1981-82.) Miller.
- 242 ROLE OF THE SCHOOL LIBRARY MEDIA SPECIALIST IN CURRICULUM IMPLEMENTATION (3). Prerequisites, Library Science 101 and 102. Considers the curriculum implementation and teaching roles of the media specialist including the development of multi-media collections and the instructional media retrieval programs. *Three hours a week, spring semester.* Miller.
- 243 ADMINISTRATION OF PUBLIC LIBRARY WORK WITH CHILDREN AND YOUNG ADULTS (3). Prerequisites, Library Science 101 and 102, or equivalent. Objectives and organization of public library services for children and young adults; designed for those who work directly with young people or who intend to work in public libraries. *Three hours a week, spring semester.* Miller.
- 246 LIBRARIANSHIP AND THE LAW (3). An introduction to the various areas of law relevant to librarianship. Particular attention will be given to current legislation relating directly to libraries and librarians. *Alternate summers.* Staff.
- 251 THE ORGANIZATION OF MATERIALS IN LIBRARIES AND INFORMATION CENTERS (3). Examination of the principles underlying the identification and

- categorization of materials; training in the use of contemporary cataloging tools and media; preparation for probable future trends, issues and methods. *Three hours a week, fall and spring semesters.* Downing.
- 255 AUTOMATING INFORMATION SYSTEMS: BIBLIOGRAPHIC DATA PROCESSING (3). Prerequisite, a knowledge of PL/I programming equivalent to that required for Library Science 101 and 102. Principles and techniques of automatic information processing, as applied to libraries and information centers, emphasizing current problems of design and implementation. Topics include problems in organizing and classifying information and systems for data base retrieval and selective dissemination information. *Three hours a week, fall and spring semesters.* Dillon.
- 256 AUTOMATING INFORMATION SYSTEMS: SUBJECT ANALYSIS (3). Prerequisite, a knowledge of PL/I programming equivalent to that required in Library Science 101 and 102. An investigation of the basic goals and objectives of subject analysis, from thesaurus construction through evaluation of retrieval systems. *Three hours a week, spring semester.* Dillon.
- 257 ON-LINE DATABASES: USE AND EVALUATION (3). Prerequisites, Library Science 101 and 102. Examination of the underlying structure of commercial on-line databases and their retrieval languages; experience in using these databases. *Three hours a week, fall semester.* Staff.
- 262 ADULT MATERIALS IN LIBRARIES (3). Prerequisites, Library Science 101 and 102. Selection and use of books, periodicals, pamphlets, and audiovisual materials (other than reference) on all subjects, for adults in public and academic libraries. *Three hours a week, fall and spring semesters.* Broadus.
- 299 SUPERVISED FIELD EXPERIENCE (3). Prerequisites, 24 semester hours, including Library Science 101 and 102 and permission of adviser. Supervised observation and practice in an approved library or other information service agency. The student will plan a work schedule with supervising librarian and field supervisor which meets a requirement of 105 hours in a library plus 5 clock hours in faculty-led group discussions for on-going evaluation of the practical experience. *Fall and spring semesters.* Staff.
- 300 READINGS AND SPECIAL STUDIES IN LIBRARIANSHIP (3). Prerequisite, permission of the instructor. Advanced reading, study, and research by an individual student on a special topic under the direction of a specific faculty member. *Three hours a week, fall and spring semesters.* Members of the graduate faculty.
- 301 RESEARCH (3). Designed to provide an individual student the opportunity to carry out a research project under the supervision of a member of the graduate faculty. *Fall and spring semesters.*
- 302 METHODOLOGIES FOR RESEARCH IN LIBRARIANSHIP (3). A survey of various methodologies useful in understanding libraries and solving their problems. Quantitative and non-quantitative techniques will be considered. *Three hours a week, fall semester.* Carpenter.
- 303 SEMINAR IN RESEARCH DESIGN (3). Prerequisite, LIBS 302. The student designs a research project to be criticized by other students and faculty; the project is expected to become the basis for the dissertation. *Three hours a week, fall semester.* McMullen.
- 306 SEMINAR IN ISSUES AND TRENDS IN LIBRARIANSHIP (3). Prerequisite, doctoral student status or permission of the instructor. Examination and analysis of current issues and trends in librarianship, including public policy, legislation, leadership, intellectual freedom, and personnel. *Three hours a week, fall semester.* Holley.
- 307 THE AGENCIES AND MEDIA OF COMMUNICATION (3). A survey of the social role of the major media and agencies of communication with special attention to the role of the library as one such agency. *Three hours a week, spring semester.* Asheim.

- 309 PROBLEMS IN EDUCATION FOR LIBRARIANSHIP (3). Prerequisite, permission of instructor. The study of education for the librarian as an example of professional education in the United States. Focuses on problems of library education within the framework of higher education in general. *Three hours a week, fall semester.* Asheim.
- 310 SEMINAR IN SELECTED TOPICS (3). Prerequisite, permission of the instructor. Three hours a week, time to be arranged. Members of the graduate faculty.
- 315 SEMINAR IN PUBLIC SERVICES (3). Prerequisite, permission of the instructor. An examination of information services in all types of libraries. Major units include surveying prototype service programs, analyzing the user community, planning, implementing, and evaluating service programs. *Three hours a week, fall and spring semesters.* Murray.
- 326 SEMINAR: POPULAR MATERIALS IN LIBRARIES (3). Prerequisite, permission of the instructor. Selected topics relating to the roles of various types of libraries in the provision and preservation of popular and "ephemeral" materials existing in various forms (print, recorded sound, etc.) *Three hours a week, spring semester.* (Not offered in 1981-82.) McMullen.
- 341 SEMINAR IN PUBLIC LIBRARIES (3). Prerequisites, LIBS 101 and 102. Selected topics in public library services, systems, networks and their management. Current issues are emphasized, along with the interests of the participants. *Three hours a week, spring semester.* Murray.
- 342 SEMINAR IN ACADEMIC LIBRARIES (3). Prerequisite, permission of the instructor. Study of problems in the organization and administration of college and university libraries with emphasis upon current issues in personnel, finance, governance, and services. *Three hours a week, spring semester.* Holley.
- 343 SEMINAR IN SPECIAL LIBRARIES AND INFORMATION SERVICES (3). Study of the organization and administration of specialized information centers and services with emphasis on problems common to a variety of services. *Three hours a week, alternate spring semesters.* Staff.
- 344 ADMINISTRATION OF ARCHIVES AND MANUSCRIPT COLLECTIONS (3). The history, principles, and techniques of acquiring and administering public and private archives and manuscript collections. Instruction will be supplemented by special lectures and tours of nearby record repositories. *Three hours a week, spring semester.* Wallace.
- 345 SEMINAR IN FINE ARTS LIBRARIANSHIP (3). A survey of the literature of the fine arts, principally the graphic arts, sculpture, and architecture. Special problems of the fine arts library, its organization and services. *Three hours a week, spring semester.* Gambee.
- 346 SEMINAR IN LAW LIBRARIANSHIP (3). Prerequisite, permission of the instructor. An introduction of the Anglo-American legal system and a study of the development of law libraries, their objectives, characteristics, and services with attention to the special problems of selecting, acquiring, and organizing law materials, and administering law library services. *Alternate summers.* Oliver.
- 348 SEMINAR IN HEALTH SCIENCES LIBRARIANSHIP (3). Prerequisites, LIBS 101 and 102. An introduction to the organization of all types of health sciences libraries with emphasis upon problems of administration and technical processing; reference and information services; library networks and library cooperation. *Three hours a week, spring semester.* Staff.
- 349 SEMINAR IN RARE BOOK COLLECTIONS (3). Prerequisite, permission of the instructor. A study of the nature and importance of rare books; and development and administration of rare book collections; problems of acquisition, organization, and service. *Three hours a week, spring semester.* Koda.

- 351 ADMINISTRATION OF TECHNICAL SERVICES (3). Advanced study of the role and organization of technical services. Emphasis on management of acquisitions, serials and cataloging departments, coordination of technical services; and the impact of automation and networking. *Three hours a week, spring semester.* Hewitt.
- 352 ADVANCED PROBLEMS IN THE ORGANIZATION OF MATERIALS IN LIBRARIES AND INFORMATION CENTERS (3). Prerequisites, permission of the instructor; LIBS 251. Analysis and solution of the more difficult problems in bibliographic description and classification; emphasis on the contributions of nontraditional systems such as UDC, PRECIS, and non-American cataloging codes. *Three hours a week, spring semester.* Downing.
- 394 DOCTORAL DISSERTATION (3 or more). *Fall and spring.* Staff.
- 400 GENERAL REGISTRATION (0).

CURRICULUM IN LINGUISTICS

SIDNEY R. SMITH, *Chairman*. Advisory Committee: Professors S. Fillenbaum, J. Flora, R. Howren, M. Levine, P. Stadter; Associate Professors C. Eble, V. Friedman, E. Montgomery; Assistant Professor C. Melchert.

Professors

ROBERT HOWREN	(9)	Phonology, Phonetics, American Indian Linguistics, Dialectology
MARIA TSIAPERA	(7)	Historical Linguistics, History of Linguistics, Dialectology
SIDNEY R. SMITH	(14)	Germanic Linguistics and Philology
RICHARD H. LAWSON	(15)	Germanic Linguistics and Philology
SAMUEL FILLENBAUM	(16)	Psychology of Language
JOHN B. CARROLL	(17)	Psycholinguistics
PAUL ZIFF	(18)	Philosophy of Language
PAUL BRANDES	(19)	Communication Theory
PETER CALINGAERT	(20)	Natural Language Processing
STANLEY MUNSAT	(21)	Philosophy of Language and Linguistics

Associate Professors

H. PHELPS GATES	(8)	Sanskrit, Comparative Grammar of Greek and Latin
EDWARD D. MONTGOMERY, JR.	(22)	Romance Linguistics and Philology
VICTOR FRIEDMAN	(23)	Slavic and Balkan Linguistics
LAWRENCE FEINBERG	(24)	Slavic Linguistics
CONNIE C. EBLE	(25)	English Linguistics
JOSEPH WITTIG	(26)	English Linguistics
CATHERINE A. MALEY	(28)	Romance Linguistics
STEPHEN F. WEISS	(29)	Natural Language Processing
MARTIN DILLON	(30)	Natural Language Analysis

Assistant Professors

RANDALL HENDRICK	(34)	Syntax, Mathematical Linguistics
H. CRAIG MELCHERT	(10)	Indo-European Linguistics, Chinese Linguistics
THOMAS L. LAYTON	(31)	Language Acquisition, Language Disorders
LARRY D. KING	(32)	Spanish and Portuguese Linguistics
ROBERT YOUNG	(33)	Natural Language Processing

Lecturer

DOROTHY D. WILLS	(35)	Sociolinguistics, African Linguistics
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The Curriculum in Linguistics, comprised of specialists teaching core courses as well as faculty from nearly a dozen different departments, offers graduate work leading to the degrees of Master of Arts and Doctor of Philosophy in Linguistics.

Degree candidates must demonstrate both a basic knowledge of the field of linguistics as a whole and the ability to do independent study in a chosen specialty. Basic knowledge of linguistics is acquired by taking certain required courses; knowledge of a specialty is gained through elective courses as well as by the writing of an M.A. thesis.

The elective courses are expected to form a coherent program in a sub-field of linguistics (e.g. phonology, syntax, historical linguistics, sociolinguistics) or in the application of linguistics to a closely related discipline (e.g. anthropology, study of a particular language or language family). To this end, each student, after consultation with the Director of Graduate Studies, will by the beginning of the second semester of residence choose a permanent advisor, who will supervise the student's program of study.

Degree programs of students in the Curriculum must satisfy the general requirements of the Graduate School. In addition, the student must fulfill the following curriculum requirements.

Master of Arts in Linguistics

Course requirements: Linguistics 100, 101, 120, 123, 130, four courses within a chosen specialty (selected with guidance of the Graduate Director), and three hours of thesis credit. A student seeking transfer credit for graduate courses taken at another institution must make a formal request to the instructor of the corresponding curriculum course, who, after consultation with the Director of Graduate studies, may recommend acceptance of the transfer credit. A maximum of six semester hours may be so transferred.

Foreign language requirement: Reading knowledge of one foreign language. For students in historical linguistics French or German is recommended.

Comprehensive Examination: The M.A. comprehensive examination, normally taken in the fall of the second year of graduate study, will consist of a three-part written examination covering the areas of phonology, syntax, and historical linguistics. The examination will be based on the required courses and a reading list published by the Curriculum. A follow-up oral examination may involve residual questions from the written examination but centers primarily upon the topic the student proposes for his or her M.A. thesis. Upon completion of the thesis the student defends his or her work in the final oral examination.

A student who wishes to bypass the M.A. Degree must submit a written request to the Chairman of the Curriculum after the M.A. comprehensive

examination. The linguistics faculty will consider the request, and the student will be informed, in writing, of the decision.

Doctor of Philosophy in Linguistics

Course requirements: 60 credit hours. Required are the courses stipulated as obligatory for the M.A. Either linguistic field work (Linguistics 293) or an approved philology course (see list of specific language groups) must be taken; also one advanced methods course at the 200 level, and a three-hour course on the history of linguistics. Students in theoretical linguistics should take either symbolic logic (Linguistics 104) or mathematical linguistics (Linguistics 140), plus one course in semantics or a course on the psychology of language. Students in historical linguistics should take one year of a classical language such as Latin, Greek, or Sanskrit.

Foreign language requirements: (a) one year of a non-Indo-European language *or* one semester in the structure of a non-Indo-European language; (b) reading knowledge of two foreign languages. In the case of students in historical linguistics, these should be French and German. Other students may fulfill (b) with any two foreign languages or, if they wish, with one foreign language plus one course in the structure of a language [the latter must be other than the one used to satisfy (a)].

Preliminary Examination: For students who have taken the M.A. degree in the Department, the M.A. written comprehensive examination described above will also serve as a diagnostic preliminary examination to assist in determining the student's capability for Ph.D. work and in planning the program of study. For the same purpose, students who enter the program at the Ph.D. level will, upon completion of nine hours of course work, also take the same preliminary examination.

The Ph.D. written comprehensive examination will consist of three essays, one each from the areas of phonology, syntax, and historical linguistics, plus one original research paper from an area of the student's choice. The essay questions are to be chosen from a list published by the Curriculum. The research paper topic must be approved by the student's advisor in consultation with a committee of two others. The essays and research paper may be submitted at any time between the passing of the preliminary examination and the completion of course work. Details concerning the essays and research paper may be obtained from the Director of Graduate Studies.

Following successful completion of the written comprehensive examination, the student will undergo an oral examination focussing primarily but not exclusively on the student's dissertation prospectus (a detailed proposal which will have been prepared by the student with the guidance of his or advisor). The oral examination committee will consist of five faculty members, who will remain members of the dissertation committee until the student has successfully defended the completed dissertation.

The Curriculum will recommend up to a maximum of two years of financial support for M.A. candidates, and up to three years of support beyond the M.A. for doctoral candidates, but such support is always contingent upon satisfactory progress as a graduate student and satisfactory performance if the stipend requires service. Research assistantships, language laboratory assistantships, teaching assistantships for linguistics courses, and University nonservice awards are available. Students proficient in a foreign language will be eligible for teaching assistantships in German, French, Italian, Latin, and other languages. Application for financial support is made in conjunction with application for admission to the Graduate School.

Further information may be obtained by writing to the Director of Graduate Studies, Curriculum in Linguistics, Dey Hall, University of North Carolina at Chapel Hill.

LINGUISTICS

- 100 INTRODUCTION TO GENERAL LINGUISTICS (Anthropology 179) (3). An introduction to the scientific study of language. The nature of language structure. How languages are alike and how they differ. *Fall*. Staff.
- 101 INTRODUCTION TO HISTORICAL AND COMPARATIVE LINGUISTICS (Anthropology 181) (3). Theories and methods of historical and comparative linguistics, with emphasis upon the Indo-European family. *Spring*. Tsiapera, Melchert.
- 102 APPROACHES TO TEACHING ENGLISH AS A FOREIGN LANGUAGE (3). Methods, theoretical approaches, and techniques in teaching English to speakers of other languages. *On demand*.
- 104 SYMBOLIC LOGIC (See Philosophy 101) (3).
- 106 GREEK DIALECTS (See Greek 106) (3).
- 110 PHILOSOPHY OF LANGUAGE (See Philosophy 110) (3).
- 115 TOPICS IN LINGUISTICS (3). Directed readings on linguistic topics not covered in specific courses. *Fall and spring*. Staff.
- 116X ENGLISH FOR FOREIGN STUDENTS (3). English for non-native speakers. Emphasis on spoken or written English according to needs of students enrolled. Auditors not permitted. *Fall and spring*. Staff.
- 120 LINGUISTIC PHONETICS (Anthropology 180) (3). Introduction to the general principles of linguistic phonetics; anatomy of vocal tract, physiology of speech production, universal phonetic theory. Practice in the recognition and transcription of speech sounds. *Fall*.
- 123 PHONOLOGY I (Anthropology 183) (3). Prerequisites, Linguistics 100 or equivalent and Linguistics 120. Introduction to the principles of modern generative phonology. Methods and theory of phonological analysis. *Spring*. Howren.
- 124 PHONOLOGY II (3). Prerequisite, Linguistics 123. Intermediate phonological theory and analysis. *Fall*. Howren.
- 130 INTRODUCTION TO GRAMMAR I (Anthropology 190) (3). Prerequisite, Linguistics 100 or consent of instructor. Methods and theory of grammatical analysis within the transformational generative framework. Special emphasis on analyzing syntactic and semantic structures of English. *Fall*.
- 133 INTRODUCTION TO GRAMMAR II (Anthropology 193) (3). Prerequisite, Linguistics 130 or equivalent. Methods and theory of grammatical analysis, with special reference to transformational grammar. *Spring*.

- 140 MATHEMATICAL LINGUISTICS (3). Introduction to topics in logic, set theory and modern algebra with emphasis on linguistic application. Automata theory and the formal theory of grammar with special reference to transformational grammars. No previous mathematics assumed. *Fall*. Staff.
- 142 INDO-EUROPEAN CULTURE AND SOCIETY (3). Survey of non-material aspects of Indo-European society recoverable by linguistic reconstruction, including law, religion, economics, poetics. Review of the Urheimat problem. No knowledge of comparative grammar is assumed. *On demand*. Melchert.
- 150 INTRODUCTION TO INDO-EUROPEAN: PHONOLOGY (3). A survey of the phonological systems of the major Indo-European languages and their development from Proto-Indo-European. *Fall, alternate years*. Melchert, Tsiapera.
- 151 INTRODUCTION TO INDO-EUROPEAN: MORPHOLOGY (3). Prerequisite, Linguistics 150 or permission of the instructor. Introduction to the major morphological categories in the Indo-European languages and their development from the proto-language. *Spring, alternate years*. Melchert.
- 160 LANGUAGES OF AFRICA (3). Introduction to the languages of Africa, their distribution and classification, phonological and grammatical structures, sociolinguistics and political aspects, with illustrations from several representative languages.
- 162 THE STRUCTURE OF CHINESE (3). Prerequisite, permission of instructor. Introductory linguistic description of Modern Mandarin Chinese. Knowledge of Chinese *not* assumed. For students of linguistics with no knowledge of Chinese and students of Chinese with no knowledge of linguistics. *On demand*. Melchert.
- 170 SOCIOLINGUISTICS (3). Survey of topics in the study of language in its social context; language varieties and functions, multilingualism, social dialects, implications for linguistic theory. *Fall*. Wills.
- 171 AFRICAN LANGUAGES AND HISTORY (3). An examination of the linguistics evidence for African history.
- 183 HISTORY AND PHILOSOPHY OF LINGUISTICS (3). Linguistic theories from classical times to the present with special emphasis on the origins of contemporary theories. *Fall*. Tsiapera.
- 184 LANGUAGE AND CULTURE (See Anthropology 184) (3).

Courses for Graduates

- 204 COMPARATIVE GRAMMAR OF GREEK AND LATIN (3). Designed not only for the student of Classics but also a basic course for students of comparative Indo-European grammar. (Alternate years.) Gates.
- 205 STRUCTURE AND HISTORY OF MODERN GREEK (Greek 205) (3). An introduction to the structure of modern Demotic Greek and its place in Greek linguistic history since Attic-Ionic. Tsiapera.
- 206 THE STRUCTURE OF ARABIC (Arabic 230) (3). Tsiapera.
- 212 ADVANCED PROBLEMS IN PHILOSOPHY OF LANGUAGE (Philosophy 212) (3).
- 215 ADVANCED METHODS IN PHONOLOGY (3). Prerequisite, Linguistics 124. Methods of theoretical argumentation in generative phonology with emphasis on recent proposals in the published literature. *Fall*. Howren.
- 216 ADVANCED METHODS IN SYNTAX (3). Prerequisite, Linguistics 133 or consent of instructor. Examination of recent developments in the theory and methods of syntactic analysis. *Fall*. Hendrick.
- 220 ADVANCED SOCIOLINGUISTICS (3). Prerequisite, Linguistics 170 or consent of instructor. Current issues in sociolinguistic research with emphasis on their implications for linguistic theory.
- 223 SEMINAR IN ANTHROPOLOGICAL LINGUISTICS (Anthropology 223) (3).

- 230 COMPARATIVE GRAMMAR OF ANCIENT LANGUAGES (3). Introductory and advanced work in the earlier stages of extant languages, such as Avestan and Sanskrit, and in extinct languages. *Spring*. Melchert.
- 238 HISTORY OF THE ENGLISH LANGUAGE (English 238) (3). Prerequisite, English 237 or permission of instructor.
- 240 AFRICAN COMPARATIVE LINGUISTICS (3). Comparative and historical analysis of African languages; e.g., comparative Bantu, comparative Afro-Asiatic including Hausa.
- 250 DIALECTOLOGY (3). Principles and methods of areal linguistics and social dialectology. *On demand*. Tsiapera, Howren.
- 283 CURRENT PROBLEMS IN LINGUISTICS (3). To explore relations of linguistics with neighboring fields and theoretical problems of current relevance within linguistics itself; some attention will be given to pedagogical methodology. *Fall and spring*. Staff.
- 293 LINGUISTIC FIELD WORK (3). Analysis and description of a language unknown to the class from data solicited from a native informant. *Alternate years*. Howren.
- 294 LINGUISTIC FIELD WORK II (3).
- 297 SPECIAL READINGS (3). Readings in linguistic topics that are not covered in the existing courses. *Fall and spring*. Staff.
- 360 SEMINAR (3). Topics vary to include specialized areas of linguistics study. *Fall and spring*. Tsiapera.
- 361 SEMINAR (3). Seminar in phonological theory. Howren.
- 362 SEMINAR (3). Seminar in grammatical theory. *Spring*.
- 393 MASTER'S THESIS (3 or more). *Fall and spring*. Staff.
- 394 DOCTORAL DISSERTATION (3 or more). *Fall and spring*. Staff.

Other courses in the University that may be of interest to a graduate student in linguistics:

GENERAL

Computer Science

- 119 Information Systems in Language Research (3). *Spring*. Dillon.
- 171 Natural Language Processing (3). *Fall*. Weiss, Calingaert.
- 181 Models of Languages and Computation (3). *Fall*. Weiss, Stanat.

Psychology

- 125 Psychology of Language (3). *Fall*. Fillenbaum, Gordon.
- 128 Development of Language and Thought (3). *Spring*. Gordon.
- 270 Measurements of Language Behavior (3). *Fall or spring*. Carroll.

Speech Communication

- 150 Voice and its Production (3). *Fall*. Staff.
- 151 Theories of Human Communication (3). *Fall*. Staff.
- 153 Social Dialects (3). *Spring*. Staff.
- 156 Communication Development in Children (3). *Fall or spring*. Staff.
- 157 Applied Phonetics (3). *Fall or spring*. Staff.
- 158 Introduction to Phonetics (3). *Fall*. Staff.

Speech and Hearing Sciences

- 162 Language Acquisition (3). *Fall*. Layton.
 163 Language Behaviors I (3). *Spring*. Layton.
 181 Hearing Sciences (3). *Spring*. Peters, Mahaffey.
 184 Speech Pathology I (3). *Spring*. Hadjian.
 206 Speech Processes (3). *Fall or spring*. Staff.
 207 Language Processes (3). *Fall or spring*. Layton.
 241 Biological Processes in Language and Speech (3). Mahaffey.
 282 Speech Science (3). *Fall or spring*. Staff.

SPECIFIC LANGUAGE GROUPS**Arabic (See complete listing under Romance Languages)**

- 101 Elementary Arabic I (3).
 102 Elementary Arabic II (3).

Baltic

- 206 Lithuanian (3). Introduction to the historical grammar of the Baltic languages.

Celtic

- 105 Old Irish (Folklore 105) (3). O'Neill.
 106 Readings In Old Irish (Folklore 106) (3). O'Neill.

Chinese (see complete listing under Slavic and Non-Western Languages)

- 101 Elementary Chinese (3).
 102 Elementary Chinese (3) (continuation).
 103 Intermediate Chinese (3).
 104 Intermediate Chinese (3) (continuation).
 110 Advanced Chinese (3).
 111 Advanced Chinese (3) (continuation).
 120 Literary Chinese (3).
 121 Literary Chinese (3) (continuation).

English

- 136 Modern English (3).
 237 Old English Grammar and Readings (3).

French

- 126 History of the French Language (3). *Spring*. Montgomery.
 146 Structure of French (3). *Fall*. Maley.
 221 Old French (3). *Fall*. Montgomery.

Germanic Languages

- 161 History of the German Language (3). *Fall*. Smith, Lawson.
 202 German Paleography (3). *Fall or spring*. Tax.
 221 Gothic (3). *Fall or spring*. Lawson, Smith.

- 222 Old High German (3). *Fall or spring*. Lawson.
 223 Comparative Germanic Grammar (3). *Fall or spring*. Smith.
 232 Old Saxon (3). *On demand*. Smith.
 233 Old Norse (3). *Fall*. Smith.
 234 Old Norse, continuation (3). *Spring*. Smith.
 235 Middle High German (3). *Spring*. Lawson, Smith.

Greek

- 201 Greek Epigraphy (3). West.
 204 Greek Palaeography (3). Snipes.

Hausa

- 121 Intensive Hausa (3). Lectures and readings in Hausa with special attention to its linguistic analysis. Wills.
 122 Intensive Hausa (3). Continuation of 121. Wills.

Hebrew

- 113 Elementary Biblical Hebrew (See Religion 113-114) (3).
 114 Elementary Biblical Hebrew (3).

Italian

- 126 History of the Italian Language (3). *Fall*. Staff.
 221 Old Italian (3). *Fall*. Montgomery.
 222 Historical Italian Grammar (3). *Spring*. Staff.

Japanese (see complete listing under Slavic and Non-Western Languages)

- 101 Intensive Japanese (3).
 102 Intensive Japanese (3).

Latin

- 202 Latin Epigraphy (3). Houston.
 203 Latin Palaeography (3). Staff.
 210 History of Latin and Italic Dialects (3).

Portuguese

- 126 History of the Portuguese Language (3). *On demand*. Sharpe.
 221 Old Portuguese (3). *Spring*. Sharpe.

Romance Languages

- 220 Vulgar Latin (3). *Spring*. Montgomery.
 225 Provençal (3). *Fall*. Montgomery.
 324 Romance Paleography (3). *Spring*. Montgomery.
 370 Minor Romance Tongues (3). *On demand*. Maissen, Montgomery.

Russian

- 101 Structure of Modern Russian (3). *Spring*. Feinberg, Friedman.
 299 History of the Russian Language (3). Feinberg, Friedman.

Sanskrit (see complete listing under Germanic Languages)

- 111 Elementary Sanskrit (3). Grammar and readings from the epic and didactic literature. *Fall, on demand.* Melchert.
- 112 Elementary Sanskrit (3). Continuation of 111. *Spring, on demand.* Melchert.
- 201 Advanced Sanskrit (3). Extensive reading from the Dharmaśāstra, the Sūtras, Brāhmanas, and the Vedas. *On demand.* Staff.
- 202 Advanced Sanskrit (3). Continuation of 201. *On demand.* Staff.

Slavic Languages

- 105 Introduction to Slavic Linguistics (3). *Spring.* Feinberg, Friedman.
- 107 Structure of a Balkan Language (3). *Fall and spring.* Friedman.
- 108 Advanced Structure of a Balkan Language (3). Friedman.
- 207 Old Church Slavonic (3). *Fall.* Friedman, Feinberg.

Spanish

- 126 History of the Spanish Language (3). *Spring.* Domínguez, Maissen.
- 146 The Structure of Modern Spanish (3). *Fall.* Staff.
- 221 Old Spanish (3). *Fall.* Sharpe.
- 222 Old Spanish (3). *Spring.* Sharpe.

Swahili

- 121 Intensive Swahili (3). Lectures and readings in Swahili with special attention to its linguistic analysis. *On demand.* Staff.
- 122 Intensive Swahili (3). Continuation of 121. *On demand.* Staff.

CURRICULUM IN MARINE SCIENCES

DIRK FRANKENBERG, *Chairman*

Professors

MILES A. CRENSHAW	(32)	Biochemistry, Calcification
DIRK FRANKENBERG	(3)	Biological Oceanography
CHARLES E. JENNER	(6)	Invertebrate Zoology
J. DONALD JOHNSON	(7)	Marine Chemistry, Halogens
JAN J. KOHLMEYER	(22)	Marine Botany, Fungi
EDWARD J. KUENZLER	(8)	Phytoplankton, Nutrient Cycling
A. CONRAD NEUMANN	(12)	Geological Oceanography

Associate Professors

JOHN M. BANE, JR.	(27)	Physical Oceanography, Shelf Circulation
JOSEPH G. CARTER	(34)	Marine Paleoecology, Molluscan Systematics
CHRISTOPHER S. MARTENS	(10)	Marine Geochemistry
CHARLES H. PETERSON	(31)	Ecology, Population Interactions
FREDERIC K. PFAENDER	(13)	Microbiology
REINHARD M. RIEGER	(14)	Ecology, Meiofauna, Beaches

Assistant Professors

LARRY K. BENNINGER	(41)	Sedimentary Geochemistry
HANS W. PAERL	(39)	Microbial Ecology

Adjunct Professors

RALPH W. BRAUER	(33)	Marine Physiology
MAX H. HOMMERSAND	(4)	Marine Botany, Algae
ROY L. INGRAM	(5)	Marine Geology, Sediments
DONALD F. KAPRAUN	(35)	Systematics and Biography of Marine Algae
HARVEY E. LEHMAN	(9)	Zoology, Embryology, Morphogenesis
IAN G. MACINTYRE	(29)	Marine Geology, Coral Reefs
ELIZABETH A. MCMAHAN	(11)	Zoology, Entomology
JOHN J. W. ROGERS	(40)	Geochemistry, Crustal Evolution
FRANK J. SCHWARTZ	(15)	Ichthyology
JOSEPH ST. JEAN, JR.	(17)	Marine Geology, Micropaleontology
DANIEL A. TEXTORIS	(18)	Geology, Sedimentary Petrology
CHARLES M. WEISS	(19)	Marine Fouling, Pollution
WALTER H. WHEELER	(20)	Stratigraphy and Paleontology

Adjunct Associate Professors

MARTIN B. GOLDBABER	(42)	Marine Geochemistry
SETH R. REICE	(25)	Ecology
MARK SHUMAN	(16)	Trace Metal Chemistry
MARK D. SOBSEY	(43)	Environmental Health Microbiology

Emeritus Professor

ALPHONSE F. CHESTNUT

The Curriculum in Marine Sciences brings together the faculties and facilities of several departments of The University of North Carolina at Chapel Hill and Institute of Marine Sciences at Morehead City to offer broad graduate training in oceanography and marine sciences. The program gives students a wide choice of faculty advisors, marine science courses, and potential research projects.

Courses at North Carolina State University at Raleigh and at Duke University may also be taken for credit through an inter-institutional program. Courses and facilities (boats, laboratories, libraries, seawater rooms, radioisotope facilities, experimental marine ponds, dormitories) are available at several coastal laboratories through cooperative agreements.

Oceanographic experience is available through the Duke/UNC Oceanographic Consortium on the 135 foot research vessel Cape Hatteras constructed in 1981, as well as on other ships at other oceanographic institutions through the University National Oceanographic Laboratory System.

Requirements for Admission

For admission to the Curriculum in Marine Sciences, an undergraduate degree is required in a basic science such as physics, chemistry, biology, bacteriology, botany, zoology, or geology, or in engineering. Students are advised to develop a broad undergraduate science major with as many as possible of the following courses:

Mathematics through calculus, information science, physics, general chemistry, analytical chemistry, organic chemistry, invertebrate zoology or paleontology, physical chemistry, geology, botany, zoology, ecology, physiology, and statistics.

Degree Requirements

Doctor of Philosophy. The Ph.D. program for a student will be supervised by a faculty committee of five drawn from the graduate faculties of one or more campuses. Requirements for the Ph.D. degree are determined by the student's supervisory committee. Normally course requirements include all four of the core courses listed below, and one hour of Seminar in Oceanography. Substitutions for these courses can be arranged with approval of the supervisory committee and the Curriculum committee on admission and performance. Additional requirements include a period of study or research at a marine station or on an oceanographic cruise, teaching experience sufficient to develop and demonstrate competence, reading knowledge of one foreign language, and presentation of a satisfac-

tory research seminar. Requirements for the minor (if any), the dissertation, comprehensive examinations, admission to candidacy, residence, and final examinations are as provided in the regulations of the Graduate School.

Master of Science. The Master of Science degree program is similar to the doctoral program except that a committee of three will suffice for the master's candidates, and there is no foreign-language requirement.

Requirements for the minor, the thesis, admission to candidacy, residence, and final examinations are as provided in the regulations of the Graduate School.

Marine Science Core Courses

- 103 GEOLOGICAL OCEANOGRAPHY (Geology 188) (4). Prerequisite, Geology 11 or 41, 42. Geomorphology, sedimentation, stratigraphy structure, and history of the ocean basins, margins, and coasts. *Three lecture and two laboratory hours a week, fall.* Neumann.
- 104 BIOLOGICAL OCEANOGRAPHY (Zoology 140, Environmental Sciences 136) (4). Prerequisites, ZOOL 105 and 102, or permission. Physical, chemical and biological factors characterizing estuarine and marine environments emphasizing factors controlling plant and animal populations. *Three lecture and two laboratory hours a week, spring.* Frankenberg.
- 105 CHEMICAL OCEANOGRAPHY (Environmental Sciences 128) (4). Prerequisite, one semester of physical chemistry or ENVR 122 or CHEM 180, or equivalent. Variation and abundance of sea water constituents, the chemical, physical and biological processes contributing to their distribution as well as problems of dispersion of conservative and non-conservative substances are considered. *Three lecture and two laboratory hours a week, spring.* Martens.
- 122 PHYSICAL OCEANOGRAPHY (4). Prerequisites, Math 31, 32, Physics 24, 25, or permission. Descriptive regional oceanography, equations of motion, the Ekman layer, wind-driven currents, thermohaline circulation, modern observations, waves, tides. *Three lecture and two laboratory hours a week, fall.* Bane.

Other Marine Sciences Courses

- 101 OCEANOGRAPHY (Zoology 126, Environmental Sciences 127) (3). Prerequisites, Zoology 11 or Botany 11, and Chemistry 21 and Physics 25, or permission. An interdisciplinary study of the sea and the interrelationship of marine processes. *Three lecture hours a week, fall.* Neumann.
- 114 ALGAE (Botany 114) (5). Prerequisite, Botany 51. Introduction to the morphology and taxonomy of freshwater and marine algae, including basic culture techniques and field experience. *Two lecture and six laboratory hours a week, spring.* Hommersand.
- 134 INVERTEBRATE DEVELOPMENT, LARVAE AND PLANKTON (Zoology 134) (3). Prerequisite, Zoology 104, 105 or 106, or permission of instructor. A survey of diversity in patterns of animal development and life cycles with emphasis on marine invertebrates. *Three lecture hours a week, spring, on occasion.* Lehman.
- 134L INVERTEBRATE DEVELOPMENT LABORATORY (Zoology 134L) (2). Prerequisite or corequisite, Zoology 134. Lab experience in obtaining, culturing, identifying and microscopic preparing of embryonic, larval and planktonic material, with emphasis on 3-living marine forms. *Six laboratory hours per week, spring, on occasion.* Lehman.

- 137 ECOLOGY OF WETLANDS (Environmental Science 137) (4 to 6). Prerequisite, Environmental Biology, Ecology, or permission. An introduction to the functioning of freshwater and estuarine marsh and swamp ecosystems, with emphasis on the systems of the southeastern U.S. *Six lecture and 16 or more laboratory hours per week, summer.* Kuenzler, Frankenberg.
- 138 ENVIRONMENTAL PROCESSES OF THE COASTAL ZONE (4). Prerequisite, science background and permission. Analysis of processes that create and control coastal zone environments. Topic selection reflecting faculty specialization, emphasis on field study. *Lecture and laboratory hours by arrangement. Fall, spring and summer.* Staff.
- 141s SPECIAL PROBLEMS IN MARINE BIOLOGY (Zoology 141s) (6). Prerequisite, Zoology 140s and/or permission. Comprehensive surveys of problems and laboratory methods in any of the following areas: Mollusca (Chestnut), Vertebrata (Fahy, Schwartz), Fungi (Kohlmeyer), Ecology (Kuenzler, Peterson and others). *Thirty or more conference and laboratory hours a week, second summer term.* (Offered on demand at Morehead City, N.C.) Staff of the Institute of Marine Sciences.
- 146 MARINE ECOLOGY (ZOOLOGY 146) (3). Prerequisite, Zoology 102, 102L or 105, or permission of the instructor. An introductory study of oceanography as it pertains to the ecology of marine organisms. *Three lecture hours a week, spring.* Rieger, Peterson.
- 151 FLUID DYNAMICS (Physics 151) (3). Prerequisite, Physics 103 or permission. The physical properties of fluids, kinematics, governing equations, viscous incompressible flow, vorticity dynamics, boundary layers, irrotational incompressible flow. *Three lecture hours per week, fall.* Bane, Bowers.
- 161s PROBLEMS IN MARINE AND ENVIRONMENTAL PHYSIOLOGY (2 or more). Participation in physiological research related to one of the following: mammals in low-pressure atmospheres; mammals in high-pressure atmospheres; high pressure physiology of vertebrates and invertebrates; physical chemistry of protein systems at high pressures; problems in human diving physiology. (Taught at Wrightsville Marine Biomedical Laboratory, Wilmington, N.C.) *Fall and summer.* Brauer.
- 199 SPECIAL TOPICS IN MARINE SCIENCES (2-4). Prerequisites, science background and permission of instructor. Directed readings, laboratory and/or field study of marine science topics not covered in regularly scheduled courses. *Lecture and laboratory hours by arrangement. Fall, spring or summer.* Staff.
- 206 SEMINAR IN OCEANOGRAPHY (1). Discussion of theories and research concerning ocean systems. Topics will stress the interactions between physical, chemical, geological, and biological processes in the sea. Separate sections will be offered as UNC-CH and at the Institute of Marine Sciences, Morehead City. *Fall, spring, and summer.* Staff.
- 215 MARINE MYCOLOGY (Botany 215) (6). Prerequisites, Botany 115 or equivalent. Structure, development, systematics and ecology of marine fungi. Given on demand at the Institute of Marine Sciences, Morehead City. *Seven and one-half lecture and fifteen laboratory hours a week, first or second summer session.* Kohlmeyer, Koch.
- 216 MARINE PHYCOLOGY (Botany 216) (5). Prerequisite, Botany 114. Structure, reproduction, systematics, and ecology of marine algae. The laboratory will include field studies and culture techniques. *Three lecture and six laboratory hours a week, fall.* Hommersand.
- 222 ADVANCED PHYSICAL OCEANOGRAPHY (3). Prerequisite, MASC 122. A professional-level physical oceanography course that synthesizes mathematical approaches with basic concepts. Emphasis is on applying mathematical competence to studies of physical processes in the sea as introduced in MASC 122. Bane.
- 226 SEMINAR IN PHYSICAL OCEANOGRAPHY (2). Prerequisite, MASC 122. Discussion of selected literature in the field of physical oceanography. *Spring.* Bane.

- 239 MICROPALAEONTOLOGY (FORAMINIFERA) (Geology 213) (4). Prerequisite, Geology 193. *Three lecture and three laboratory hours a week, spring.* (Alternate years.) St. Jean.
- 245 ECOLOGY OF PHYTOPLANKTON (Environmental Sciences 235 and Botany 245) (4). *Fall.* Kuenzler.
- 300 RESEARCH IN MARINE SCIENCES (2 or more).
- 393 MASTER'S THESIS (3 or more).
- 394 DOCTORAL DISSERTATION (3 or more).

Courses in other departments that are considered appropriate for a major in marine sciences:

- Botany 114. Algae. Hommersand.
- Botany 141 (Biology 102, Ecology 102, Zoology 108). Ecology. Lieth; staff.
- Botany 219. Algal Physiology. Hommersand.
- Environmental Sciences 122. Water Chemistry. Johnson, O'Melia.
- Environmental Sciences 132. Limnology and Water Pollution. Weiss.
- Environmental Sciences 134. Environmental Microbiology. Pfaender.
- Environmental Sciences 233. Microbial Ecology. Pfaender.
- Geology 118. Sedimentation. Ingram.
- Geology 151. Geodynamics. Rogers.
- Geology 180, 181. Applied Geophysics. Powell.
- Geology 206. Marine Paleocology. Carter.
- Geology 221. Sedimentary Petrology. Textoris.
- Geology 250. Marine and Surficial Geochemistry. Martens.
- Zoology 109. Introduction to Hydrobiology. Jenner.
- Zoology 134. (Marine Sciences 134) Invertebrate Development, Larvae and Plankton. Lehman.
- Zoology 156, 157. Advanced Marine Invertebrate Zoology. Jenner, Rieger; Visiting staff.
- Zoology 208. Population Ecology. Stiven, White.
- Zoology 208L. Methods in Population Analysis. Stiven, White.
- Zoology 213. Advanced Marine Ecology. Jenner, Rieger; Institute of Marine Sciences staff.

DEPARTMENT OF MATHEMATICS

JOHN A. PFALTZGRAFF, *Chairman*

Professors

THOMAS H. BRYLAWSKI	(2)	Combinatorics
JOSEPH A. CIMA	(4)	Complex Analysis, Functional Analysis
ROBERT L. DAVIS	(5)	Combinatorial Algebra
PATRICK B. EBERLEIN	(6)	Differential Geometry, Dynamical Systems
ROBERT B. GARDNER	(8)	Differential Geometry, Partial Differential Equations
LANDOR D. GEISSINGER	(9)	Combinatorial Algebra
WILLIAM W. GRAVES	(10)	Functional Analysis
KENNETH I. GROSS	(11)	Groups, Representations, and Harmonic Analysis
ROBERT G. HEYNEMAN	(12)	Bialgebras and Hopf Algebras
W. ROBERT MANN	(16)	Nonlinear Problems
ANCEL C. MEWBORN	(17)	Ring Theory
SHELDON E. NEWHOUSE	(18)	Dynamical Systems
KARL E. PETERSEN	(20)	Ergodic Theory
JOHN A. PFALTZGRAFF	(22)	Complex Analysis
MICHAEL SCHLESSINGER	(24)	Algebraic Geometry, Commutative Algebra
WILLIAM W. SMITH	(25)	Commutative Algebra and Ideal Theory
JOHANN SONNER	(26)	Category Theory
JAMES STASHEFF	(19)	Algebraic Topology
JON W. TOLLE	(27)	Optimization Theory
JONATHAN M. WAHL	(28)	Algebraic Geometry
WARREN R. WOGEN	(29)	Operator Theory
FRED B. WRIGHT	(30)	Functional Analysis

Associate Professors

JAMES N. DAMON	(14)	Singularity Theory
SUE E. GOODMAN	(3)	Foliations
DOUGLAS G. KELLY	(15)	Combinatorics, Probability
NORBERTO KERZMAN	(32)	Several Complex Variables
BRIAN MARCUS	(7)	Ergodic Theory, Dynamical Systems
JOSEPH F. PLANTE	(23)	Foliations and Dynamical Systems

Assistant Professor

DONALD ST. P. RICHARDS	(33)	Multivariate Analysis and Characterization Theory
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Emeritus Professors

ALFRED T. BRAUER
EDWARD A. CAMERON
VINTON A. HOYLE

The Department of Mathematics offers graduate training leading to the degrees Master of Arts, Master of Science, and Doctor of Philosophy. A master's degree may be included or bypassed in the doctoral program. All of a student's graduate work may be done within the Department. The M.A.T. degree is also available with a major in mathematics in the School of Education.

The separate departments of Mathematics, Physics and Astronomy, and Statistics are housed in Phillips Hall, as are the Computation Center and the special library for these three departments and for the Department of Computer Science. This departmental library contains an unusually large and complete collection of mathematical books and journals.

The Department of Mathematics offers a number of teaching assistantships and teaching fellowships each year. Applicants for financial aid are considered also for several University fellowships awarded by the Graduate School in the university-wide competition. Applications for admission and financial assistance may be obtained from the Dean of the Graduate School. Applications for financial aid should be filed by February 1.

Degree Requirements

The general regulations of the Graduate School govern the work for graduate degrees in mathematics. Specific requirements are explained below. A graduate student in mathematics may receive credit only for mathematics courses numbered 137 and above.

The requirements for a master's degree are quite flexible, but all aspects of the program must be approved by the Director of Graduate Studies. The requirements include: programming ability at the level of computer science 16; satisfactory completion of 30 semester hours of approved course work; demonstration of either a basic reading knowledge of an approved foreign language (usually French, German or Russian), or demonstration of a working knowledge of an approved computer programming language; completion of a master's thesis for a Master of Arts degree, or a master's project for a Master of Science degree; and successful performance in an oral examination covering both course work and the master's project or thesis. A detailed statement on the master's degree requirements is available from the Department. The course schedule for a first-year graduate student will depend upon the student's undergraduate training; one typical schedule is as follows. Fall Semester: Two courses from Mathematics 180, 186, 193, 203 and one elective course from one of the other mathematical or physical sciences. Spring Semester: Two courses from Math. 181, 196, 204, 230 and one elective course from one of the other mathematical or physical sciences. The Department considers two years as the normal time to complete these requirements.

No minimum number of semester hours is required for a Ph.D.; however doctoral students must satisfactorily complete Mathematics 180, 181, 186, 196, 203, 204, 230, 231, and 271 or 286 and usually complete a total of at least forty-eight semester hours in preparation for writing a dissertation. The Graduate School requires a minimum of 3 hours of 394.

Requirements for a Ph.D. include programming ability at the level of computer science 16, a reading knowledge of two foreign languages chosen from French, German, Russian, or other language approved by the Director of Graduate Studies; successful performance on a comprehensive examination covering basic course work, a minimum of two semesters' instructional service, successful performance on a doctoral oral examination covering specialized topics in the area of proposed research, and the writing of a dissertation. The department considers four years as the normal time to complete these requirements.

Minor in Mathematics

Graduate students in other departments who plan to offer mathematics as a (complete or partial) minor field for the Ph.D. should consult the Director of Graduate Studies in Mathematics for approval of their programs and for assignment of an advisor in the Department of Mathematics. This should be done at the earliest possible time, in order to prevent disappointment for the student.

Courses for Graduates and Advanced Undergraduates

The name of the instructor who last taught the course appears after the course. It is not necessarily the name of the instructor who will next teach the course.

- 101 MATHEMATICAL CONCEPTS IN ART (3). Prerequisite, Art 37. Mathematical theories of proportion, perspective (projective invariants and the mathematics of visual perception). Symmetry and aesthetics will be expounded and illustrated by examples from painting, architecture and sculpture. (Alternate years.) Staff.
- 106 MATHEMATICAL METHODS IN BIostatISTICS (Bios 106) (3). Prerequisite, Mathematics 32 or equivalent. Special mathematical techniques in the theory and methods of biostatistics as related to the life sciences and public health. Includes brief review of calculus, selected topics from intermediate calculus, and introductory matrix theory for applications in biostatistics. *Fall*. Staff.
- 111 DEVELOPING MATHEMATICAL CONCEPTS (3). Prerequisite, consent of instructor. An investigation of various ways elementary concepts in mathematics can be developed. Applications of the mathematics developed will be considered. This course is ordinarily offered as an in-service course for teachers. *Spring*. Staff.
- 115 HISTORY OF MATHEMATICS (3). Prerequisite, calculus and abstract algebra, graduate students by permission only. A brief general survey of the history of Mathematics. Some special problems in depth. Problems in the history of mathematics. *Spring*. Staff.

- 117 EUCLIDEAN AND NON-EUCLIDEAN GEOMETRIES (3). Prerequisite, Mathematics 32 or permission of instructor. Critical study of basic notions and models of Euclidean and non-Euclidean geometries, order, congruence and distance. *Summer and spring*. Smith, Brylawski, Goodman.
- 118 BASIC CONCEPTS OF ANALYSIS (3). Prerequisites, Mathematics 32 and consent of instructor. Limits, continuity, differentiability, uniform continuity. Riemann integration. Infinite sequences and series; uniform convergence; power series. A student cannot receive credit for this course after receiving credit for Mathematics 193. *Summer*. Staff.
- 120 PROBABILITY (3). Prerequisite, Mathematics 34. Foundations of probability; random variables and distribution functions; the binomial; Poisson, and normal distributions; expectations, moments, moment-generating functions; compound events and joint distributions; limit theorems; applications. *Spring*. Cima.
- 121 ADVANCED CALCULUS I (3). Prerequisite, Mathematics 34. Continuity and differentiability for real-valued functions of several variables and for vector-valued functions; chain rules; implicit function theory; Jacobians; theory of extrema. *Fall and spring*. Wogen.
- 122 ADVANCED CALCULUS II (3). Prerequisite, Mathematics 121. Curves and surfaces; Riemann integration; improper integrals; line and surface integrals; theorems of Gauss, Green and Stokes; transformation of multiple integrals; series; uniform convergence. *Fall and spring*. Damon.
- 123 FUNCTIONS OF A COMPLEX VARIABLE WITH APPLICATIONS (3). Prerequisite, Mathematics 121. The algebra of complex numbers, elementary functions and their mapping properties, complex limits, power series, analytic functions, contour integrals, Cauchy's theorem and formulae, Laurent series and residue calculus, elementary conformal mapping and boundary value problems. Poisson integral formula for the disk and the half plane. *Spring*. Wogen.
- 124 ELEMENTARY DIFFERENTIAL EQUATIONS (3). Prerequisite, Mathematics 34. Introduction to ordinary differential equations, linear differential systems, power series solutions, Laplace transforms, numerical methods. *Fall and spring*. Stasheff.
- 128 MATHEMATICAL METHODS FOR THE PHYSICAL SCIENCES I (3). Prerequisite, Mathematics 34. Ordinary differential equations, Laplace transform, divergence and Stokes theorems, matrices and determinants. *Fall*. Gross, Mann.
- 129 MATHEMATICAL METHODS FOR THE PHYSICAL SCIENCES II (3). Prerequisite, Mathematics 124 or 128. Partial differential equations. Bessel and Legendre functions, orthogonal expansions, Fourier series and integrals. *Spring*. Mann.
- 132 LINEAR ALGEBRA (Formerly Math 116.) (3). An introduction to the theory of vector spaces, linear transformations, systems of linear equations, matrices, determinants, eigenvectors, diagonalizations. Davis.
- 133 ELEMENTARY THEORY OF NUMBERS (3). Prerequisite, Mathematics 32. Divisibility, Euclidean algorithm, congruences, residue classes, Euler's function, primitive roots, Chinese remainder theorem, quadratic residues, number theoretic functions. Farey and continued fractions, Gaussian integers. *Fall and spring*. Wright.
- 134 ELEMENTS OF MODERN ALGEBRA (3). Prerequisite, Mathematics 32. Sets and functions, rings, ordered integral domains, integers, fields and rational numbers, real and complex numbers, polynomials, groups. *Fall and spring*. Sonner.
- 137 LINEAR ALGEBRA (3). Prerequisite, Mathematics 34. Vector spaces, linear transformations, duality, diagonalization, primary and cyclic decomposition, Jordan canonical form, inner product spaces, orthogonal reduction of symmetric matrices, spectral theorem, bilinear forms, multilinear functions. *Fall and spring*. Eberlein.
- 138 ALGEBRAIC STRUCTURES (3). Prerequisite, Mathematics 137. Permutation groups, matrix groups, groups of linear transformations, symmetry groups; finite

- abelian groups; residue class rings, algebras of matrices, linear maps, and polynomials; real and complex numbers, rational functions, quadratic fields, finite fields. *Fall and spring*. Heyneman.
- 146 INTRODUCTION TO PROBABILITY (Statistics 126) (3). Prerequisite, Mathematics 34. An introduction to the mathematical theory of probability, covering random variables, moments, binomial, Poisson, normal, and related distributions, generating functions, sums and sequences of random variables, combinatorial and statistical applications. *Fall and spring*. Staff.
- 147 MATRIX THEORY (3). Prerequisites, Math 34 and Computer Science 16 or its equivalent. Computational aspects of algebras of matrices with applications; determinants; numerical solution of linear systems; norms and error estimates; eigenvalues; linear programming. Math 132 covers elementary aspects of linear systems and matrices and may not be taken for credit after credit has been granted for Math 147. *Fall, spring and summer*. Gardner.
- 148 COMBINATORIAL MATHEMATICS (Statistics 156) (3). Prerequisites, Mathematics 134 or 138, or permission of the instructor. Topics chosen from: Generating functions, Polya's theory of counting, partial orderings and incidence algebras, principle of inclusion-exclusion, Mobius inversion, combinatorial problems in physics and other branches of science. *Fall*. Kelly.
- 149 INTRODUCTION TO GRAPH THEORY (Statistics 158) (3). Prerequisite, Mathematics 137 or equivalent. Basic concepts of directed and undirected graphs. Partitions and distances in graphs. Planar and non-planar graphs. Matrix representation of graphs. Network flows. Applications of graph theory. *Spring*. Staff.
- 151 DETERMINISTIC MODELS IN OPERATIONS RESEARCH (Statistics 181, ORSA 181) (3). Prerequisite, Mathematics 147. Linear, integer, non-linear and dynamic programming, classical optimization problems, network theory. *Fall and spring*. Staff.
- 157 TOPICS IN MATRIX THEORY (3). Prerequisites, Mathematics 147 or equivalent, and some computer programming language. Quadratic and hermitian series; applications to systems of differential equations; nonnegative matrices, Perron-Frobenius Theorem; integer matrices, some applications in combinatorics. *Spring*. Mewborn.
- 165 THEORY OF INTEREST (3). Prerequisite, Mathematics 32. Simple and compound interest, annuities, amortization, depreciation, capitalized cost, bonds. This course is designed to prepare students for part 4A of the actuarial examinations. *Spring*. Mann.
- 166 NUMERICAL ANALYSIS FOR ACTUARIES (3). Prerequisite, Mathematics 34. Finite differences, interpolation, summation, numerical differentiation and iteration, numerical approaches to linear systems, linear programming, queuing theory, decision analysis, network analysis, simulation. *Spring*. Mann.
- 167 LIFE CONTINGENCIES (Statistics 107) (3). Prerequisite, Math 32. A detailed study of various actuarial functions. Single-life functions, multiple-life functions, and some population problems. *Fall*. Staff.
- 171 APPLIED MATHEMATICS IN COMPUTER SCIENCE (Computer Science 151-152) (3 each). Prerequisites, calculus through differential equations, elementary linear algebra, and programming. Develops the mathematical tools and insights necessary to produce familiarity with a broad outlook on analytical and numerical methods useful in computer science. *Fall and spring*. Computer Science Staff.
- 173 QUALITATIVE THEORY OF DIFFERENTIAL EQUATIONS (3). Prerequisite, Mathematics 122 or consent of the instructor. Existence and uniqueness theorems, linear and nonlinear systems, differential equations in the plane and on surfaces, Poincare-Bendixson Theory, Liapounov stability and structural stability, critical point analysis. Newhouse.

- 174 THE FINITE ELEMENT METHOD (3). Prerequisites, Intermediate Calculus and linear algebra. Finite difference methods, Hermite interpolation, splines, variational methods, applications to boundary value problems associated with ordinary and partial differential equations. *Spring*. Mann.
- 175 TOPICS IN ANALYSIS (3). Prerequisite, Mathematics 122 or consent of instructor. Topics may include linear spaces, convexity, mathematical programming, duality, algorithms, and other subjects related to the mathematical theory of optimization. *Fall*. Staff.
- 176 TOPICS IN ALGEBRA (3). Prerequisite, consent of instructor. Topics may include number theory, algebraic number theory, field theory, and algebraic geometry. Staff.
- 177 TOPICS IN GEOMETRY (3). Prerequisite, consent of instructor. Topics may include non-Euclidean geometries, linear geometry, finite geometries, topology and algebraic geometry. Staff.
- 180 GEOMETRY OF CURVES AND SURFACES (3). Prerequisite, Advanced calculus. Topics include: (curves) Frenet formulas, isoperimetric inequality, theorems of Crofton, Fenchel, Fary-Milnor; (surfaces) fundamental forms, Gaussian and mean curvature, special surfaces, geodesics, Gauss-Bonnet theorem. *Fall*. Cima.
- 181 INTRODUCTORY TOPOLOGY (3). Prerequisites, Mathematics 193 and 186 for permission of instructor. Topological spaces, connectedness, separation axioms, product spaces, extension theorems. Classification of surfaces, fundamental group and covering spaces, Sard's theorem and Brouwer fixed point theorem, transversality theorems and applications. *Spring*. Stasheff.
- 184 FOUNDATIONS OF SET THEORY (3). Prerequisite, Mathematics 137. Formalized mathematics; proof methods; axiom of set theory; products coproducts, kernels, cokernels, brackets; orders, cardinals, natural numbers; applications of set-theoretical principles to concrete mathematical situations. Sonner.
- 185 ALGEBRAIC LOGIC I (Philosophy 185) (3). Prerequisite, Mathematics 138 (Algebraic Structures) or Philosophy 101 (Symbolic Logic). Basic concepts in logic treated as a branch of mathematics. Topics may include: Boolean algebras, polyadic algebras, cylindric algebras, ultraproducts. *Spring*. Staff.
- 186 LINEAR ALGEBRA (3). Prerequisite, Mathematics 138 or permission of instructor. Vector spaces, linear maps, determinants; commutative rings, algebras, polynomials; structure of operators; inner products. *Fall*. Smith.
- 190 COMBINATORIAL THEORY (3). Corequisite, Mathematics 186 or permission of instructor. Foundations of combinatorial mathematics; partial orders, lattices. Mobius and incidence algebras, matching theory, Ramsey's theorem, permutation representations and Polya's theory of counting. *Fall*. Brylawski.
- 193 INTRODUCTORY ANALYSIS (3). Prerequisite, advanced calculus. Elementary metric space topology; continuous functions; differentiation of vector-valued functions; implicit, inverse function theorem. Topics from: Weierstrass theorem; existence and uniqueness theorems for differential equations; series of functions. *Fall*. Wogen.
- 195 INTERMEDIATE PROBABILITY (Statistics 132) (3). Prerequisite, Mathematics 194. Foundations of probability theory. Basic classical theorems. Modes of probabilistic convergence. Central limit problem. Generating functions, characteristic functions. Introduction to stochastic processes. *Spring*. Statistics Staff.
- 196 COMPLEX ANALYSIS (3). Prerequisite, Mathematics 193. A rigorous treatment of complex integration, including the Cauchy theory. Elementary special functions, power series, local behavior of analytic functions. *Spring*. Eberlein.

Courses for Graduates

- 203 MEASURE AND INTEGRATION (3). Prerequisite, Mathematics 193 or consent of instructor. Lebesgue and abstract measure and integration, convergence, theorems, differentiation, Radon-Nikodym theorem, product measures, Fubini theorem, Lebesgue spaces, invariance under transformations, Haar measure and convolution. *Fall*. Wogen.
- 204 INTRODUCTORY FUNCTIONAL ANALYSIS (3). Prerequisite, Mathematics 203. Hahn-Banach and separation theorems. Hamel basis; normed and locally convex spaces, duals of spaces and maps, weak topologies; closed graph and open mapping theorems, uniform boundedness theorems. *Spring*. Graves.
- 205 ADVANCED COMPLEX ANALYSIS (3). Prerequisite, Mathematics 196. Laurent series; Mittag-Leffler and Weierstrass Theorems; Riemann mapping theorem; Runge's theorem; additional topics chosen from: harmonic elliptic, univalent, entire, meromorphic functions; Dirichlet problem; Riemann surfaces. *Fall*. Pfaltzgraff.
- 206 SEVERAL COMPLEX VARIABLES (3). Prerequisite, Mathematics 196. Elementary theory, the Cousin problems, domains of holomorphy, Runge domains and polynomial approximation, local theory, complex analytic structures, coherent analytic sheaves and Stein manifolds, Cartan's theorems. *Spring*. (Alternate years). Kerzman.
- 210 TOPICS IN ANALYSIS (3). Prerequisite, consent of the instructor. Subjects may include geometric function theory, Riemann surfaces, Nevanlinna theory, Banach spaces of analytic functions, calculus of variations, distribution theory, partial differential equations, or Fourier Series. *Spring*. Cima.
- 213 ADVANCED FUNCTIONAL ANALYSIS (3). Prerequisite, consent of instructor. Subjects may include operator theory on Hilbert space, operators on Banach spaces, locally convex spaces, vector measures, Banach algebras. *Spring*. (Alternate years.) Staff.
- 224 HARMONIC ANALYSIS (3). Prerequisite, consent of instructor. Subjects may include topological groups, abstract harmonic analysis, Fourier analysis, noncommutative harmonic analysis and group representations, automorphic forms and analytic number theory. *Fall*. (Alternate years.) Staff.
- 230 RINGS AND REPRESENTATIONS (3). Prerequisite, Mathematics 186. Multilinear algebra, groups and modules, fields and Galois theory, representations of finite groups. *Spring*. Wahl.
- 231 COMMUTATIVE ALGEBRA (3). Prerequisite, Mathematics 230. Field extensions, integral ring extensions, Nullstellensatz and normalization theorem, derivations and separability, local rings, valuations, completions, filtrations and graded rings, dimension theory. *Spring*. Heyneman.
- 234 TOPICS IN ALGEBRA (3). Prerequisite, Mathematics 230. Topics from the theory of rings, theory of bialgebras, homological algebra, algebraic number theory, categories and functions. *Fall*. (Alternate years.) Damon.
- 253 TOPICS IN COMBINATORIAL MATHEMATICS (3). Prerequisite, Mathematics 190 or consent of instructor. Topics may include: combinatorial geometries, coloring and the critical problem, the bracket algebra, reduced incidence algebras and generating functions, binomial enumeration, designs, valuation module of a lattice, lattice theory. *Spring*. (Alternate years.) Brylawski.
- 257 ALGEBRAIC GEOMETRY (3). Prerequisite, Mathematics 230. Topics may include: algebraic varieties, algebraic functions, abelian varieties, projective and complete varieties, algebraic groups, schemes and the Grothendieck theory, Riemann-Roch theorem. *Spring*. (Alternate years.) Schlessinger.
- 261 THEORY OF DYNAMICAL SYSTEMS (3). Prerequisite, consent of instructor. Topics may include: ergodic theory, topological dynamics, stability theory of differential equations, classical dynamical systems, differentiable dynamics. *Spring*. Petersen.

- 271 DIFFERENTIABLE MANIFOLDS (3). Prerequisites, Mathematics 181, 186, and 193. Calculus on manifolds, vector bundles, vector fields and differential equations, Lie Groups, connections, de Rham cohomology. *Spring*. Gardner.
- 272 DIFFERENTIAL GEOMETRY (3). Prerequisite, Mathematics 271. Riemannian geometry, first and second variation of area and applications, effect of curvature on homology and homotopy, Chern-Weil theory of characteristic classes, recent applications due to Bott, Chern-Simons, and Baum-Cheeger. *Spring*. Gardner.
- 273 LIE GROUPS AND LIE ALGEBRAS (3 each). Prerequisites, Mathematics 186 and 274
- 274 271. Relationship between Lie algebras and Lie groups, classification of complex semi-simple Lie algebras, representation theory, applications to geometry, cohomology of Lie algebras, compact groups. *Fall and spring*. (Alternate years.) Heyneman.
- 277 SPECIAL TOPICS IN GEOMETRY (3 each). Prerequisite, Mathematics 271. Topics may include: elliptic operators, complex manifolds, exterior differential systems, homogeneous spaces, integral geometry, submanifolds of Euclidean space. *Fall*. (Alternate years.) Plante.
- 286 ALGEBRAIC TOPOLOGY (3). Prerequisites, Mathematics 181 and 186. Homotopy and homology; simplicial complexes and singular homology; other topics may include: cohomology, universal coefficient theorems, higher homotopy groups, fibre spaces. *Spring*. Plante.
- 287 TOPICS IN ALGEBRAIC TOPOLOGY (3). Prerequisite, Mathematics 286. Topics may include: CW-complexes, spectral sequences, classification of fibre bundles, Cech cohomology, cohomology operations and the Steenrod algebra, homotopy of spheres and classical groups, algebraic homotopy theory, K-theory. *Fall and spring*. (Alternate years.) Stasheff.
- 390 SEMINAR (3).
- 393 MASTER'S THESIS (3 or more). (This should not be taken by students electing non-thesis Master's projects.)
- 394 DOCTORAL DISSERTATION (3 or more).
- 400 GENERAL REGISTRATION (0).

DEPARTMENT OF MUSIC

JAMES W. PRUETT, *Chairman* (on leave)

MICHAEL W. ZENGE, *Acting Chairman* (1981-82)

Professors

JAMES HAAR	(37)	Renaissance Music, Nineteenth-Century Music, History of Music Theory
ROGER D. HANNAY	(7)	Composition, Contemporary Music, New Music Ensemble
RUDOLPH J. KREMER	(10)	Organ, Baroque Music
JAMES W. PRUETT	(14)	Renaissance Music and Notation, Mass History, Bibliography
DAVID SERRINS	(15)	Orchestra, Oboe, University Symphony Orchestra
HOWARD E. SMITHER	(16)	Oratorio and Opera, Baroque Music
MICHAEL W. ZENGE	(20)	Piano, Keyboard Music

Associate Professors

HAROLD L. ANDREWS	(2)	Classic Era, Structural Analysis
LARRY D. COOK	(47)	Carolina Choir, Conducting
LYNN D. GLASSOCK	(21)	Percussion, Theory
DONALD L. OEHLER	(24)	Clarinet, Theory
THOMAS A. WARBURTON	(17)	Renaissance Music, Twentieth-Century Music
FRANCIS M. WHANG	(18)	Piano
STAFFORD WING	(19)	Voice
ANN M. WOODWARD	(5)	Viola, Chamber Music

Assistant Professors

ELAINE SCOTT BANKS	(46)	Violoncello, Chamber Music, Chamber Singers
EDWARD J. BOSTLEY	(35)	Horn, Music Education
MICHAEL S. ECKERT	(49)	Composition, Theory
JON FINSON	(36)	Nineteenth-Century Music, Collegium Musicum
JAMES E. KETCH	(33)	Trumpet, Jazz Laboratory Band, Jazz History
RICHARD E. LUBY	(41)	Violin, Chamber Music
MARAJEAN B. MARVIN	(29)	Voice, Opera Theatre
FREDRIC W. MOSES	(48)	Voice
MARMADUKE S. MILES	(34)	Piano, Piano Pedagogy
DAVID F. REED	(25)	Tuba, Wind Ensemble
BROOKS DE WETTER-SMITH	(28)	Flute, Music Education

Lecturers

MARGARET F. LOSPINUSO	(42)	Bibliography
BARBARA H. ROWAN	(27)	Piano

Visiting Associate Professors

FREDERICK RENZ	(52)	Performance Practices
NANCY M. VAN DEUSEN	(51)	Medieval Music

Emeritus Professors

EDGAR H. ALDEN
 JOEL J. CARTER
 LARA G. HOGGARD
 WILTON E. MASON
 WILLIAM S. NEWMAN
 EARL SLOCUM

The Graduate Programs of Study

Graduate work in the Department of Music meets the needs of students who intend to specialize in musicology, in music history and literature, in composition, in performance, and in choral conducting. The Department also supports other graduate study in the University, particularly in the School of Education.

Special Facilities

The Department of Music offers extensive facilities that are favorable to advanced study in music. Performing resources comprise over eighty pianos (including a fortepiano), four organs (including a Schlicker tracker organ), three harpsichords, a clavichord, and other historical instruments. A number of orchestral instruments are available for concert and practice use. The electronic music studio includes an Arp Synthesizer and an array of related equipment.

Central to the departmental resources is the Music Library, which ranks high among the nation's music libraries for its collected scholarly editions, scholarly studies, periodicals, early source materials, iconographic aids, microfilm, archives, folk music collections, practical performing editions, and recordings. Several extensive private collections assembled by individual faculty members for special studies are often available to advanced students.

Degrees

The Department offers the degrees of *Master of Arts* (M.A.) in music history and literature; *Master of Music* (M.M.) in composition or per-

formance, including choral conducting; and *Doctor of Philosophy* (Ph.D.) in musicology. It also supports the School of Education's programs leading to the degrees of *Master of Arts in Teaching* (M.A.T.), and *Doctor of Education* (Ed.D.) with a minor or special project in music; application to these programs is made to the School of Education, from which information is available.

Prerequisites for Degree Programs

The usual prerequisite for admission to graduate work leading to the M.A. and Ph.D. degrees is a Bachelor of Arts degree with a major in music, comparable to that given at this University. The B.M. and B.M.Ed. degrees usually lead, respectively, to the M.M. and the graduate music education degrees.

All applicants for graduate study in music are required to take both the verbal and quantitative Aptitude Tests as well as the Advanced Test in Music of the Graduate Record Examinations. These tests should be taken early enough for the scores to be submitted with the application for admission. An applicant for the M.A. or the Ph.D. program must submit with the application a thesis or research paper. An applicant for the M.M. program in composition must submit with the application one or more compositions. An applicant for the M.M. program in performance must demonstrate advanced standing through a qualifying performance, in person or by tape. An applicant for the M.M. program in choral conducting must submit with the application a tape of choral works that he or she has conducted and should consult with the director of this program. For return of tapes, compositions, and papers, a self-addressed, stamped envelope must be provided.

Language and Course Requirements, Examinations

M.M. candidates will normally have had two years of undergraduate study in a modern foreign language before admission; if not, the language requirement may be met by two years of study at the undergraduate level, or by passing the departmental language examination, or by passing the ETS examination. *M.M. candidates* in voice and choral conducting must also pass an examination in diction and song translations. *M.A. candidates* must pass the departmental examination in one modern foreign language; *Ph.D. candidates*, in two.

Music 110, Advanced Musicianship (passed with a grade of P or better), is required in all degree programs; Music 101, Resources and Methods, in all programs except composition. Central to the *M.M. program* is study in the applied music area and a "thesis" requirement that is met by a degree recital, by a composition, or by conducting, as appropriate to the program. Certain other courses and performance activities are specified by each

applied music area with the total credit hours for the M.M. programs ranging from 33-36; details of each program are available upon request to the Department. *M.A. and Ph.D. candidates* may optionally include courses from other departments that may be organized as a formal minor (9 hours for the M.A., 15 for the Ph.D.) or as a "supporting program"; such programs are devised and approved through consultation with the student's advisor and the departments concerned.

M.A. candidates will write a thesis that derives from a paper prepared for a graduate course. All candidates for a master's degree take a final oral examination covering course work; a final written examination is not given.

At the beginning of each spring semester a qualifying examination is given to those who wish to proceed to the *Ph.D. program* after finishing the M.A. Students already in the Department's M.A. program will be advised to take the examination in the second year. Those who received the M.A. at another institution must take the examination in the spring of the first year of study; these students will be evaluated during the second semester of study and advised as to whether they should continue. Following the completion of course work and language requirements, Ph.D. students will take a written examination in three areas of specialization to be determined through consultation with the faculty, and an oral examination focused largely on the area of the proposed dissertation.

The *Master of Arts in Teaching degree* is administered by the School of Education. Candidates who are not already certified to teach may qualify for the first-level teaching certificate (North Carolina "Class A" certificate) as special students and then proceed to the regular M.A.T. program. A minimum of thirty-three semester hours is required, with the following distribution: Music, 18 hours: Music 101, 110, Theory elective, 9 hours; applied Music, 6 hours; other electives, 3 hours; Education, 15 hours; EDCI 200, 287, 306; EDFO 106 or 180 or 285; EDFO 101 or 201 or 223 (see section of this catalogue under School of Education).

Fellowships, Assistantships, and Other Student Aid

Besides campus-wide grants (discussed elsewhere in this bulletin), assistantships and special grants are available to selected graduate students in music. The deadline for all graduate applications is February 1; separate application for aid is not necessary but may be indicated on the general application form for admission to the Graduate School. Selected applicants will be nominated for University-wide awards. Assistantships awarded by the Department require about ten hours of service per week. Qualified students may teach applied music and thus earn additional income. Awards range from \$2,000.00 to \$4,500.00, and may include consideration for partial tuition remission for out-of-state students. The

Edgar Memorial Fund Fellowship of \$4,000.00 plus consideration for partial tuition remission for out-of-state students is awarded by the Department to an incoming graduate student in musicology or composition. The Fellowship may be renewed.

Applied Music Fees: Fees for individual instruction are \$62.50 per semester for one half-hour lesson a week or \$125.00 per semester for one hour lesson a week. The fee for one hour of practice daily in a room with piano is \$15.00 per semester; for two hours of practice daily, \$24.00 per semester; for three hours of practice daily, \$33.00 per semester. (Advanced piano students may arrange to do at least part of their practicing on grand pianos.) Organ and harp practice fees are \$24.00 and \$20.00, respectively, per semester for one hour of daily practice.

Courses for Graduates and Advanced Undergraduates

- 101 RESOURCES AND METHODS OF MUSICOLOGY (3). Introduction to the scope, methodology, and bibliography of musicology. Extensive use of the music library, preparation for advanced seminars, and proper research procedures are stressed. *Fall*. Lospinuso.
- 102 SURVEY OF MUSIC STYLE (3). Survey of the chief styles of music history, with emphasis on methods of analysis, examination of representative scores, written exercises, and related readings. Warburton.
- 103 PRIMITIVE AND ORIENTAL MUSIC (3). A study of the folk music of primitive peoples throughout the world and of the traditional and folk music in Oriental countries.
- 104 FOLK MUSIC OF EUROPE AND THE NEW WORLD (3). A study of folk music in European countries, emphasizing similarities in the British Isles and southern United States.
- 105 CHINESE MUSIC (3). Prerequisite, Music 32, Chinese 102, or permission of the instructor. An introduction to Chinese music through recordings, musical documents, and Chinese musical instruments, emphasizing the place of music in Chinese society.
- 110 ADVANCED MUSICIANSHIP (3). Advanced study in sight-singing (including techniques related to solfege, reading in clefs), dictation, and keyboard (including figured bass, harmonization, improvisation, and score reading). *Fall, spring*.
- 114 20TH-CENTURY HARMONIC TECHNIQUES (3). Prerequisite, Music 57. Hannay.
- 127 HARPSICHORD CONSTRUCTION (3). History of the harpsichord and the music composed for it. Readings, recordings, and workshop sessions devoted to actual construction of a harpsichord. Kremer.
- 135 AMERICAN MUSIC (3). Its growth and development from the early colonies to the present.
- 136 PERFORMANCE PRACTICES (3). Problems of rhythm, ornamentation, articulation, and expression in both instrumental and vocal music, with emphasis on the period from 1550-1825 and practical applications in an informal collegium musicum.
- 140 ORATORIO (3). The development of the genre from its origins to the present. Smither.
- 141 THE MADRIGAL (3). Its international flowering, especially at the peak of music's Renaissance era. Smither, Haar.
- 142 OPERA (3). A survey of the types, national and international trends, conflicts, and chief masterworks from opera's beginning around 1600 to the present.

- 144 ART SONG (3). A study of the development of this genre, especially during its great flowering in the Lieder, *melodies*, and other national types of the nineteenth century.
- 145 THE SONATA (3). A study or survey of the meaning, uses, spread, scoring, and structural changes of this form type from its origins to the present. One era is emphasized each time, as announced in advance.
- 146 THE STRING QUARTET (3). From its origins in early chamber music to its culmination in the Classic, Romantic, and Modern eras, including problems of texture, form, and performance.
- 147 THE SYMPHONY (3). The growth of the symphony as an independent orchestra genre, especially in the masterworks from Haydn, Mozart, and Beethoven to Prokofiev, Piston, and other Moderns. Andrews.
- 148 KEYBOARD MUSIC (3). A historical survey that follows either stringed keyboard music through the harpsichord, clavichord, and piano, or organ music in its successive stages. Kremer, Zenge.
- 149 GENRE STUDIES (3). Other specific surveys of genres, forms, and styles of music in keeping with the series, Music 140-148. Staff.
- 150 FRANZ JOSEPH HAYDN (3). The man and his times, his music and its styles. Andrews.
- 151 J. S. BACH (3). With special attention alternately to the vocal and the instrumental works. Kremer, Smither.
- 152 MOZART (3). Andrews.
- 153 BEETHOVEN (3). Andrews.
- 154 HANDEL (3). Smither.
- 155 BRAHMS (3).
- 156 WAGNER AND VERDI (3).
- 157 DEBUSSY AND RAVEL (3). Warburton.
- 158 STRAVINSKY AND SCHOENBERG (3). Hannay.
- 159 COMPOSER STUDIES (3). Other specific surveys in keeping with Music 150-158.
- 160 PEDAGOGY OF THEORY (3). Prerequisites, Music 51, 53, 55 and 57, or permission of the instructor. Techniques of teaching; evaluation of current books, scores, and anthologies covering all aspects of sight-singing, keyboard, analysis, and written approaches to harmony and counterpoint. Practical classroom experience. *Spring*. Hannay.
- 161 STRUCTURAL AND STYLISTIC ANALYSIS (3). Studies in the problems and techniques of musical analysis.
- 162 INSTRUMENTATION (3). Practical exercises in scoring and arranging for various combinations from single instrumental choirs to full concert orchestra, with trial group performances. *Spring*. Bostley, Reed, Serrins.
- 163 INSTRUMENTAL ARRANGING (3). Exercises in arranging for various combinations of woodwind, brass, and percussion instruments, with practical application.
- 164 CHORAL ARRANGING (3). Theory and practice of arranging music for voice in all standard choral combinations with emphasis on historical traditions and stylistic differences.
- 165 SURVEY OF CONTRAPUNTAL TECHNIQUES (3). Renaissance, Baroque, and early 20th century; analysis and imitative writing. Haar, Kremer.
- 166 COMPOSITION (3). Original compositions in various forms. *Fall and spring*. Hannay.
- 167 THE ELECTRONIC STUDIO (3). Limited to majors in the Division of Fine Arts, with permission of the instructor. An introduction to the technical aspects of electronic music, including familiarization with synthesizers. Hannay.
- 168 BASSO CONTINUO (3). Practical and historical studies in styles of keyboard realizations of basso continuo. Development of keyboard skill.

- 171 INSTRUMENTAL PERFORMANCE REPERTOIRE (3). Survey of solo and ensemble literature. Emphasis may vary among brass, percussion, strings, woodwinds.
- 172 LIEDER PRACTICUM (3). By permission of class instructor and major voice instructors. Extensive analysis and performance study of German art song with special emphasis on textual factors and accompanying skills. Zenge.
- 173 OPERA DIRECTION PRACTICUM (3). Practical experience in opera direction. Marvin.
- 174 CHURCH MUSIC PRACTICUM (3). Practical study of church music: church year, hymnody, chant, Roman, Anglican, Protestant services, organ improvisation, and related problems. Kremer.
- 175 ADVANCED CONDUCTING I and II (3 each). Prerequisite, Music 68. *Fall and spring*. Banks, Serrins.
- 201- GRADUATE APPLIED MUSIC (3 or 1½). Individual applied music instruction.
- 208 M.M. in Performance candidates receive 3 hours credit for their major instrument or voice for one hour lesson a week, each semester, and register for at least 18 hours a week of practice, each semester; they will continue to register for individual instruction until the "thesis" requirements (recital and concerto or opera role) have been met. Qualified graduate students in degree programs other than the M.M. degree in Performance may receive like credit for applied music, but such credit will not substitute for course work otherwise required for the M.A. and Ph.D. degrees. After qualifying through audition, graduate students may enroll for 1½ credits (usually, or 3 exceptionally) per semester in applied music. A maximum of 6 hours credit may be applied toward the M.M. in Composition or the M.A.T.; 3 hours credit toward the M.M. in Choral Conducting. Students who have received the allowable number of hours credit, but who desire to continue applied music study, and M.A. and Ph.D. students will enroll in a course with the suffix X. Graduate Music Ensemble carries 1½ hours credit. *Fall and spring*. Staff.

Applied Music

201A	PIANO	204B	OBOE
201B	ORGAN	204C	CLARINET
201C	HARPSICHORD	204D	SAXOPHONE
201X	KEYBOARD INSTRUMENT	204E	BASSOON
	Credit not applicable to a music degree	204F	RECORDER
202	VOICE	204X	WOODWIND INSTRUMENT
202X	VOICE		Credit not applicable to a music degree
	Credit not applicable to a music degree	205A	FRENCH HORN
203A	VIOLIN	205B	TRUMPET
203B	VIOLA	205C	TROMBONE
203C	VIOLONCELLO	205D	TUBA
203D	STRING BASS	205X	BRASS INSTRUMENT
203E	HARP		Credit not applicable to a music degree
203F	GUITAR	206	PERCUSSION
203X	STRING INSTRUMENT	206X	PERCUSSION
	Credit not applicable to a music degree		Credit not applicable to a music degree
204A	FLUTE		

Music Ensembles

207A	UNIVERSITY SYMPHONY	207K	PIANO ENSEMBLE
207B	CHAMBER ORCHESTRA	207L	MARCHING/CONCERT/ PEP BAND
207C	UNIVERSITY WIND ENSEMBLE	207M	GUITAR ENSEMBLE
207D	NEW MUSIC ENSEMBLE	207N	PERCUSSION ENSEMBLE
207E	JAZZ LAB BAND	208A	CAROLINA CHOIR
207F	BRASS CHAMBER GROUPS	208B	UNIVERSITY MIXED CHORUS
207G	WOODWIND CHAMBER GROUPS	208C	UNIVERSITY CHAMBER SINGERS
207H	STRING CHAMBER GROUPS	208D	MEN'S GLEE CLUB
207J	MIXED CHAMBER ENSEMBLE	208E	OPERA THEATRE
		208F	WOMEN'S GLEE CLUB
		208G	COLLEGIUM MUSICUM

- 210 SURVEY OF CHORAL MUSIC (3). Survey and style critical analysis of choral masterworks in the large forms; historical trends; study of composers from Palestrina to the present, using scores, lectures, readings, recordings, and performances.
- 240 PROSEMINAR IN MEDIEVAL MUSIC (3). Study of selected topics in Medieval music. Emphasis on basic stylistic aspects and problems of analysis, and on both primary and secondary sources and bibliography. Independent work is stressed, in preparation for more developed, independent research at the seminar level (Music 337). Lectures and student reports.
- 241 PROSEMINAR IN RENAISSANCE MUSIC (3). In keeping with Music 240. Haar, Pruett, Warburton.
- 242 PROSEMINAR IN BAROQUE MUSIC (3). In keeping with Music 240. Smither, Haar.
- 243 PROSEMINAR IN CLASSIC MUSIC (3). In keeping with Music 240. Andrews.
- 244 PROSEMINAR IN ROMANTIC MUSIC (3). In keeping with Music 240. Finson, Haar.
- 245 PROSEMINAR IN MODERN MUSIC (3). In keeping with Music 240. Hannay, Warburton.
- 246 PROSEMINAR IN AMERICAN STUDIES (3). Study of selected topics from the musical history of America, from Colonial times to the early twentieth century. Advanced bibliography in American musicology. Research topics relating principally to primary sources. Lectures and student reports.
- 249 PROSEMINAR IN MUSICOLOGY (3). Other specific surveys dealing with the music of a certain limited period or locale, or concerned with some special concept.
- 251 ARS ANTIQUA AND ARS NOVA (3). Notation, performance practices, liturgical functions, social functions, concordances, structural principles, and extramusical influences.
- 252 RENAISSANCE MANUSCRIPT STUDIES (3). Provenance and history, notation, and concordances, including textual studies and edition techniques, Haar, Pruett, Warburton.
- 261 ANALYTICAL TECHNIQUES (3). Techniques of analysis of music from the Middle Ages to the present. Andrews, Warburton.
- 262 ORCHESTRATION (3). Practical orchestral scoring with emphasis on understanding and imitating historical styles for Mozart through Ravel. Hannay, Serrins.
- 264 ADVANCED TONAL COUNTERPOINT (3). Practical exercises, with special emphasis on the techniques of Bach. Hannay, Warburton.

- 265 ADVANCED COMPOSITION (3 each). Designed for the development of creative
 266 originality in musical composition. *Fall and spring*. Hannay.
 298 SPECIAL STUDIES. The faculty assists and advises graduate students' research or
 creative work. Hours and credits to be arranged. Staff.
 337 SEMINAR IN MUSICOLOGY (3). Seminar subjects and staff to be announced. *Fall
 and spring*.
 393 MASTER'S THESIS (3 or more). *Fall and spring*. Staff.
 394 DOCTORAL DISSERTATION (3 or more). *Fall and spring*. Staff.
 400 GENERAL REGISTRATION (0).

NOTE: The following courses come under the School of Education.

- EDCI MUSIC EDUCATION IN THE PUBLIC SCHOOL, K-12 (3). A study of the goals,
 186 historical development, and present curricular practices in music education at all
 levels. Bostley.
 EDCI ADVANCED CHORAL METHODS AND VOCAL DEVELOPMENT PRO-
 187 CEDURES FOR SECONDARY SCHOOL MUSIC (3). The development of the
 singing voice, ear training, reading, and musicianship, in teaching and conducting.
Summer. Hoggard.
 EDCI THE TEACHING OF APPLIED MUSIC: VOICE (3). Analysis, methods, and tech-
 188 niques of vocal pedagogy. *Spring and alternate summers*. Staff.
 EDCI INVESTIGATIONS AND TRENDS IN MUSIC EDUCATION (3). A survey of
 287 recent studies in the psychology of music; current practices here and abroad as
 reported in professional journals; readings and reports on selected topics such as
 programmed instruction. *Alternate summers*. Staff.
 EDCI EDUCATION WORKSHOPS (3 or 6). Music education workshops may be in Piano
 380 Pedagogy, Elementary School Music, or other subject. *Summer*. Staff.

CURRICULUM IN NEUROBIOLOGY

PIERRE MORELL, *Director*

Professors

- | | | |
|----------------------|------|---|
| GEORGE R. BREESE | (2) | Developmental and Peptide Pharmacology Neuropharmacology; Experimental Alcoholism |
| NORMAN A. COULTER | (4) | Mathematical Modeling of Neural Processes |
| FREDERIC L. ELDRIDGE | (74) | Neural Control of Respiration |
| LAWRENCE I. GILBERT | (79) | Insect Physiology |
| EDWARD GLASSMAN | (13) | Neurochemical Genetics |
| JACOB S. HANKER | (16) | Neurocytochemistry of Diabetes Mellitus and Sensory Neuropathies |
| JAMES N. HAYWARD | (17) | Neuropeptides; Hypothalamus; Immunocytochemical Studies of Neuroendocrine Cells |
| O. W. HENSON | (63) | Auditory Physiology, Comparative Anatomy of Auditory System |
| RICHARD N. JOHNSON | (75) | Biological Control Systems, Analysis and Simulation; Real-Time Data Acquisition |
| RICHARD A. KING | (19) | Brain and Behavior |
| MARTIN R. KRIGMAN | (20) | Heavy Metal Neurotoxicology; Synaptogenesis |
| MOTOY KUNO | (21) | Neurophysiology of Central Synapses |
| MORRIS A. LIPTON | (22) | Psychopharmacology |
| M. STEPHEN MAHALEY | (73) | Immuno-Oncology of Nervous System; Functional Neuroanatomy |
| PIERRE MORELL | (27) | Myelin Metabolism; Axonal Transport; Heavy-Metal Neurotoxicology |
| ROBERT A. MUELLER | (30) | Regulation of Biogenic Amines |
| PAUL L. MUNSON | (31) | Neuroendocrinology of Ca Metabolism |
| PAUL A. OBRIST | (32) | Psychophysiology; Stress and Cardiovascular Disease |
| LORCAN O'TUAMA | (34) | Heavy Metals and Brain Barrier Tissue |
| JOHN P. PERKINS | (60) | Regulation of Neurotransmitters and Pharmacology of Glial Cells |
| EDWARD R. PERL | (35) | Nociception; Electrophysiology of Somatosensory Systems |
| ARTHUR J. PRANGE | (37) | CNS Effects of Neuropeptides; Affective Disorders |
| PAUL G. SHINKMAN | (41) | Receptive Field Properties of Developing Visual System |
| WALTER E. STUMPF | (42) | Localization of Steroid and Peptide Hormones |
| BARRY L. WHITSEL | (46) | Somatosensory Mechanisms |
| R. HAVEN WILEY | (47) | Social Organization and Communication in Invertebrates |

- JOHN E. WILSON (48) Effects of Experience on Metabolism of Macromolecules in Brain

Associate Professors

- LINDA DYKSTRA (51) Behavioral Effects of Opioids
 PAUL B. FAREL (11) Spinal Cord Development and Regeneration
 RICHARD L. GLASSER (12) Organization of Respiratory Mechanisms in Brain
 HENRY S. HSIAO (18) Mechanics of Phototaxis
 J. STEPHEN KIZER (64) Regulation of Neurotransmitter Metabolism; Neuro-Endocrinology
 JEAN LAUDER (71) Neurotransmitters and Hormone Neurogenesis
 DOUGLAS LAY (53) Auditory Structures
 J. DOUGLAS MANN (83) Brain Barrier Systems
 DAVID L. MCILWAIN (23) Chemistry of Regeneration and Degeneration in Spinal Motoneurons
 GERHARD W. MEISSNER (55) Structure, Function and Assembly of Membranes
 ROYCE L. MONTGOMERY (26) Anatomy of the Limbic System
 TAI-CHAN PENG (69) Endocrine Pharmacology
 PETER PETRUSZ (36) Neuropeptides; Neuroendocrinology; Reproductive Biology
 ALDO RUSTIONI (50) Somatosensory Pathways; Synaptogenesis
 ANN E. STUART (76) Sensory Processing in Invertebrate Nervous Systems
 W. GRADY THOMAS (43) Auditory Mechanisms
 JAMES N. WEAKLY (45) Synaptic Transmission, Regeneration; Trophic Interactions

Assistant Professors

- RAYMOND J. DINGLEDINE (72) Synaptic Mechanisms; Electrophysiology of Drug Action
 MICHELA GALLAGHER (80) Biological Basis of Memory and Learning
 ROBERT GREENWOOD (61) Extracellular Ion Homeostasis, Cortical Electrophysiology
 T. KENDALL HARDEN (59) Characterization and Isolation of Receptors; Cyclic Nucleotides
 LAWRENCE M. MARSHALL (81) Structure and Function of Developing Synapses
 KEN DOUGLAS MCCARTHY (77) Biochemical Analysis of Cultured Neurons, Oligodendrocytes and Astrocytes
 GERRY S. OXFORD (67) Biophysics of Excitable Membranes
 JIRI PRAZMA (38) Auditory Mechanisms
 ROBERT SEALOCK (58) Cell Biology and Biochemistry of Acetylcholine Receptors

Research Associate Professor

- RICHARD B. MAILMAN (82) Behavioral and Biochemical Neuropharmacology

Adjunct Associate Professor

RONALD W. OPPENHEIM

(56) Developmental Neurobiology and
Behavioral Development

The Neurobiology Curriculum of The University of North Carolina at Chapel Hill includes faculty from the Departments of Anatomy, Anesthesiology, Biochemistry and Nutrition, Biostatistics, Medicine, Neurology, Oral Biology, Oral Surgery, Pathology, Pharmacology, Physiology, Psychiatry, Psychology, Surgery, Zoology, and from the Curricula in Genetics and in Biomedical Engineering and Mathematics. The theme unifying members of these diverse departments is a desire to understand the mechanisms whereby the nervous system functions. While sharing this fundamental interest in the nervous system, research techniques used by members of the Curriculum are quite diverse and provide the student with the opportunity to master a wide variety of laboratory skills.

Graduate students working toward the Ph.D. in Neurobiology must take Neurobiology 101a, 111, 112, 200, 203, 227, 290, and 302, as well as other courses suggested by the Associate Director of Training.

The minor in Neurobiology consists of a minimum of 15 hours of courses selected from the list below with the approval of the Associate Director.

Special fellowships, commensurate with usual grants-in-aid, are available to support graduate students who are working toward the Ph.D. degree under the direction of a faculty member in the Neurobiology Program and who major in Neurobiology. After the second year, graduate students are to receive travel awards to attend national scientific meetings.

Applicants are urged to complete their applications by February 1.

Courses for Graduates and Advanced Undergraduates

- 100 BIOCHEMISTRY FOR STUDENTS OF BIOLOGY AND CHEMISTRY (Biochemistry 100, Chemistry 107, Zoology 107) (3). Prerequisites, Chemistry 61 and one course in biology. Lectures on the regulation and mechanism of reactions in living organisms, with emphasis on general principles. Protein structure and enzyme function; central pathways in intermediary metabolism; metabolic control; expression of genetic information; molecular disease. *Fall*. Wolfenden; staff. *Spring*. Meissner.
- 101a NEUROANATOMY (Anatomy 101) (5). The central nervous system and organs of special sense. *Three lecture and four laboratory hours a week, spring*. Rustioni.
- 101b INTRODUCTION TO BIOMEDICAL ENGINEERING (3). Prerequisites, Mathematics 32 and Zoology 11 of equivalents. Topics included are dimensional analysis in biology, biomechanics, biorheology, bioacoustics, membrane transport, bioelectricity, sensory transducers, biological control systems, and neural information processing. *Fall*. Coulter.
- 101c CONDITIONING AND LEARNING (Psychology 101) (3). Prerequisites, Psychology 10 and 22. A comprehensive survey of the methods, findings, and theories of classical and operant conditioning. Skills necessary to evaluate, integrate and summarize significant original literature will be developed. *Fall*. Dykstra, Eckerman, Waller.

- 102 BIOLOGICAL FOUNDATIONS OF BEHAVIOR (Psychology 102) (4). Prerequisite, Psychology 22 or Zoology 11. Ethological, genetic and physiological variables will be studied in relation to their behavior effects. *Two lecture and three laboratory hours a week, spring.* Staff.
- 106 PHYSIOLOGICAL PSYCHOLOGY (Psychology 106) (3). Prerequisite, Psychology 10, or a course in Zoology. Elements of neurophysiology, neuroanatomy, and neurochemistry as they apply to the understanding of behavior and conscious experience. *Fall and spring.* King, Gallagher.
- 110 TECHNIQUES IN PHYSIOLOGICAL PHARMACOLOGY (Pharmacology 110) (3). Prerequisites, Pharmacology 202 and permission of the instructor. Students will learn and perform a variety of physiological techniques often used in classical pharmacological research. *One lecture and six laboratory hours a week, spring.* Staff. (1980 and alternate years.)
- 111 NEUROBIOLOGY LABORATORY APPRENTICESHIP (3-9). Prerequisite, permission of the Director of Training of the Neurobiology Program. A laboratory-tutorial course to acquaint the student with methods used in several areas of neurobiology. *Fall, spring.* Faculty of the Neurobiology Program.
- 111a BIOMEDICAL INSTRUMENTATION (BMME 111) (3). Prerequisites, Mathematics 32 or equivalent, permission of the instructor. Designed for students who do not have and want experience in electronics. The fundamentals of circuit theory, microprocessors and practical circuit design are presented in the context of biological applications. This course includes a laboratory and individual student projects. *Fall.* Hsiao.
- 113 ANIMAL BEHAVIOR (Zoology 113) (3). Prerequisites, Zoology 11, 11L, or permission of the instructor. An introduction to animal behavior, including the ontogeny, physiology, ecology and evolution of behavior. *Three lecture and three laboratory hours a week, fall and spring.* Mueller, Wiley.
- 113L
- 118 NEUROENDOCRINOLOGY (Anatomy 118) (Pharmacology 118) (2). Prerequisite, permission of the instructor. A review of presently held concepts in neuroendocrinology with emphasis on topographical aspects of brain structures related to hormone action. *Two lecture hours a week spring.* Stumpf, Sar. (1982 and alternate years.)
- 120 COMPARATIVE PHYSIOLOGY (Zoology 120) (3). Prerequisites, Zoology 11, 11L, or Biology 21, 21L and 1 course in Physiology is recommended. Comparative physiology of the major organ systems with emphasis on common principles underlying homeostasis. *Three lecture hours a week, spring.* Koeppel. (1982 and alternate years.)
- 120L COMPARATIVE PHYSIOLOGY LABORATORY (Zoology 120L) (1-3). Corequisites, Zoology 120 and permission of the instructor. Instrumentation and techniques in comparative physiology. Hours and credit by prior agreement. *Spring.* Koeppel.
- 121 INTRODUCTION TO BIOMEDICAL DATA PROCESSING (BMME 121) (Physiology 121) (3). Prerequisite, Computer Science 16 or equivalent. This is an introduction to the methods of automatic computation of special relevance to biomedical problems. Sampling theory, analog-to-digital conversion, digital filtering will be explored in depth. *Spring.* Lucas.
- 122 DEVELOPMENTAL NEUROBIOLOGY (Anatomy 122) (3). Prerequisite, permission of instructor. This course will be a general discussion of problems of structural and functional development of the vertebrate nervous system. *Three lecture hours a week, spring.* Lauder. (1981 and alternate years.)
- 123 BEHAVIORAL PHARMACOLOGY (Pharmacology 123, Psychology 123) (3). Prerequisites, Pharmacology 202, or Psychology 101 and 106, or their equivalent. Basic principles of pharmacology and of the experimental analysis of animal behavior will be considered in relation to drugs that affect the central nervous system. *Three lecture hours a week, spring.* (1983 and alternate years.)

- 125 INTRODUCTION TO NEUROPHYSIOLOGY (Zoology 125) (3). Prerequisite, Zoology 120 or 121 or permission of the instructor. The neurophysiological basis of behavior with emphasis on structure and function of membranes, neurons, synapses, and complex functional units of nervous systems. *Three lecture hours a week, on occasion.* Staff.
- 131 INTRODUCTION TO BIOMATHEMATICS (BMME 131) (3). Prerequisite, Mathematics 32 or equivalent. An introduction to the dynamic analysis of biological systems, including: differential equations of behavior, transient response, Fourier analysis and frequency response, and applications of the LaPlace transform in biology and medicine. *Fall.* Coulter.
- 140 CELL AND ORGAN SYSTEM PHYSIOLOGY (Physiology 140) (5). Prerequisite, permission of the instructor. Principles of cell and organ system physiology suitable for students with a biology and chemistry background. *Spring.* Staff.
- 150 NEUROBIOLOGY (3). Prerequisite, permission of the instructor. A tutorial in selected topics in neurobiology tailored to meet interests of the students and competencies of instructors. *Fall and spring.* Staff.

Courses for Graduates

- 200 ADVANCED NEUROPHYSIOLOGY (Physiology 204) (3). Prerequisite, Physiology 140, working knowledge of mammalian neuroanatomy and permission of the instructor. A course designed to provide detailed analysis of selected areas of neurophysiology, such as synaptic transmission, sensory and motor systems, and higher integrative mechanisms. *Fall.* Staff.
- 201a EXPERIMENTAL METHODS: CONDITIONING AND LEARNING (Psychology 201) (3). Principal topics include: classical conditioning, operant conditioning, stimulus control of behavior. *Fall.* Staff.
- 201c ADVANCED BIOMEDICAL INSTRUMENTATION (BMME 201) (3). Prerequisites, BMME 11 or permission of the instructor. Topics include analysis of medical instrumentation with emphasis on pressure, flow, bioelectric, and ultrasonic transducers. This course includes a laboratory and weekly demonstrations of clinical instruments in the hospital. Students are given the opportunity to design and fabricate original devices. *Spring.* Hsiao.
- 202 BIOLOGICAL PSYCHOLOGY (Psychology 202) (3). Prerequisites, graduate standing in psychology or permission of the instructor. The course will have two parts: a survey of basic brain-behavior relations, e.g., in perception, learning, and motivation, and a survey of topics in applied neuropsychology, including behavioral effects of brain damage, brain mechanisms in language, and normal brain functioning in man. *Three lecture hours a week, spring.* Shinkman.
- 203 SYNAPTIC PHARMACOLOGY (Pharmacology 203) (3). Prerequisite, Pharmacology 202. An indepth consideration of biochemical and physiological bases for actions of neuroactive drugs and their possible sites of action in terms of identified pathways and synapses in the brain. *Three lecture hours per week, fall.* Breese, Dingledine, Harden and Mueller.
- 204 ADVANCED BIOLOGICAL PSYCHOLOGY: CENTRAL NERVOUS SYSTEM (Psychology 204) (3). Prerequisite, Psychology 106 or equivalent. Each fall one specific topic will be covered in depth, e.g., neural bases of memory storage, homeostasis, and perception. Format will include lecture and seminar meetings with student presentations. *Fall.* Shinkman.
- 205 ADVANCED BIOLOGICAL PSYCHOLOGY: AUTONOMIC NERVOUS SYSTEM (Psychology 205) (3). Prerequisites, Psychology 106 and/or 202, or permission of the instructor. Autonomic nervous system bases of emotion, motivation, and learning. *Two lecture and two laboratory hours a week, on demand.* Obrist.

- 211 SPECIAL TOPICS IN PHYSIOLOGY (Physiology 211, 212) (3-5). Prerequisite,
212 permission of the instructor. Individually arranged programs of study in depth of
selected topics. *Fall and spring*. Staff.
- 218 EXPERIMENTAL ENDOCRINOLOGY (Zoology 218) (2). Prerequisite, permis-
sion of the instructor. *Six laboratory hours per week, spring*. Staff. (1982 and alternate
years.)
- 220 NEUROPATHOLOGY (Pathology 220) (5). Prerequisite, Pathology 161s. System-
atic study of the more common diseases of the nervous system, utilizing a gross
specimen collection, a microscope slide set, current autopsy and surgical specimens,
and a histochemical laboratory. *Two conference and six laboratory hours a week,
spring and summer*. Krigman.
- 221 NEURAL INFORMATION PROCESSING (BMME 221) (3). Prerequisites, Bio-
medical Engineering-Biomedical Mathematics 101 and Physiology 140 or equivalent.
This approaches the nervous system as a data-processing network, and the brain as the
computer for a homeostat. *Spring*. Coulter. (Alternate years.)
- 225 EXPERIMENTAL NEUROPHYSIOLOGY (Zoology 225) (3). Prerequisite, permis-
sion of the instructor. Six or more laboratory hours a week. On occasion. Staff.
- 227 NEUROCHEMISTRY (Biochemistry 227) (3). Prerequisite, Biochemistry 100 or
equivalent. An introductory course in the biochemistry of the nervous system. Topics
include aspects of energy metabolism, neurotransmitters, intermediary metabolism,
and the metabolism of macromolecules in the nervous system. *Fall*. Wilson, Morell.
(1982 and alternate years.)
- 235 SEMINAR IN CHEMICAL NEUROBIOLOGY (Biochemistry 235) (3). *Fall*. Wil-
son, Morell. (1983 and alternate years.)
- 259 SEMINAR IN COMPARATIVE ANIMAL BEHAVIOR (Zoology 259) (2). *Fall*.
McMahan, Mueller, Wiley.
- 260 SEMINAR IN COMPARATIVE PHYSIOLOGY (Zoology 260) (3). Prerequisite,
Zoology 120, or permission of the instructor. *Spring*. Staff.
- 290 SEMINAR IN NEUROBIOLOGY (Biochemistry 290) (3). (Physiology 290) (Pathol-
ogy 290) (Pharmacology 290) (Psychology 290) (3). Prerequisite, permission of the
Director of Training of the Neurobiology Program. An intensive consideration of
selected topics and problems. Participation required of Neurobiology Trainees.
Spring. Faculty of the Neurobiology Program.
- 302 SEMINAR IN THE BIOLOGICAL FOUNDATIONS OF PSYCHOLOGY (Psy-
chology 302) (3). Selected advanced topics depending on the interests of the instructor
and students. *Fall and spring*. King, Shinkman.
- 310 RESEARCH IN NEUROBIOLOGY (Biochemistry 310) (Pathology 310) (Pharma-
cology 310) (Physiology 310) (Zoology 302) (Psychology 310) (3-12). Prerequisite,
permission of a staff member. Research in various aspects of neurobiology. *Six to
twenty-four hours a week, fall and spring*. Faculty of the Neurobiology Program.
- 394 DOCTORAL DISSERTATION (1 or more). *Fall, spring, summer*. Research adviser.
- 400 GENERAL REGISTRATION (0).

SCHOOL OF NURSING

LAUREL ARCHER COPP, *Dean*

Professors

LAUREL ARCHER COPP	(59)	Nursing Research
MARGERY A. DUFFEY	(102)	Curriculum/ Research
NANCY MILO	(56)	Health Services Research
KATHERINE B. NUCKOLLS	(83)	Primary Care Nursing

Associate Professors

SANDRA L. BERRY	(02)	Ob/ Gyn Nursing
AUDREY J. BOOTH	(75)	Administration
ELEANOR M. BROWNING	(61)	Geriatrics
MARGARET E. CAMPBELL	(62)	Medical-Surgical Nursing
JOANN DALTON	(86)	Medical-Surgical Nursing
MARY C. DOWE	(84)	Medical-Surgical Nursing
LAURICE FERRIS	(04)	Cardiovascular Nursing
ANNE H. FISHEL	(60)	Psychiatric Nursing
CATHERINE I. FOGEL	(63)	Ob/ Gyn Nursing
SANDRA G. FUNK	(62)	Nursing Research, Statistics
BONNIE HENSLEY	(103)	Continuing Education
CATHEE J. HUBER	(45)	Pediatric Nursing
BETTY LANDSBERGER	(58)	Child Development, Family Relationships
PATRICIA A. LAWRENCE	(27)	Diabetic Nursing
CLARA M. LEWIS	(77)	Nutrition
SHIRLEY MASON	(109)	Medical-Surgical Nursing
HELEN M. MURPHY	(51)	Well Child Family Health Care
VIRGINIA J. NEELON	(10)	Medical-Surgical Nursing, Physiology
FAYE D. PICKARD	(14)	Medical-Surgical Nursing
BARBARA C. RYNERSON	(64)	Psychiatric Nursing
MARIAN SMALLEGAN	(81)	Continuing Education
CAROLYN A. WILLIAMS	(33)	Nursing Research

Assistant Professors

BARBARA BIBB	(99)	Primary Care Nursing
JOAN DINAPOLI	(112)	Primary Care Nursing
BONNIE J. FRIEDMAN	(106)	Community Health
MARGARET F. HUDSON	(91)	Primary Care Nursing
JEAN KINCADE	(105)	Sociology
JANE MITCHELL	(79)	Primary Care Nursing
SUSAN F. PIERCE	(89)	Cardiovascular Nursing
LINDA SMITH	(80)	Primary Care Nursing
INGRID ELIZABETH SWENSON	(88)	Women's Health
ELEANOR TAGGERT	(65)	Medical-Surgical Nursing
INEZ TUCK	(111)	Secondary Care Nursing

Instructors

MARY LYN FIELD	(107)	Primary Care Nursing
DIANE LAUVER	(98)	Primary Care Nursing

Lecturers

PATRICIA CHRISTIAN	(92)	Psychiatric Nursing
CAROL GARRISON	(87)	Primary Care Nursing
BETTY HARRIS	(108)	Obstetrics
MARION HIGHRITER	(66)	Public Health Nursing
ELIZABETH M. TORNUQUIST	(67)	Nursing Research

Clinical Professor

THOMAS E. CURTIS	(34)	Psychiatry, Family Therapy
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Clinical Associate Professors

ALICE E. DIETZ	(68)	Medical-Surgical Nursing
CLARA WALTERS	(97)	Primary Care Nursing

Clinical Assistant Professor

BEVERLY W. FERREIRO	(94)	Secondary Care
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Research Professor

ARLENE PAYNE	(110)	Research
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Master of Science in Nursing

The graduate curriculum of The University of North Carolina at Chapel Hill School of Nursing was revised in 1978 on the basis of information from numerous University, state, regional, and national reports detailing needs in health care and recommending new emphases in higher education for the health professions. The new curriculum for the master's degree in Nursing is designed to prepare graduates to respond to contemporary health problems and rapidly changing methods for improving health.

The curriculum consists of three components: Core, Primary Care, and Secondary Care. The core of the curriculum provides the student a broad knowledge of the scope of contemporary health problems and health improvement interventions, and lays the foundation for in-depth study of health improvement strategies in primary or secondary care. In addition, students learn methods and approaches to research which are appropriate for working with the problems of contemporary health and illness.

All students take the core courses and elect to concentrate in either primary care or secondary care with additional work in management or education. The program in primary care prepares the graduate to function as a nurse practitioner, delivering a range of services, in ambulatory settings for the most part, to meet the majority of needs for health care of

individuals and groups. The program in secondary care is designed to develop nurses with expertise in the care of patients with intensive and medically complicated problems requiring specialized personnel, equipment, and/or facilities for adequate management. Graduates of both the primary and secondary care programs are prepared to function as researchers, educators, or managers in nursing.

The School of Nursing is committed to the principle of equal opportunity and does not discriminate on the basis of age, race, sex, color, national origin, religion, or handicap with respect to applicants for admission. Minority students, older students, and male students are encouraged to apply.

Core

The core of the curriculum provides the student a broad knowledge of the scope of contemporary health problems and health improvement interventions, and lays the foundation for in-depth study of health improvement strategies in primary or secondary care areas of concentration.

More specifically, the core learning phase emphasizes 1) improving health by a broad range of methods; 2) developing an enhanced capacity for working with large groups, particularly in an organizational setting; 3) determining methods for contributing to program development; 4) solving problems of contemporary health and illness as they apply to individuals as well as communities; and 5) learning methods and approaches to research which are appropriate for working with the problems of contemporary health and illness.

The student learns to understand the nature of contemporary health problems by examining the effect of the environment on health, analyzing the profile of contemporary health problems, and analyzing the impact of personal health services and ecological interventions on the health of individuals and small groups.

Environmental and socioeconomic strategies directed at improving the health of selected population groups are analyzed, and their impact is compared to that of personal health service strategies. The student analyzes the policy and program decision-making which determines current and potential health improvement interventions, and compares methods of influencing decision-making at both intra- and interorganizational levels.

The following content is considered essential to develop the common frame of reference reflected by the core of the curriculum: biological, behavioral and sociocultural concepts; systematic inquiry; information related to the nature and quality of the environment; and political, economic, and organizational concepts relevant to modern illness prevention. This core content is multidisciplinary in nature, with emphasis on research from a wide variety of sources. The core courses are required for all students.

Core Course Descriptions

Contemporary Health Problems:

- NURS 255 CONTEMPORARY HEALTH PROBLEMS AND HEALTH IMPROVEMENT INTERVENTIONS I (3). Examines contemporary health problems and health improvement interventions within a broad context. An epidemiological approach is utilized in examining the health and illness of various at risk populations. The focus is on understanding the nature of contemporary health problems by examining the effects of the environment on health; understanding the profile of contemporary health problems; and analyzing the effectiveness of personal health services in improving health. The conceptual framework for the total curriculum is introduced at the outset of the course as a basis for study. *Fall*.
- NURS 355 CONTEMPORARY HEALTH PROBLEMS AND HEALTH IMPROVEMENT INTERVENTIONS II (3). Prerequisite, Nursing 255. Emphasis is placed on examining policy and program decision-making processes at intra- and inter-organizational levels. Environmental strategies are contrasted with personal health service strategies relative to their potential for improving health of populations. *Spring*.

Research:

- NURS 274 RESEARCH METHODS I (3). Prerequisites, undergraduate statistics and undergraduate research methods. Emphasizes in-depth knowledge of research methodology including overview of health and nursing research, selection of a research problem, research design, sampling, measurement, and data collection methods. *Fall*.
- NURS 275 RESEARCH METHODS II (3). Prerequisite, Nursing 274. The student is expected to design a research project relevant to a clinical nursing problem, which is approved for implementation. *Spring*.
- NURS 374 RESEARCH METHODS III (3). Prerequisites, Nursing 274 and Nursing 275. Focuses on methods of data analysis, including descriptive and inferential statistics, basic computer skills and methods of data presentation and interpretation. *Fall*.
- NURS 375 RESEARCH METHODS IV (3). Prerequisites, Nursing 274, Nursing 275, and Nursing 374. The student is expected to complete a written research report and a written publication-style article, and to make an oral presentation of the research findings. *Spring*.
- NURS 393 MASTER'S THESIS (3-6). Through the thesis, opportunity is provided for independent pursuit of knowledge and understanding, for the development of competence in solving nursing problems, and for increasing recognition of responsibility to contribute to professional knowledge by systematic investigation. *Fall, spring, summer*.

Research Options

Group Research Project

Students may elect to take the four-course research sequence (N274, N275, N374, N375) which involves completing a group research project. The main purpose of the group project option is to provide students with an opportunity to collaboratively use their clinical expertise, theoretical knowledge, and research skills in the investigation of a clinical practice problem of interest. The intent of this learning experience is to foster the

use of research in expanding nursing knowledge and contributing to the resolution of clinical practice problems.

Students who elect the group project option submit a report of their findings in an acceptable but less formalized style than that required of thesis students. Emphasis is placed instead on the writing of an article from the research for publication. This practice has the advantage of promoting the dissemination of research findings and offering intensive editorial assistance.

Thesis

Two alternatives are available to students electing the thesis:

1. Thesis students may elect to take the first and third courses of the research sequence described earlier (N-274; N-374) and register for thesis credit (N-393) during the second and fourth semesters. In addition, thesis students are encouraged to attend selected sections of N-275 to facilitate their proposal development.

The option described above offers the student a research methodology course, assistance in developing the thesis research proposal, and guidance in analyzing and interpreting data. This sequence of courses is designed to facilitate the student's completion of the thesis within the two-year academic framework.

2. Thesis students may elect to take courses in research methodology and statistics in another department of the University such as Epidemiology, Biostatistics, Psychology, or Education; take a short course in data analysis which uses a packaged computer program such as SPSS; and take thesis credit (N-393) during the second year.

Primary Care

Primary care includes a range of services delivered for the most part in ambulatory and home settings to meet the majority of needs for health care of individuals and groups. It focuses upon the assessment of health status, the prevention of diseases and disabilities and maintenance of health. Clients are assisted in the management of significant life events, minor illnesses, chronic diseases and nonspecific symptomatic complaints, with referral for specialty care as needed.

The master's program in primary care prepares the graduate to function as a nurse practitioner in primary care settings and as an educator, coordinator, and nurse researcher. As nurse practitioners, graduates are prepared to deliver personal health services to individuals, including assessment of the state of health, identification of present or potential problems, and implementation of a plan of care. Their scope of practice also includes

concern for the health needs of families and communities. They have acquired skill in teaching lay and professional individuals and groups, and are prepared to work collaboratively with professionals of other disciplines in planning, implementing, and evaluating strategies to maintain or improve the functioning of institutions or agencies. Their research training enables them to use the methods of systematic inquiry in the evaluation of health services and the solution of clinical or administrative problems.

Clinical Expectations

The clinical requirements of the graduate program in primary care include approximately 8 hours a week of supervised clinical rotations the first semester, 12 hours a week in the second and third semesters, and a clinical preceptorship during the last semester. Applicants are encouraged to identify a preceptor prior to admission, although this is not a condition of acceptance. On completion of the preceptorship the student may take the Family Nurse Practitioner certifying exams.

Primary Care Course Descriptions

- NURS 215 ADVANCED ISSUES IN PRIMARY CARE (1). Focuses on issues and trends in primary health care delivery systems. Emphasis is placed on the role and responsibility of the master's prepared FNP in our present health care system. *Fall.*
- NURS 245 ADVANCED DIAGNOSTIC PROCESS (4). Prepares students to utilize the techniques of interviewing, history taking, physical examination and selected diagnostic procedures in the assessment of health and the diagnosis of illness. *Fall.*
- NURS 265 ADVANCED CONCEPTS OF PRIMARY CARE I (2). Focuses on mental health and developmental concepts. Emphasis is placed on operationalizing strategies for dealing with mental health needs and problems in ambulatory settings. *Fall.*
- NURS 266 ADVANCED CONCEPTS OF PRIMARY CARE II (6). Prerequisites, Nursing 245, 255, 265, 274. Continuation of Advanced Concepts of Primary Care I. Focuses on methods of health promotion and assessment and treatment of common health problems. Emphasis is on the application of research to clinical practice. *Spring.*
- NURS 267 ADVANCED CONCEPTS OF PRIMARY CARE III (6). Prerequisites, Nursing 255, 265, 266, 274, 275, 355. Continuation of Advanced Concepts of Primary Care II. Focuses on methods of health promotion and assessment and treatment of common health problems in all age groups. Emphasis is placed on application of research findings in clinical settings. *Fall.*
- NURS 268 ADVANCED PRIMARY CARE PRACTICUM (6). Focuses on clinical application and implementation of the family nurse practitioner role in a primary care setting. *Spring.*

Secondary Care

Secondary care may be defined as a range of personal health services to persons with health problems that are intensive and medically complicated and require specialized personnel, equipment, and/or facilities for adequate management. Secondary care nursing, which is one aspect of the

care of such patients, takes place in a variety of settings—hospitals, nursing homes, patients' homes, etc.

The master's program in secondary care is designed to develop nurses with specialized expertise in the care of patients with these intensive and medically complicated problems. Instead of specializing clinically in the traditional areas of concentration in nursing (medical-surgical, psychiatric, obstetric and pediatric nursing), students concentrate on clients with one of the broad major categories of secondary care problems (trauma, cancer and cardiovascular disease), or they choose to concentrate on care of a particular age group of clients (children, adults, the aging) and look at all the secondary care problems as they affect this group.

In the theory portion of their combined theory/clinical courses students analyze selected concepts from the behavioral sciences and critical components of the biophysiological sciences to develop and test a theoretical framework for secondary care practice.

As graduates they are skilled in comprehensive assessment of groups of patients as well as the individual patient, and are prepared to implement and evaluate intervention strategies for intensive and medically complicated health problems. They have acquired the interpersonal and communication skills needed for effective interaction with patients and families, and are prepared to collaborate with others involved in health care.

Clinical Expectations

The clinical practice requirement of the master's program in secondary care is six hours a week each semester for four semesters.

Secondary Care Course Descriptions

NURS 220 SECONDARY CARE NURSING I (3). A general systems approach is utilized as the framework for (1) the analytical study of concepts from the behavioral sciences and (2) their clinical application by students to patients with secondary care health problems. *Fall*.

NURS 225 SECONDARY CARE NURSING II (3). Prerequisite, Nursing 220. Through analysis of critical components of the biophysical sciences and their clinical application to patients with secondary care health problems, students continue to develop a theoretical framework for practice. *Spring*.

NURS 235 ANALYSIS OF NURSING PRACTICE (3). Prerequisite, Nursing 225. Through a critical evaluation of secondary care nursing practices and selected conceptual models for nursing practice, students formulate a theoretical base for practice and test it clinically. *Spring*.

NURS 245 ADVANCED DIAGNOSTIC PROCESS (3). Prepares students to utilize the techniques of interviewing, history taking, physical examination, and selected diagnostic procedures in the assessment of health and the diagnosis of illness. *Fall*.

A graduate level elective is required from the social sciences or the biophysical sciences.

Functional Options

Options in Education and Management have been developed for the graduate program. Each student will be required to complete 6-12 credit hours in the option sequence which best suits the individual's interest, experience and career goals. The sequence and timing of the option will vary depending upon the student's area of concentration.

Education Option

Based upon assessment of the student's past experience and/or formal courses in education, the student may enter Level I or Level II of the Education Option. Completion of Level III is required.

- Level I:* Basic Instructional Skills
EDCI 265—College Teaching
- Level II:* Instruction and Curricular Considerations
(Select one of the following)
- a. EDFO 103—Psychology of Adult Learning
 - b. EDCI 200—Introduction to Curriculum
 - c. EDCI 208—The College Curriculum
 - d. EDCI 303—Problems in the Curriculum
- Level III:* Practicum or Teaching Internship
EDCI 306—Practicum in Curriculum and Instruction:
Adult-Higher

Management Option

- Level I:* Basic course required for all students.
HPAA 105—Concepts of Health Administration
or
HPAA 210—Health Management Methods I
- Level II:* A. Secondary Care
(Select one of the following or comparable courses with approval of advisor.)
- a. HPAA 211—Health Management Methods II
 - b. HPAA 296—Organizational Behavior of Health Institutions
 - c. HPAA 195—Implementing and Managing Change in Health Organizations
 - d. HPAA 183—Personnel Administration

B. Primary Care

(Select one of the following or a comparable course with approval of advisor.)

- a. HPA 227—Ambulatory Care and Related Services
- b. HPA 182—Budgeting and Financial Management
- c. HPA 200—Quantitative and Analytical Methods for Health Administration
- d. HPA 150—Introduction to Health Economics

Level III: Secondary Care

NURS 236—Secondary Care Nursing Management Practicum

Prerequisites

Students are expected to have successfully completed an undergraduate statistics course and an undergraduate research methods course before enrolling in the first graduate research course. Questions regarding these prerequisites should be directed to the Student Services Office of the School of Nursing.

ADMISSION**Admission Requirements**

1. Evidence of current and maintained state licensure. For legal reasons, North Carolina licensure is required in order for students to have laboratory placement in clinical facilities.

(For information on how to obtain North Carolina registration, contact the North Carolina Board of Nursing, P.O. Box 2129, Raleigh North Carolina 27602.)

2. An official transcript reflecting the B.S.N. degree, as well as transcripts of any other undergraduate and graduate work.

3. A strong overall academic record with an average of B or better, both in nursing courses and during the last two years of undergraduate work.

4. Official copy of scores received on the aptitude tests of the Graduate Record Examination. It is recommended that applicants take these tests at least 9 months prior to anticipated admission date.

5. Three letters of recommendation (one recent or current work reference and two academic references).

6. Completion of the Personal Statement Form and Personal Data Sheet.

7. A record of previous work experience as a registered nurse (a minimum of one year's duration for admission to Primary Care and a minimum of two years' duration for admission to Secondary Care).

8. A personal interview (may be required). Scheduling of the interview will be initiated by the School of Nursing upon receipt of all written materials.

When completing the application, applicants should indicate which area of concentration, Primary Care or Secondary Care, they are applying for and indicate which functional option, Education or Management, they wish to pursue.

All students enrolled in the School of Nursing must carry professional liability (malpractice) insurance coverage.

All application materials must be received by the School of Nursing by November 1 for *spring admission*. (Spring admission is offered on a limited basis depending upon the availability of positions within the quota and upon available faculty resources. Spring admission is usually on a part-time basis.)

All application materials must be received by the School of Nursing by *February 1* for *fall admission*.

Degree Requirements

Removal of any provisions of the original admission to the Graduate School.

Observation of the degree time limit (5 years).

Satisfactory completion of required semester hours of graduate credit*, with due regard to the removal of all temporary grades (Incompletes, Absences, No Reports, and S grades on all course work with the exception of the thesis N-393); registration for N-393 for at least 3 hours for those master's students selecting the thesis; and approval through the Graduate School of transfer credit.

Written comprehensive examination.

A thesis or group research project.

Oral defense of the thesis.

*42-47 semester hours, including core courses, required courses in the area of concentration, acceptable courses from the Education or Management option, 3-6 hours thesis or research project. The minimum number of semester hours will vary depending upon which area of concentration is pursued and whether or not a student is required to register for a total of 9 or 12 semester hours of research.

DIVISION OF OCCUPATIONAL THERAPY

MARLYS M. MITCHELL, *Chairman*

Professor

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| MARLYS M. MITCHELL | (1) | Administration, Curriculum Development
Exceptional Children |
|--------------------|-----|--|

Associate Professors

- | | | |
|----------------------|-----|--|
| GLADYS N. MASAGATANI | (5) | Psychiatry, Mental Health, Group Process |
| JOAN C. ROGERS | (6) | Gerontology, Physical Disabilities, Life
Span Human Development |

Assistant Professors

- | | | |
|----------------------|-----|--|
| ANNE B. BLAKENEY | (4) | Rehabilitation, Sensory Integration,
Geriatrics |
| THEODORE I. KING, II | (8) | Neuroscience, Physical Dysfunctions,
Adult Rehabilitation |
| DORIS A. SLACK | (7) | Kinesiology, Physical Disabilities, Hand
Rehabilitation |

Clinical Assistant Professor

- | | | |
|-------------------|-----|---|
| LINDA KING-THOMAS | (3) | Sensory Integration, Mental Retardation,
Neurodevelopmental Theory |
|-------------------|-----|---|

The Division of Occupational Therapy in the Department of Medical Allied Health Professions offers a graduate program leading to the Master of Science degree with a major in occupational therapy. The program is a two year program planned for individuals with a baccalaureate degree in a field other than occupational therapy.

Requirements for Admission

1. A bachelor's degree from an accredited institution.
2. Submission of scores from the Graduate Record Examination.
3. An overall grade point average of B or better.
4. Three letters of recommendation.

The Occupational Therapy Division requires from each applicant:

1. A goal statement.
2. Documented record of relevant work or volunteer experience.

The M.S. program has the following prerequisites:

1. Human or Gross Anatomy (with lab)
2. Introductory Human Physiology (with lab)
3. Child or Adolescent Growth and Development

4. Abnormal Psychology or Personality
5. Sociology, Social Problems, or Anthropology
6. Statistics
7. Competence in Three Manual Skills (woodworking and leatherwork plus ceramics or weaving) by course or experience

The Master of Science Program requires a minimum of 54 semester credit hours. The program is two years in length and includes substantial field experience. A thesis or research project is required.

Occupational Therapy courses are available to graduate students enrolled in other areas of the University. Many require permission of the instructor.

Courses for Graduates

- 160 FOUNDATIONS OF OCCUPATIONAL THERAPY (2). A study of the value systems, concepts, current theories, and treatment methodologies in occupational therapy, with application to treatment situations. *Fall*. Rogers.
- 180 INTRODUCTION TO HUMAN GROWTH AND DEVELOPMENT (Physical Therapy 180) (4). Study of normal development in the life span, with discussion of deviations due to disease and/or development aberrations. Application to occupational therapy. *Fall*. Blakeney, Rogers, King-Thomas.
- 200 PROFESSIONAL SKILLS IN OCCUPATIONAL THERAPY (1). Development of skills of observation and written verbal and nonverbal communication specific to occupational therapy. Recording observed behavior, writing professional reports, and public speaking are included. *Fall*. Mitchell.
- 210 APPLIED ANATOMY FOR OCCUPATIONAL THERAPISTS (3). Prerequisites, Human Anatomy 41; Human Physiology 94. Structure of the human body with application to occupational therapy. Normal and abnormal considerations in lecture and lab. Permission required for non-O.T. majors. *Fall*. Staff.
- 211 KINESIOLOGY/BIOMECHANICS FOR OCCUPATIONAL THERAPISTS (3). Functional aspects of the human body with application to occupational therapy. Normal and abnormal considerations in lecture and lab. Permission required for non-O.T. majors. *Fall*. Slack.
- 220 NEUROLOGICAL SCIENCES FOR OCCUPATIONAL THERAPY (3). Prerequisites, Human Anatomy 41; Human Physiology 94. Neuroanatomy and neurophysiology of peripheral and central nervous systems, including motor control and sensory systems. Application to occupational therapy evaluation and treatment of dysfunction. *Spring*. King.
- 230 THERAPEUTIC PROCEDURES IN OCCUPATIONAL THERAPY (5). Course will present activity concepts and skills used as treatment tools in occupational therapy. Remediation strategies of analysis, adaptation and application of activities for development of function will be stressed in lab. *Spring*. Slack.
- 290 PROGRAM PLANNING, MANAGEMENT, AND SUPERVISION IN OCCUPATIONAL THERAPY (3). Principles of program planning, management and supervision applied to occupational therapy services. *Fall*. Mitchell.
- 300 PROFESSIONAL SKILLS IN OCCUPATIONAL THERAPY (1). Planning and writing research proposal or thesis in occupational therapy. Professional writing skills for papers, projects and grants will be developed. *Spring*. Mitchell.

- 320 FIELD EXPERIENCE IN OCCUPATIONAL THERAPY (6 & 2). Direct experience with clients/patients in varied service and treatment settings. May be repeated for credit. *Summer, spring, fall*. Masagatani.
- 330 RESEARCH IN OCCUPATIONAL THERAPY (3). Independent project in occupational therapy. Faculty supervision. May be repeated for credit. *Fall, spring, summer*. Staff.
- 340 ISSUES AND PROBLEMS IN OCCUPATIONAL THERAPY (3). Seminar discussions on selected issues and problems related to occupational therapy. May be repeated for credit. *Fall*. Masagatani.
- 350 INDEPENDENT STUDY: SPECIAL TOPICS IN OCCUPATIONAL THERAPY (1-3). Independent study to pursue specific interests and topics. Faculty supervision. May be repeated for credit. *Fall, spring, summer*. Staff.
- 360 THEORY DEVELOPMENT IN OCCUPATIONAL THERAPY (3). Prerequisite, OCCT 160 and permission of instructor. Study of the nature of theory; theory in a practice profession; criteria for assessing theories; the development of scientific thought; general systems theory; theory building in occupational therapy. Seminar. *Fall*. Rogers.
- 393 THESIS (3). Independent research project in occupational therapy. Faculty supervision. May be repeated for credit. *Fall, spring, summer*. Staff.

Medical Allied Health Professions Courses (MAHP)

- MAHP 204 MEDICAL ASPECTS OF REHABILITATION (3). Medical, psychological and life aid systems in rehabilitation and counseling of individuals with medical and/or physical disabilities. *Fall*. King.
- MAHP 212 PSYCHOSOCIAL DISABILITIES: TREATMENT AND REHABILITATION (3). Psycho-social adaptive behaviors and psychiatric pathology will be presented by lectures. Occupational therapy theory and program development for prevention and remediation will be stressed and augmented by clinical experiences and seminars. *Spring*. Masagatani.
- MAHP 304 STATISTICS AND RESEARCH DESIGN IN ALLIED HEALTH (3). Prerequisite, beginning statistics. Research methodologies and research designs. Descriptive statistics and statistical inference. Application to Medical Allied Health. *Fall*. Rogers.

CURRICULUM IN OPERATIONS RESEARCH AND SYSTEMS ANALYSIS

GEORGE S. FISHMAN, *Chairman*

Professors

JOHN P. EVANS	(2)	Mathematical Programming, Production Theory
GEORGE S. FISHMAN	(10)	Simulation Methodology, Applications of Operations Research
DAVID S. RUBIN	(3)	Integer Programming, Networks
RICHARD H. SHACHTMAN	(4)	Decision Theory, Stochastic Processes, Health Applications
WALTER L. SMITH	(8)	Probability, Stochastic Processes
JON W. TOLLE	(6)	Optimization Theory
HARVEY M. WAGNER	(19)	Management, Strategic Thinking, Modeling

Associated Professors

DOUGLAS G. KELLY	(12)	Combinatorics, Probability
ALAN W. NEEBE	(11)	Networks, Integer Programming, Location Theory
DONALD F. STANAT	(5)	Theory of Computation, Formal Languages, Artificial Intelligence

Assistant Professors

VIDYADHAR G. KULKARNI	(16)	Stochastic Models
LOUIS R. MOORE	(17)	Applied Probability, Computational Statistics, Computer Graphics

Visiting Lecturer

RADHIKA V. KULKARNI	(18)	Ranking and Selection Procedures
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Adjunct Associate Professor

PAUL T. BOGGS	(14)	Nonlinear Optimization, Numerical Methods
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Operations Research and Systems Analysis are concerned with the process of decision making for the purpose of optimal resource allocation. The spectrum of related activities includes basic research in optimization theory, development of deterministic and stochastic mathematical models as aids for decision making, and application of these models to real world problems. The principal steps in modeling consist of analyzing relationships that determine the probable future consequences of decision choices and devising appropriate measures of effectiveness in order to evaluate the relative merits of alternative actions. During the past thirty years, Operations Research has developed into a discipline whose methods of analysis

are regularly employed in many diverse industries and governmental agencies.

The Curriculum in Operations Research and Systems Analysis consists of a resident faculty and an interdisciplinary faculty with programs of study that offer considerable opportunity for the pursuit of individual student interests. Both the M.S. and Ph.D. degrees are offered, with specialization possible in deterministic optimization theory (such as non-linear programming) in stochastic processes and applied probability (such as queueing theory and simulation), or in an approved area of application (such as management science). The M.S. program is intended for the student who is preparing for a career in industry, government, or consulting. The Ph.D. program emphasizes theoretic depth and is tailored primarily to the student who is preparing for a research teaching career. Each program includes study of the mathematical foundations of Operations Research. In either case the specific program of study for each student is determined to a large extent on an individual basis through consultation with a faculty advisor to obtain a balance between application and theory. Although it is possible for the well-prepared student to complete the M.S. requirements in three semesters, it more typically requires four semesters. The Ph.D. program, including the dissertation, generally requires four or five years past the bachelor's degree.

Requirements for Admission to Graduate Study

Applicants must have demonstrated a high level of scholastic ability in their undergraduate studies and must satisfy the entrance requirements of the Graduate School. No restrictions are placed on the undergraduate major for admission to the Curriculum. However, to be adequately prepared for study in Operations Research, an applicant should have a good mathematical background including courses in advanced calculus, linear or matrix algebra, and probability, and the knowledge of a computer language. A student admitted with a deficiency in one or more of these topics must remove it at the beginning of her or his graduate work. If the deficiency is not severe, this can be accomplished without interrupting the normal program.

Degree Requirements

Candidates for degrees in Operations Research and Systems Analysis must meet the general requirements of the Graduate School. This includes, for the Ph.D. degree, a reading knowledge of one foreign language. Course selections for a degree in Operations Research and Systems Analysis are taken from Curriculum offerings and from regular offerings of related departments. By design, Operations Research and Systems Analysis has an interdisciplinary character, so that in addition to the following courses,

selections can be made from the departments of Biostatistics, City and Regional Planning, Computer Science, Epidemiology, Economics, Health Administration, Library Science, Mathematics, Psychology, and Statistics.

Additional information may be obtained by request from the Admissions Chairman, Curriculum in Operations Research and Systems Analysis, Smith Building 128A, The University of North Carolina at Chapel Hill, Chapel Hill, NC 27514.

Courses for Graduates and Advanced Undergraduates

- 167 APPLIED STOCHASTIC PROCESSES (Biostatistics 167)(3). Prerequisite, Biostatistics 160 or Statistics 126 or equivalent. Survey of Markov chains, Poisson processes and extensions, branching processes and other stochastic models of empirical processes. Population, health services and other applications. *Fall*. Shachtman.
- 180 STOCHASTIC MODELS IN OPERATIONS RESEARCH (Statistics 180)(3). Prerequisite, Biostatistics 160 or Statistics 126. Introduction to queueing theory (substantial). Markovian sequential decision processes, inventory theory and topics from stochastic linear programming, simulation, scheduling, game theory. *Spring*. Kul-karni.
- 181 DETERMINISTIC MODELS IN OPERATIONS RESEARCH (Mathematics 151) (Statistics 181) (3). Prerequisite, Mathematics 147. Linear, integer, nonlinear and dynamic programming, classical optimization problems, network theory. *Fall*. Kul-karni, Tolle.
- 182 NONLINEAR AND DISCRETE OPTIMIZATION (Mathematics 152) (3). Non-linear optimization: quadratic programming. Newton's and other methods in unconstrained optimization, constrained optimization including Lagrange multipliers and Kuhn-Tucker conditions. Discrete optimization: transportation problems and other network problems. *Spring*. Staff.

Courses for Graduates

- 210 DETERMINISTIC METHODS IN OPERATIONS RESEARCH I (3). Prerequisite, Calculus of several variables, linear or matrix algebra. A study of the basic principles of linear programming, including the simplex algorithm, duality, and postoptimality analysis, and an introduction to nonlinear programming. *Fall*. Rubin, Tolle.
- 211 DETERMINISTIC METHODS IN OPERATIONS RESEARCH II (3). Prerequisite, ORSA 210 or consent of the instructor. Modeling and solution techniques for problems in integer programming, networks, and dynamic programming. *Spring*. Rubin, Wagner.
- 212 NONLINEAR OPTIMIZATION (3). Prerequisite, ORSA 210 and advanced calculus or consent of instructor. Convexity, necessary and sufficient conditions for optimality, sensitivity analysis, and algorithms for unconstrained and constrained problems. *Spring*. Tolle.
- 213 ADVANCED LINEAR PROGRAMMING (3). Prerequisite, ORSA 210 or equivalent. Topics in linear programming including large scale problems, special structures, computational considerations, and quadratic programming. *Fall*. (Alternate years.) Rubin.
- 214 TOPICS IN INTEGER PROGRAMMING (3). Prerequisite, ORSA 211. Possible topics include Lagrangian relaxation. Benders' decomposition, group theoretic

- approaches, location models, and matching and covering models. *Fall*. (Alternate years.) Neebe, Rubin.
- 215 NETWORK FLOWS (Business Administration 310) (3). Prerequisite, permission of the instructor. Network flow problems and solution algorithms; maximum flow, shortest route, assignment, and minimum cost flow problems; Hungarian and out-of-kilter algorithms. Combinatorial and scheduling (CPM and PERT) applications. *Spring*. Neebe.
- 221 STOCHASTIC MODELS FOR OPERATIONS RESEARCH (3). Prerequisite, Stat 129 or equivalent. Introduction to mathematical models for decision-making under uncertainty. Specific topics include reliability theory, inventory models, queueing theory, optimization in queues, and Markov decision processes. *Spring*. Kulkarni.
- 225 INTRODUCTION TO INVENTORY THEORY (Business Administration 309) (3). prerequisite, permission of instructor. Introduction to the techniques of constructing and analyzing mathematical models of inventory systems. *Fall*. Wagner.
- 233 DISCRETE EVENT SIMULATION (3). Prerequisite, Stat 127, 129, or permission of instructor, or the equivalent and familiarity with computer programming. Introduces students to modeling, programming and statistical concepts applicable to discrete event simulation on digital computers. Emphasizes statistical analysis of simulation output. Students will model, program and run simulations. *Fall*. Fishman.
- 234 DISCRETE EVENT SIMULATION (3). Prerequisite, ORSA 233 or its equivalent. Continuation of ORSA 233. Describes random number and stochastic variate generation, estimation of input parameters and design of simulation experiments. *Spring*. Fishman.
- 245 DECISION THEORY (Business Administration 206) (3). Prerequisite, Business Administration 205 or equivalent. Axiomatic development of subjective probability and utility theory. Introduction to decision analysis, statistical decision theory, and game theory. *Fall*.
- 250 DECISION ANALYSIS (3). Prerequisite, Statistics 126 or equivalent. Material on Decision Analysis from texts and papers of Howard, Raiffa and others. Extensive, normal forms of analysis, subjective probability, utility theory. Analysis of specific decision problems. Orientation to applications. *Spring*.
- 321 DIRECTED READING IN OPERATIONS RESEARCH AND SYSTEMS ANALYSIS (Variable). Prerequisite, permission of Operations Research faculty member. *Fall and spring*. Staff.
- 351 SPECIAL TOPICS IN OPERATIONS RESEARCH AND SYSTEMS ANALYSIS (Variable). Prerequisite, permission of instructor. *Fall and spring*. Staff.
- 352 WORKSHOP IN APPLIED OPERATIONS RESEARCH (3). Prerequisite, permission of the instructor. Workshop concentrates on application of quantitative methods to the solution of a specific problem adopted as a class project. *Spring*. Staff.
- 389 OPERATIONS RESEARCH AND SYSTEMS ANALYSIS STUDENT SEMINAR (1). Survey of literature in operations research and systems analysis. *Spring*. Staff.
- 393 MASTER'S THESIS (3 or more). Prerequisite, permission of the student's adviser. *Fall*. Staff.
- 394 DOCTORAL DISSERTATION (3 or more). Prerequisite, permission of the student's adviser. *Fall and spring*. Staff.
- 400 GENERAL REGISTRATION (0).

DEPARTMENT OF PATHOLOGY

JOE W. GRISHAM, *Chairman*

Professors

FREDERIC B. ASKIN	(80)	Surgical Pathology
WALTER R. BENSON	(2)	Surgical Pathology
EMILY S. BARROW CLARK	(19)	Genetic Pathology
FREDERIC G. DALLDORF	(4)	Ultrastructure of Microcirculation, Anatomic Pathology, Infectious Diseases
DONALD T. FORMAN	(59)	Clinical Biochemistry
J. DIETER GERATZ	(5)	Surgical Pathology, Enzymology
JOHN B. GRAHAM	(7)	General and Experimental Pathology, Population Studies, Human Genetics
JOE W. GRISHAM	(1)	General and Experimental Pathology, Environmental Pathology, DNA Replication and Repair
R. PAGE HUDSON, JR.	(8)	Forensic Pathology, Accident Pathology
WILLIAM D. HUFFINES	(9)	Anatomic Pathology, Renal Pathology
DAVID G. KAUFMAN	(34)	Experimental Pathology, Chemical Carcinogenesis
MARTIN R. KRIGMAN	(10)	Neuropathology, Environmental Pathology
WILLIAM J. KUHN	(58)	Immunohematology, Blood Banking
ROBERT D. LANGDELL	(11)	Hematopathology, Blood Banking
ROGER L. LUNDBLAD	(22)	Experimental Pathology
ARTHUR J. MCBAY	(14)	Forensic Toxicology
WILLIAM W. MCLENDON	(12)	Automation and Data Processing in Laboratory Medicine, Clinical Chemistry
JAMES R. PICK	(20)	Comparative Pathology
HAROLD R. ROBERTS	(15)	Thrombosis and Hemorrhage Research and Therapy, Hematology
EDWARD V. STAAB	(51)	Nuclear Medicine, Immunology
ROBERT H. WAGNER	(17)	Biochemical Aspects of Thrombosis and Hemorrhage, Experimental Pathology
WILLIAM P. WEBSTER	(18)	Oral Pathology, Transplantation

Associate Professors

NADIA MALOUF ANDERSON	(26)	Cytogenetics, Pediatric Pathology
STUART A. BENTLEY	(88)	Hematology
PHILIP M. BLATT	(49)	Hematology, Blood Coagulation
CHARLES N. CARNEY	(23)	Surgical Pathology, Cytology
HERBERT A. COOPER	(6)	Experimental Pathology, Hemophilia
ROBERT E. CROSS	(46)	Clinical Chemistry
THOMAS R. GRIGGS	(50)	Experimental Pathology
JOHN E. HAMMOND	(47)	Clinical Chemistry
PAUL MUSHAK	(29)	Heavy Metals, Chemistry, Electron Spin Resonance
DENNIS W. ROSS	(64)	Hematology

- RICHARD W. SHERMER (30) Thrombocyte Agglutination, General Pathology, Cytology
 DAVID H. WALKER (35) Experimental Pathology, Rickettsial Diseases

Assistant Professors

- DWIGHT A. BELLINGER (89) Comparative Pathology
 THOMAS W. BOULDIN (72) Neuropathology
 JOHN D. BUTTS (70) Forensic Pathology
 JERJANG CHANG (87) Comparative Pathology
 JOHN F. CHAPMAN, JR. (79) Clinical Chemistry
 DAVID CHOU (78) Laboratory Computer Services
 J. CHARLES JENNETTE (61) Renal Pathology, Immunopathology
 DAVID T. MILLER (77) Blood Bank
 ROBERT L. REDDICK (63) General Pathology, Electron Microscopy, Soft Tumor Tissue
 HOWARD M. REISNER (38) Immunogenetics
 LAWRENCE M. SILVERMAN (73) Clinical Chemistry
 RICHARD R. TIDWELL (42) Medicinal Chemistry
 MICHAEL D. TOPAL (41) Mutagenesis, Carcinogenesis

Research Professor

- JOHN HIGGINSON (91) Environmental Carcinogenesis

Research Assistant Professors

- CORA-JEAN EDGELL (84) Somatic Genesis
 G. YANCEY GILLESPIE (44) Immunology, Immunochemistry, Cytogenetics
 KATHRYN PRYZWANSKY (86) Electron Microscopy

Research Instructor

- GARY J. SMITH (85) Carcinogenesis

Adjunct Professors

- FREDERICK J. DE SERRES (53) Environmental Mutagenesis
 LEON GOLBERG (54) Environmental Chemistry, Subcutaneous Carcinogenesis
 ROBERT A. GOYER (74) Environmental Pathology, Heavy Metals
 HEINRICH B. MALLING (90) Genetic Pathology
 PAUL NETTESHEIM (65) Pulmonary Function and Toxicology
 THOMAS M. SCOTTI (55) Environmental Pathology
 JAMES A. SWENBERG (66) Chemical Carcinogenesis

Adjunct Associate Professors

- ROBERT C. BROWN (56) Cellular Pathology and Ultrastructure
 BARRY W. GLICKMAN (81) Genetic Pathology
 MICHAEL A. RESNICK (82) Genetic Pathology

Adjunct Assistant Professors

JAMES C. BARRETT	(75)	Mutagenesis and Carcinogenesis
BRYON E. BUTTERWORTH	(67)	Genetic Toxicology
BRUCE A. FOWLER	(57)	Environmental Pathology
STEPHEN C. NESNOW	(39)	Human Oncology
JAMES A. POPP	(76)	Comparative Pathology

Professor Emerita

MARGARET C. SWANTON

Professor Emeritus

KENNETH M. BRINKHOUTS

Graduate work in the Department of Pathology is offered to those interested in acquiring a more extensive basic knowledge of diseases and their effects on bodily functions. Students are given the opportunity to undertake candidacy for the Master of Science and Doctor of Philosophy degrees.

Prospective candidates must hold a bachelor's degree from an accredited college.

The Department is located in the Preclinical Educational Building. There are well equipped laboratories for research and advanced work in pathology.

As a part of the essential training, prospective candidates are required to assist in teaching two or more semesters for the M.S., four or more semesters for the Ph.D. Participation in research activities is required of all advanced degree candidates.

Courses for Graduates and Advanced Undergraduates

- 107 INTRODUCTION TO NEUROBIOLOGY (Biochemistry 107) (Neurobiology 107) (Pharmacology 107) (Physiology 107) (3). Prerequisites, one course in the biological sciences and permission of the Director of the Neurobiology Program. This is an interdisciplinary course to provide students with an integrative view of modern concepts of Neurobiology. (Alternate years.) *Three lecture hours a week, fall semester.* Members of the Neurobiology Program.
- 161s PATHOLOGY (5). Prerequisite, permission of the instructor. *Two lectures, one conference and four laboratory hours a week, spring.* Staff.
- 162 EXPERIMENTAL PATHOLOGY. Hours, credits and instructor to be arranged.
- 163 ELECTRON MICROSCOPY (4). Prerequisite, permission of instructor. Theoretical and practical aspects of electron microscopy. Application of transmission and scanning electron microscopy to pathology, with emphasis on ultrastructure of cells and organelles. *Two lecture and six laboratory hours a week, fall and spring.* Staff.
- 166 MOLECULAR BIOLOGY OF BLOOD COAGULATION (3). Prerequisites, Biochemistry 100 or Biochemistry 105 or permission of instructor. A comprehensive presentation of the chemistry and molecular biology of the blood coagulation mechanisms including consideration of component proteins, lipids, cofactors, interaction

- with other homeostatic systems, and control. *Three lectures per week, fall semester.* (1983 and alternate years.) Staff.
- 169 INTRODUCTION TO HUMAN IMMUNOGENETICS (Genetics 169) (3). Prerequisite, permission of the instructor. A seminar course using immunological techniques to familiarize participants with genetic systems defined in humans. Includes discussion of methodology and its application to problems of interest to participants. *Three lectures, fall.* (1982 and alternate years.) Staff.
- 170 GENERAL, SYSTEMIC AND CLINICAL PATHOLOGY (2). Prerequisite, permission of the instructor. A consideration of the nature of disease from a number of aspects, emphasizing particularly the chemical, physiologic and genetic as well as the morphologic. Designed for dental students. *One lecture and two laboratory hours a week, fall semester.* Staff.
- 171 GENERAL, SYSTEMIC AND CLINICAL PATHOLOGY (4). Prerequisite, Pathology 170. A consideration of the nature of disease from a number of aspects, emphasizing particularly the chemical, physiologic and genetic as well as the morphologic. Designed for dental students. *Two lecture and four laboratory hours a week, spring semester.* Staff.
- 180 DNA AND CELL PATHOLOGY (Genetics 180) (Biochemistry 180) (3). Prerequisites, Biochemistry 100 and permission of the instructor. The basic chemistry of DNA and its associated structural and replicative proteins as it relates to mechanisms of mutagenesis and carcinogenesis. *Three lecture hours a week, spring.* (1983 and alternate years.) Staff.

Courses for Graduates

- 213 PATHOLOGY FOR GRADUATE STUDENTS (5). Prerequisites, Pathology 161s or 170 and permission of the instructors. A tutorial course in human pathology. *Two seminar and six laboratory hours a week, fall and spring.* Staff.
- 214 ETIOLOGY AND PATHOGENESIS OF HUMAN DISEASE (3). Prerequisite, permission of instructor. A tutorial course covering topics such as cell injury, cell death, tissue inflammation, necrosis, repair, and carcinogenesis. Covers basic aspects of pathology in greater depth than Pathology 161s. *Two lecture and one seminar hours a week, spring.* Staff.
- 216 MODELS AND METHODS IN EXPERIMENTAL PATHOLOGY (3). Prerequisite, permission of instructor. An introduction to the use of *in vivo* and *in vitro* models in the study of disease. Special methods such as tissue culture, cell fractionation, and immunochemical procedures will be considered. *Two lecture and one seminar hours a week, fall.* Staff.
- 220 NEUROPATHOLOGY (Neurobiology 220) (5). Prerequisite, Pathology 161s. Systematic study of the more common diseases of the nervous system, utilizing a gross specimen collection, a microscope slide set, current autopsy and surgical specimens, and histochemical laboratory. *Two conference and six laboratory hours a week, spring and summer.* Staff.
- 221 HEMATOPATHOLOGY (4). Prerequisite, Pathology 161s. A tutorial course to introduce the advanced student to techniques and problems of disorders of the blood. This will cover many aspects of immunohematology, disorders of erythrocytes, disorders of leukocytes and bone marrow studies. *Two conference and six laboratory hours a week, fall.* Staff.
- 222 HUMAN GENETICS AND CONSTITUTIONAL PATHOLOGY (5). Prerequisite, permission of the instructor. A tutorial course designed to meet the needs of the student desiring an introduction to the field of human genetics. This includes elementary statistics, basic genetic theory and practical field work in obtaining relevant family information from persons, archives and census records, related to constitutional pathology. *Two conference and six laboratory hours a week, fall.* Staff.

- 223 SPECIAL METHODS IN PATHOLOGY (5). Prerequisite, permission of the instructor. Conducted on a tutorial basis, with the aim of providing experience with specialized techniques including histochemistry, electron microscopy, fluorescent and phase microscopy, chromatography, electrophoresis, and ultracentrifugation. *Two conference and six laboratory hours a week, spring.* Staff.
- 228 ADVANCED TOPICS IN PROTEIN CHEMISTRY (Biochemistry 228) (3). Prerequisite, Biochemistry 100 or equivalent. Chemical approaches to the elucidation of simple and complex proteins. Special topics will include normal and abnormal hemoglobins, proteins involved in biological matrices and glycoproteins. *Three lecture hours a week, spring.* Staff.
- 241 SPECIAL TOPICS IN GENETICS (Genetics 241) (2). Prerequisite, permission of the instructor. Introduction to human immunogenetics. *Two lecture hours a week, spring.* (1982 and alternate years.) Staff.
- 275 GENETICS SYSTEMS (Bacteriology 275, Biochemistry 275, Botany 275, Genetics 275, Zoology 275) (3). An advanced course in genetics emphasizing the genetics and molecular biology of viruses, bacteria, fungi, insects and mammals and based upon the personal research of the staff. *Fall.* (1982 and alternate years.) Staff of the Genetics Curriculum.
- 290 SEMINAR IN NEUROBIOLOGY (Biochemistry 290) (Neurobiology 290) (Pharmacology 290) (Physiology 290) (Zoology 290) (3). Prerequisites, one graduate course in the biological sciences and permission of the Director of Neurobiology Program. An integrative consideration of selected topics and problems associated with the nervous system and behavior. *Three lecture hours a week, fall and spring.* Staff of the Neurobiology Program.
- 291 SEMINAR IN BLOOD COAGULATION (2). Prerequisite, Pathology 166 or permission of the instructor. An in-depth analysis of the current state-of-the-art in hemostasis research with emphasis on the molecular pathology of the clotting factors, fibrinolytic system, and platelet function. *Two hours a week, fall and spring.* Staff.
- 292 SEMINAR IN CARCINOGENESIS (2). Prerequisite, permission of the instructor. Survey of classical and current literature on selected critical issues in carcinogenesis. Discussions consider experimental methods and observations as well as theories and generalizations. *Two seminar hours a week, fall.* (1982 and alternate years.) Staff.
- 301 SEMINAR IN PATHOLOGY (2). Prerequisite, Pathology 161s. *Three hours a week, to be arranged.* Staff.
- 302 RESEARCH IN PATHOLOGY (3 or more each). Prerequisite, permission of the
- 303 Department. *Ten or more laboratory hours a week, to be arranged.* Staff.
- 304
- 310 RESEARCH IN NEUROBIOLOGY (Biochemistry 310) (Neurobiology 310) (Pharmacology 310) (Physiology 310) (Zoology 310) (3-12). Prerequisites, permission of a staff member and the Director of the Neurobiology Program. Research in various aspects of Neurobiology. *Six to twenty-four hours a week, fall and spring.* Staff of the Neurobiology Program.
- 393 MASTER'S THESIS (3 or more). *Fall and spring.* Staff.
- 394 DOCTORAL DISSERTATION (3 or more). *Fall and spring.* Staff.
- 400 GENERAL REGISTRATION (0).

DEPARTMENT OF PHARMACOLOGY

JOHN P. PERKINS, *Chairman*

Professors

GEORGE R. BREESE	(15)	Drugs and Neurotransmitters, Brain Development
YUNG-CHI CHENG	(41)	Cancer and Viral Chemotherapy, Deoxynucleotide Folate and DNA Metabolism
CARY W. COOPER	(4)	Endocrine Pharmacology, Radio-immunoassay
KENNETH H. DUDLEY	(28)	Drug Biotransformation, Penicillin Hypersensitivity
T. KENNEY GRAY	(21)	Intestinal Absorption, Clinical Endocrinology
PHILIP F. HIRSCH	(7)	Endocrine Pharmacology, Calcium Metabolism
ROBERT A. MUELLER	(32)	Synthesis and Inactivation of Biogenic Amines
PAUL L. MUNSON	(2)	Endocrine Pharmacology, Biological Assay
DAVID A. ONTJES	(30)	Endocrine Pharmacology, Clinical Endocrinology
JOHN P. PERKINS	(35)	Cyclic Nucleotides, Biological Regulation
BETSY J. STOVER	(13)	Metabolism and Toxicology of Radionuclides
WALTER E. STUMPF	(25)	Drug Distribution, Autoradiography
ROY V. TALMAGE	(18)	Calcium and Phosphate Metabolism
SVEIN U. TOVERUD	(14)	Endocrine and Nutritional Pharmacology

Associate Professors

HUGH J. BURFORD	(3)	Educational Methods, Fetal Alcohol Syndrome
LUIGI X. CUBEDDU	(53)	Clinical Pharmacology, Cardiovascular Pharmacology
JOHN T. GATZY, JR.	(6)	Cellular Toxicology of Heavy Metals
BARRY GOZ	(29)	Virus and Cancer Chemotherapy
CURTIS HARPER	(22)	Pulmonary Drug Metabolism, Toxicology
J. STEPHEN KIZER	(34)	Basic and Clinical Endocrinology
TAI-CHAN PENG	(11)	Endocrine and Morphological Pharmacology
DORIS T. POOLE	(12)	Intracellular pH, Tumors
GENE A. SCARBOROUGH	(36)	Molecular Basis of Plasma Membrane Structure and Function
RONALD G. THURMAN	(38)	Biochemical Pharmacology, Drug and Alcohol Metabolism

Assistant Professors

RAYMOND J. DINGLEDINE	(40)	Mechanism of Action of Opiates on Hippocampal Neuronal Function
T. KENDALL HARDEN	(37)	Receptors for Neurotransmitters, Neuronal Regulation
KENNY D. MCCARTHY	(42)	Pharmacology of Specific Cell Classes
W. JACKSON PLEDGER	(39)	Control of Mammalian Cell Growth

Research Associate Professor

RICHARD B. MAILMAN	(52)	Molecular and Biochemical Pharmacology
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Adjunct Professors

GERTRUDE B. ELION	(43)	Chemotherapy
JAMES R. FOUTS	(16)	Drug Metabolism, Developmental Pharmacology
LEON GOLBERG	(44)	Environmental Toxicology
GEORGE H. HITCHINGS	(45)	Chemotherapy
ROBERT A. MAXWELL	(19)	Autonomic and Cardiovascular Pharmacology
CLIFFORD L. MITCHELL	(46)	Behavioral Toxicology
DAVID P. RALL	(23)	Toxicology, Drug Distribution, Cancer Chemotherapy

Adjunct Associate Professors

DONALD J. NELSON	(48)	Chemotherapy
THOMAS SPECTOR	(51)	Enzymology
ETHARD W. VAN STEE	(49)	Pulmonary Toxicology

Adjunct Assistant Professors

BARRETT R. COOPER	(33)	Neurotransmitters, Centrally Acting Drugs
LAWRENCE W. REITER	(50)	Behavioral Toxicology

Emeritus Professors

THOMAS CULLOM BUTLER
FRED WILSON ELLIS
WILLIAM HENRY PEARLMAN

The Department of Pharmacology offers a program of study which leads to the degree of Doctor of Philosophy. The curriculum is individualized in recognition of the diverse backgrounds and interests of students and the broad scope of the discipline of pharmacology. The basic course requirements for the Ph.D. degree include introductory and advanced courses in pharmacology and courses in a related supporting or minor program in accord with the principal interest of the students in biochemical, physiological, or behavioral pharmacology or in toxicology. In addition, in order to satisfy the requirements of the Department and the Graduate

School, the student must pass an examination or courses in a foreign language, pass written and oral doctoral examinations, write a dissertation which is based on original research, and submit to a final oral examination. Under special circumstances, the Department will offer a program leading to the M.S. degree. The requirements are appropriate course work, a written comprehensive examination, a thesis which is based on original research, and a final oral examination.

The department offers a variety of research areas for the dissertation research including biochemical, cardiovascular, autonomic, endocrine, chemotherapy, and behavioral pharmacology, pharmacology of the central nervous system, pharmacology of ethanol, drug metabolism, and toxicology. The student is expected to begin independent research early in his training and to participate in an intensive program of research seminars. Close personal contact between preceptor and trainee is encouraged.

Research Facilities

Laboratory facilities and a wide variety of research equipment are available in the department, which is located in the Faculty Laboratory and Office Building where it occupies approximately 26,000 square feet exclusive of classrooms and animal facilities.

Assistantships and Other Student Aid

Financial assistance is available to a limited number of students on a competitive basis. The stipend is \$5040 per year, and there is an allowance for tuition and fees.

Requirements for Admission

The Department of Pharmacology will consider applications from interested students who have or expect to receive a bachelor's degree in a scientific discipline. Applications may be made at any time during the year, but in order to receive favorable consideration for financial aid, they should be sent by February 1.

Courses for Graduates and Advanced Undergraduates

- 105 **TECHNIQUES IN MOLECULAR ENDOCRINOLOGY (2)**. Prerequisites, Biochemistry 100L, 105, or equivalent and permission of the instructor. A guide to techniques for the estimation of hormones in tissues, hormone-protein interactions, isolation and characterization of hormones and hormone-binding proteins, and hormone dynamics. *Two lecture hours a week, fall.* (1982 and alternate years.) Pearlman.
- 106 **CURRENT CONCEPTS IN MOLECULAR ENDOCRINOLOGY (2)**. Prerequisites, Biochemistry 100 or equivalent, and permission of the instructor. Recent research in chemical endocrinology bearing on the biology of reproduction, normal growth and development, and cancer; mechanisms of hormone action and other topics. *Two lecture hours a week, fall.* (1983 and alternate years.) Pearlman.

- 110 TECHNIQUES IN PHYSIOLOGICAL PHARMACOLOGY (3). Prerequisites, Pharmacology 202, and permission of the instructor. Students will learn and perform a variety of physiological techniques often used in classical pharmacology research. *One lecture and six laboratory hours a week, spring.* (1982 and alternate years.) Staff.
- 118 NEUROENDOCRINOLOGY (Anatomy 118) (2). Prerequisite, permission of the instructor. A review of presently held concepts in neuroendocrinology with emphasis on topographical aspects of brain structures related to hormone action. Emphasis on endocrine functions as related to neuropharmacology, behavior, consolidation of memory, psychopathology, neurophysiology and neuroanatomy. *Two lecture hours a week, spring.* (1982 and alternate years.) Stumpf.
- 123 BEHAVIORAL PHARMACOLOGY (Neurobiology 123) (Psychology 123) (3). Prerequisites, Pharmacology 202, or Psychology 101 and 106, or their equivalents. Basic principles of pharmacology and of the experimental analysis of animal behavior will be considered in relation to drugs that affect the central nervous system. *Three hours a week, spring.* (1983 and alternate years.) Staff.
- 134 PHARMACOLOGY (DENT 123) (3). A course for second-year students in the School of Dentistry. *Two lecture hours a week and special assignments, fall.* Toverud; associates.
- 135 BIOLOGICAL SCIENCES LABORATORY (DENT 124) (3). "In-depth" laboratory experiences in pharmacology for students in the School of Dentistry. *Five laboratory and conference hours a week, fall and spring.* Toverud; associates.

Courses for Graduates

- 201 BASIC PRINCIPLES OF PHARMACOLOGY (1). Prerequisite, permission of the instructor. Dose-effect relationships and the concept, kinetics, isolation and identification of receptors. *One lecture hour a week, fall.* Perkins.
- 202 PRINCIPLES OF PHARMACOLOGY AND TOXICOLOGY (Toxicology 202) (5). Prerequisites, Biochemistry 100 and Physiology 140, or their equivalents and permission of the instructor. Introduces the major areas of pharmacology and toxicology and serves as a basis for more advanced courses such as Pharmacology 203 or 204. *Five lecture hours a week, spring.* Goz; associates.
- 203 SYNAPTIC PHARMACOLOGY (Neurobiology 203) (3). Prerequisite, Pharmacology 202 or permission of the instructor. An in depth consideration of biochemical and physiological bases for actions of neuroactive drugs and their possible sites of action in terms of identified pathways and synapse in the brain. *Three lecture hours a week, fall.* Breese, Dingedine, Harden, Mueller.
- 204 CARDIOVASCULAR AND RENAL PHARMACOLOGY (2). Prerequisites, Pharmacology 202 and permission of the instructor. Recent advances in the elucidation of the mechanisms by which cardiotonic, antidysrhythmic and diuretic agents alter cardiac and renal function. *Two lecture hours a week, spring.* Poole; associates.
- 205 INHIBITORS OF NUCLEIC ACID AND PROTEIN METABOLISM: MECHANISMS AND APPLICATIONS (2). Prerequisites, Pharmacology 202 and permission of the instructor. The mechanisms of action of inhibitors of nucleic acid and protein metabolism and how they may be used to further understanding of cellular replicatory processes, antibacterial, antiviral and anticancer chemotherapy. *Two lecture hours a week, fall.* Goz.
- 206 PHARMACOLOGY OF HORMONES AND VITAMINS AFFECTING MINERAL HOMEOSTASIS AND BONE METABOLISM (2). Prerequisites, Pharmacology 202 and permission of the instructor. Concepts and current research concerning the roles of parathyroid hormone, calcitonin, steroid hormones and vitamins A, C, and D in calcium homeostasis and bone mineral metabolism. *Two lecture hours a week, spring.* Toverud, Cooper.

- 207 RECENT ADVANCES IN TOXICOLOGY (Toxicology 207) (2). Prerequisites, Pharmacology 202 and permission of the instructor. Recent advances in teratogenesis, mutagenesis, cardio-, hepato-, and pulmonary toxicology and the modes of action of toxic chemicals that are found in the environment. *Two lecture hours a week, fall.* Gatz; associates.
- 208 CELLULAR REGULATORY MECHANISMS (2). Prerequisites, Pharmacology 202 and permission of the instructor. Recent advances in the area of cellular regulatory mechanisms: specifically, regulation of enzyme activity, protein synthesis, plasma membrane protein turnover, and cell growth. *Two lecture hours a week, spring.* Perkins, Pledger.
- 209 BIOTRANSFORMATION OF XENOBIOTICS (Toxicology 209) (2). Prerequisites, Biochemistry 100 or equivalent and permission of the instructor. Recent advances in the mechanisms by which drugs and other foreign chemicals are metabolized to active or inactive products. The importance of metabolic pathways to therapy/toxicity. *Two lecture hours a week, fall.* Harper; associates.
- 211 INTRODUCTION TO PHARMACOLOGICAL RESEARCH (4 each). A course for first-year graduate students majoring in Pharmacology. A series of research projects of limited scope, each pursued for an 8 to 10 week period under the supervision of a different faculty member. *Twelve laboratory hours a week, fall and spring.* Cooper; associates.
- 212 INTRODUCTION TO PHARMACOLOGICAL RESEARCH (2). Prerequisites, Pharmacology 211 and 212. This is a continuation of Pharmacology 211 and 212. *Six laboratory hours a week, first summer session.* Cooper.
- 213 INTRODUCTION TO PHARMACOLOGICAL RESEARCH (2). Prerequisites, Pharmacology 211, 212, and 213. This is a continuation of Pharmacology 211, 212, and 213. *Six laboratory hours a week, second summer session.* Cooper.
- 215 THE STRUCTURE AND FUNCTION OF CELL SURFACE MEMBRANES (2). Prerequisites, Biochemistry 100 or equivalent and permission of the instructor. Lecture course covering current concepts of the molecular nature of the cell plasma membrane and its components. *Two lecture hours a week, fall.* Scarborough.
- 221 TUTORIAL IN PHARMACOLOGY (3 or more). Prerequisites, Pharmacology 202 or its equivalent, and permission of the staff. Students will spend 4-6 week periods with selected instructors reading in depth in specialized fields of pharmacology. Oral presentations and written reports will be required. *Fall, spring, and summer.* Staff.
- 231 THEORY OF RATE PROCESSES IN PHARMACOLOGY (3). Prerequisites, Pharmacology 202, or its equivalent, or physical chemistry, and permission of the instructor. Theory of the effects of temperature, pressure, chemical environment (including drugs), and time on biochemical and living systems. *Three lecture hours a week, fall.* Stover.
- 290 SEMINAR IN NEUROBIOLOGY (Biochemistry 290) (Neurobiology 290) (Pathology 290) (Physiology 290) (3). Prerequisites, one graduate course in the biological sciences and permission of the Director of the Neurobiology Program. An intensive consideration of selected topics and problems. *Spring.* Members of the Neurobiology Program.
- 301 RESEARCH IN PHARMACOLOGY (5 or more). Prerequisite, permission of the staff. *Fall, spring, and summer.* Staff.
- 310 RESEARCH IN NEUROBIOLOGY (Biochemistry 310) (Neurobiology 310) (Pathology 310) (Physiology 310) (Psychology 310) (Zoology 310) (3-12). Prerequisite, permission of a staff member of the Neurobiology Program. Research in various aspects of neurobiology. *Six to twenty-four hours a week, fall and spring.* Members of the Neurobiology Program.

- 330 SEMINAR IN RECENT ADVANCES IN PHARMACOLOGY (1). Students will meet as a group with faculty members to summarize and discuss the important current pharmacological literature. *One hour a week, fall and spring.* Gatzy, Goz.
- 331 SEMINAR IN GENERAL PHARMACOLOGY (1). A series of weekly lecture-seminars by graduate students, faculty members, and visiting scientists on current research in pharmacology. *One hour a week, fall and spring.* Munson, Peng.
- 393 THESIS FOR MASTER'S DEGREE (3 or more). Prerequisite, permission of the staff. *Fall, spring and summer.* Staff.
- 394 DOCTORAL DISSERTATION (3 or more). Prerequisite, permission of the staff. *Fall, spring, and summer.* Staff.
- 400 GENERAL REGISTRATION (0).

SCHOOL OF PHARMACY

TOM S. MIYA, *Dean*

Professors

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|--------------------|------|---|
| MELVIN A. CHAMBERS | (1) | Pharmacy Administration |
| GEORGE H. COCOLAS | (2) | Stereochemistry of Drug-Receptor Interactions, CNS Cholinergic Mechanisms, Mechanism of Action of Narcotics |
| FREDERICK M. ECKEL | (9) | Exploration and Role Development of Pharmacist as Health Team Member |
| JEAN PAUL GAGNON | (22) | Administrative and Socioeconomic Research of Pharmacy Practice |
| KUO-HSIUNG LEE | (13) | Cancer Chemotherapy and Chemistry of Natural Products of Biomedical Significance |
| LARRY J. LOEFFLER | (12) | Development of Drug Radioimmunoassays, Heterocyclic Quinones as Chemotherapeutic Agents, 1, 3-Dipolar Cycloaddition Reactions |
| ARTHUR J. MCBAY | (4) | Analytical Toxicology |
| TOM S. MIYA | (27) | Pharmacodynamics and Biochemical Pharmacology and Toxicology of CNS Drugs |
| CLAUDE PIANTADOSI | (6) | Lipid Chemistry |
| JAMES SWARBRICK | (41) | Physical Pharmacy and Biopharmaceutics |

Associate Professors

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|-------------------|------|--|
| STEPHEN M. CAIOLA | (14) | Evaluation of Pharmacy Service Delivery Models and Therapeutic Regimens in Ambulatory Care Settings |
| B. W. HADZIJA | (19) | Pharmacokinetic Studies of Drugs and Their Metabolic Degradation |
| LAWRENCE J. HAK | (24) | Inpatient Clinical Services with Special Interest in Chronic Renal Failure and Nutrition |
| IRIS H. HALL | (15) | Screening and Mechanism of Action of Potential Hypolipidemic, Antifertility and Anticancer Drugs |
| KHALID S. ISHAQ | (21) | Synthesis of Glycerylethers and Their Sulfur Analogs, Protease Inhibitors, Radioactive Synthesis and Cancer Chemotherapy |
| RAYMOND JANG | (29) | Psychosocial Factors Influencing Patient Care and Interprofessional Relations |
| JAMES L. OLSEN | (10) | Pharmaceutical Dosage Forms, Aerosols, Product Development and Production |
| J. ROBERT POWELL | (40) | Clinical Pharmacokinetics and Drug Metabolism |

LEROY D. WERLEY
JACK K. WIER

- (28) Socio-Economic Aspects of Pharmacy
(11) Secondary Metabolites of Higher Fungi,
Biosynthesis of Secondary Metabolites
of Plants

Assistant Professors

BETTY H. DENNIS

- (38) Inpatient Clinical Services with Special
Interests in Clinical Pharmacology and
Hematologic Disease

RICHARD J. KOWALSKY
A. WAYNE PITTMAN

- (26) Radiopharmaceuticals
(30) Hypertension, Clinical Pharmacokinetics,
Cardiology and Drug Administration

RALPH H. RAASCH

- (32) Clinical Pharmacokinetics and Parenteral
Nutrition

HANI M. SADEK

- (36) Biopharmaceutics, Dissolution Tech-
nology, Formulation of Sustained
Release Dosage Forms

ROBERT P. SHREWSBURY
WILLIAM W. TAYLOR

- (39) Biopharmaceutics and Pharmacokinetics
(17) Unique and Extemporaneous Formulation
of Dosage Forms for Clinical and
Research Purposes

WILLIAM A. WARGIN
DALE ERIC WURSTER

- (33) Biopharmaceutics and Pharmacokinetics
(37) Adsorption-desorption Processes

Instructor

ABRAHAM G. HARTZEMA

- (42) Theoretical Foundation of Behavioral
Pharmacy

Lecturer

CHARLES C. PULLIAM

- (35) Epidemiology of Drug Use and Misuse,
Drug Therapy in the Elderly

Clinical Associate Professor

J. HEYWARD HULL

- Cardiovascular Pharmacology, Clinical
Pharmacokinetics, Study Design
and Analysis

Clinical Assistant Professors

ALLEN W. ROSMAN

- Drug Information and Psychiatric
Clinical Pharmacy

G. DAVID RUDD

- Pediatric Pharmacology, Neurology/
Anesthesiology

Adjunct Professors

CHESTER J. CAVALLITO

- Synthetic Medicinal Chemistry, Structure-
activity Relationships; Drug Research
and Development and Public Policy

ELVIN A. HOLSTIUS

- Pharmaceutical Research and
Development

VLADIMIR PETROW	Metabolic Endocrinological Diseases, Aspects of Steroid Biochemistry in Reproduction and Contraception
BARBARA ROTH	Synthesis, Physical Properties and Medicinal Chemistry of Pyrimidines, Condensed Pyrimidines and Related Nitrogen Heterocycles
FRED L. SNYDER	Lipid Biochemistry, Separation Tech- niques and Radiopurity and Labeling of Lipids
MONROE E. WALL	Natural Products, Steroid Chemistry, Cancer Chemotherapy, Drug Metabolism

Adjunct Associate Professors

JOHN W. BETTIS	Pharmaceutical Research and Development
M. ROBERT BLUM	Basic and Clinical Pharmacokinetics and Bioavailability
WILLIAM J. MURRAY	Clinical Pharmacology and Bioavailability of Drugs
ROLLAND I. POUST	Drug Product Development
RICHARD WELCH	Drug Metabolism

Adjunct Assistant Professors

ALLEN E. CATO, JR.	Clinical Drug Trials, Pediatric Diseases and Pulmonary Medicine
ALLEN A. LAI	Applications of Pharmacokinetics to Clinical Drug Research
RONNIE J. SPIVEY	Drug Product Development
JOEL E. SUTTON, JR.	Drug Product Development

Emeritus Professors

GEORGE P. HAGER
ALBERT M. MATTOCKS

The School of Pharmacy offers graduate courses which lead to the degrees of Master of Science and Doctor of Philosophy awarded by the Graduate School. The School offers courses of study for graduate degrees in four separate divisions with majors in the areas described below.

Instruction emphasizes research and is given by means of lectures, recitations, and seminars combined with appropriate work in the laboratories. Because of the excellent rapport that exists between the Departments of Chemistry, Biochemistry and Pharmacology and the graduate programs in the School of Pharmacy, the graduate student has the opportunity for interdisciplinary cooperative research. The graduate degree programs also benefit from the relations of the faculty with the Research Triangle Institute (especially the Chemistry and Life Sciences Laboratory), Burroughs

Wellcome Pharmaceutical Research Laboratories, and Oak Ridge Associated Universities.

The pharmacy profession, the pharmaceutical industry, government agencies, and academic institutions provide many and varied opportunities for men and women who have been trained in the pharmaceutical sciences as offered at The University of North Carolina at Chapel Hill.

The School of Pharmacy occupies Beard Hall, completed in 1959 with 69,240 square feet of floor area. Its laboratory facilities are well adapted to graduate instruction. The Health Sciences Library has an outstanding collection of books and journals and offers many library support services. Appropriate use also is made of the library and laboratory facilities offered by the Departments of Biochemistry, Botany, Chemistry, Pharmacology, and Physiology.

Medicinal Chemistry

Research involving synthetic and natural products with special implications for neurochemistry, enzymology, drug mechanisms, lipid chemistry, radioactive labeling, cancer chemotherapy and biochemical mechanisms. M.S. and Ph.D. offered.

The field of Medicinal Chemistry is interdisciplinary. It applies and extends the basic concepts of chemistry, biochemistry and pharmacology to the investigation of biomedical problems. Areas of study can include the relationship between molecular structure and biological activity, biochemical mechanisms of drug action and drug toxicity, problems of isolation of chemicals from natural sources and elucidation of their chemical structure and the development of analytical methods that apply to all the above areas of research.

Pharmaceutics

A Ph.D. degree in Pharmaceutics is offered. The areas of concentration within the Division are as follows:

Pharmaceutical Technology: Advanced studies in dosage form design, scale up techniques and unit process optimization and process validation.

Pharmacokinetics: Advanced studies and research on the factors affecting the absorption, distribution, metabolism and excretion of drugs. Attention is given to improving effectiveness and reducing toxicity of drugs in living systems.

Physical Pharmacy: Advanced physical-chemical principles and their application to pharmaceutical systems.

An M.S. degree is offered in two areas of specialization:

Industrial Pharmacy: Study of development of improved dosage forms, drug bioavailability, production methods, process variables and stability of drug products. Attention is given to Federal Food and Drug Adminis-

tration regulations regarding investigational and new drug application procedures. An off-campus research rotation in a pharmaceutical industrial setting provides an on-site practical experience.

Radiopharmaceutics: Study of synthesis, measurements, dispensing and storage of radioactive drugs in a hospital or industrial setting.

Pharmacy Administration

Pharmacy Administration focuses on the research skills necessary to address the socio-economic aspects of pharmacy. The objective of the graduate program in Pharmacy Administration is to educate students to perform research and teaching in the areas of socio-economics and management as they relate to pharmacy, drugs, or drug distribution systems. Graduates exposed to management and behavioral concepts and principles will find employment opportunities in the drug industry, public and private drug programs, chain pharmacy and research organizations. In addition to a core curriculum, the student minors in an area of interest with offerings from the School of Business, the Departments of Sociology, Psychology, and Economics, or the School of Public Health.

The education received in Pharmacy Administration culminates in a research paper or thesis on some facet of pharmacy or drug distribution. M.S. offered.

Pharmacy Practice

The School of Pharmacy offers a graduate program in Pharmacy Practice, combined with a residency. Several residency options are available. An ASHP accredited residency of 24 months duration is offered at the North Carolina Memorial Hospital, the training hospital of the University of North Carolina at Chapel Hill. An ASHP accredited residency in Pharmacy Practice also is offered. The opportunity is provided to specialize in various areas of pharmacy practice during the second year of the program. The program, requiring 24 months to complete, leads to the Master of Science degree in Pharmacy with specialization in pharmacy practice and a Certificate of Residency. During the summer, the resident spends full-time working for the residency. The program begins on July 1. The student should become licensed to practice in the State of North Carolina by the second year in the program.

A wide variety of courses are available at the School of Pharmacy, the School of Public Health, and other University schools and departments from which to develop a student's program.

The rotation of students among practice sites provides opportunities for gaining a knowledge base in such non-hospital settings as community health centers, health education centers and mental health centers, as well as pharmaceutical industry or organizational pharmacy, thus providing valuable experience in new areas of pharmacy practice.

Requirements for Admission

Admission to candidacy for the graduate program in the School of Pharmacy presupposes the completion of a standard collegiate curriculum in pharmacy, chemistry, biochemistry, biology, zoology, or in an allied field in the University, or in other universities or colleges having curricula acceptable to the Graduate School.

Inquiries and requests for application forms from predoctoral candidates should be directed to: Chairman, Committee on Graduate Studies, School of Pharmacy, The University of North Carolina at Chapel Hill, Chapel Hill, North Carolina 27514.

Graduate Assistantships and Fellowships in the School of Pharmacy

Graduate teaching assistantships in the School of Pharmacy provide a stipend of \$5,200 for nine months' service and a possible reduction in out-of-state tuition. Additional support is available for the summer. The time required in teaching is from twelve to fifteen hours per week.

The North Carolina Pharmaceutical Research Foundation, Inc., offers several research fellowships carrying various stipends, plus an allowance for special supplies, to graduate students who major in pharmacy or medicinal chemistry.

A residency in pharmacy practice is offered through the Division of Pharmacy Practice. Also, there is a residency in hospital pharmacy offered at NC Memorial Hospital. A yearly stipend is awarded in both residencies.

All awards are given on a competitive basis with consideration given to the applicant's academic record and Graduate Record Examination scores. Information concerning these assistantships, fellowships, and traineeships may be obtained by writing directly to the Dean of the School of Pharmacy.

MEDICINAL CHEMISTRY

Courses for Graduates and Advanced Undergraduates

- 121 CHEMISTRY OF NATURAL PRODUCTS (3). Prerequisites, Chemistry 166 or equivalent and permission of the instructor. An introduction to the isolation, structure determination, biosynthesis, and synthesis of natural products; emphasis on aspects relating to medicinal chemistry. *Three hours a week, spring or fall.* Lee; staff.
- 141 INTRODUCTION TO RESEARCH IN MEDICINAL CHEMISTRY (1-3). Prerequisites, Chemistry 61, 62, and permission of the professor. *One conference and three or more laboratory hours a week, fall and spring.* Staff.
- 151 BIOMEDICINAL CHEMISTRY (3). Prerequisites, Medicinal Chemistry 68, 69, or permission of instructor. Principles of genetic regulation and disease which alter drug handling by the body. The effects of drugs on the regulatory mechanisms of cell metabolism, immunodefense, reproduction and disease states. *Three lecture hours per week, fall or spring.* Hall.

- 152 MECHANISM OF ADVERSE DRUG REACTIONS (3). Prerequisites, Pharmacology 55, 56, Pharmacy Practice 77, 81, Medicinal Chemistry 68, 69, or equivalent. Introduction to mechanisms of drug interactions using major drug groups as examples with some case histories. *Three lecture hours per week, fall.* Hall; staff.
- 153 BASIC CONCEPTS OF CANCER AND ITS THERAPY (3). Prerequisites, Medicinal Chemistry 66 or Biochemistry 100, Pharmacology 55, 56, 216, Pharmacy 77, 76, Physiology 93 or equivalents. The etiology, pathogenesis, types, metabolic and biochemical differences, detection, prevention, management, therapy, adverse effects of cancer are discussed. *Three lecture hours per week, fall or spring.* Hall, Bryan.
- 160 PRINCIPLES OF QUALITY CONTROL (4). Prerequisites, Chemistry 62 and Pharmacy 71 or their equivalents, or permission of instructor. An application of the analytical methods used on raw materials and finished pharmaceutical products with emphasis on good manufacturing processes and USP/NF requirements. *Three lecture and three laboratory hours per week, fall.* Lee, Sadek.
- 164 PHARMACEUTICAL ANALYTICAL RESEARCH TECHNIQUES (3-4). Prerequisite, permission of instructor. Introduction to the analytical techniques used in the pharmaceutical sciences. *Two lecture and two to four laboratory hours per week, spring.* Staff.
- 168 MEDICINAL CHEMISTRY (4). Prerequisites, Chemistry 62, Biochemistry 100 or equivalent. Basic concepts of structure-activity-relationships of chemotherapeutic agents and drugs affecting metabolic disorders. A survey of the important drug classes, discussion of their mechanism of action and rationale of molecular modification of prototype drugs. *Four lecture hours per week, fall.* Ishaq, Loeffler, Piantadosi.
- 169 MEDICINAL CHEMISTRY (4). Prerequisites, Chemistry 62, Physiology 102 or equivalent. Basic concepts of structure-activity-relationships of pharmacodynamic agents. A study of various classes of drugs acting on the nervous system and cardiovascular system. *Four lecture hours per week, spring.* Cocolas, Ishaq, Loeffler.

Courses for Graduates

- 241 SPECIAL PROBLEMS IN MEDICINAL CHEMISTRY (1 or more). Prerequisites, Chemistry 61, 62 and permission of the professors. *One conference and three or more laboratory hours a week, fall and spring.* Staff.
- 242 SELECTED TOPICS IN SYNTHETIC ORGANIC MEDICINAL CHEMISTRY (3). Prerequisite, Chemistry 168 or equivalent. Discussions from current literature on the theory and techniques involved in the synthesis of biologically active compounds. *Fall and spring.* Ishaq, Lee, Loeffler.
- 244 SELECTED TOPICS IN NATURAL PRODUCTS (2). Prerequisites, Chemistry 166 and 168. Discussions of important recent developments in the chemistry of natural products of biomedical significance. *Spring.* (1982 and alternate years.) Lee; staff.
- 270 ADVANCED MEDICINAL CHEMISTRY I (3). Prerequisites, Medicinal Chemistry 168, 169 or their equivalents or permission of instructor. Special topics in Medicinal Chemistry stressing physico-chemical and biological principles of drug action, drug design, and drug receptor interactions. *Three lecture hours each week, fall.* Staff.
- 271 ADVANCED MEDICINAL CHEMISTRY II (3). Prerequisite, Medicinal Chemistry 270. Current special topics in Medicinal Chemistry. *Three lecture hours per week, spring.* Staff.
- 361 SEMINAR (1 each). *Fall and spring.* Staff.
- 362
- 391 RESEARCH IN MEDICINAL CHEMISTRY (1-5). *One conference and nine laboratory hours a week per course, fall or spring.* Staff.
- 392
- 393 MASTER'S THESIS (3). *Fall and spring.* Staff.
- 394 DOCTORAL DISSERTATION (3-5). *Fall and spring.* Staff.
- 400 GENERAL REGISTRATION (0).

PHARMACEUTICS**Courses for Graduates and Advanced Undergraduates**

- 103 STERILE PHARMACEUTICAL PRODUCTS (3). Prerequisite, permission of instructor. A study of the preparation and properties of parenteral drug forms along with required control procedures. *Three lecture hours a week, spring.* Sadek, Olsen, Kowalsky.
- 104 TOXICOLOGY AND DRUG ABUSE (3). Prerequisites, Medicinal Chemistry 69, Biochemistry 66. Introduction to drug and chemical adverse reactions including important aspects of toxicology and industrial hygiene. *Fall.* McBay.
- 105 ANALYTICAL TOXICOLOGY (2). Prerequisite, permission of the instructor. *One lecture and three laboratory hours a week, spring.* McBay.
- 106 RADIOPHARMACEUTICALS (3). Principles and techniques of radioisotopes, the dispensing and control of radiopharmaceuticals. *Three lectures a week, fall.* Kowalsky.
- 106L RADIOPHARMACEUTICALS LABORATORY (2). Prerequisite, Pharmacy 106. *One lecture, one three-hour lab a week, spring.* Kowalsky.
- 162 PHARMACEUTICAL TECHNOLOGY (4 each). Prerequisites, Chemistry 62 and
163 Pharmacy 67. Study and manufacture of pharmaceuticals on a large and semi-commercial scale. *Two lecture and four laboratory hours a week, fall and spring.* Olsen, Sadek.
- 171 INTRODUCTION TO RESEARCH IN PHARMACY (1-3). These two courses provide one or two semester assignments of special research problems in pharmacy. *One conference and three or more laboratory hours a week, fall and spring.* Staff.
- 181 PHARMACOKINETICS AND BIOPHARMACEUTICS (3). Prerequisite, Physiology 93. A basic study of the concentration-time course of drugs and their metabolites, methods of pharmacokinetic analysis, bioavailability, design of dosage regimens, influence of disease states on drug kinetics, and pharmacokinetic drug interactions. *Fall.* Wargin, Shrewsbury.
- 182 CLINICAL PHARMACOKINETICS (4). Prerequisite, Pharmacy 181 or equivalent. Application of pharmacokinetic principles to the rational design of dosage regimens of specific drugs based upon individual patient parameters. *Spring.* Wargin, Raasch, Staff.
- 191 PRODUCT FORMULATION (5 each). Development and evaluation of pharmaceutical and cosmetic products. *Two lecture and six laboratory hours a week, fall and spring.* Olsen, Sadek.

Courses for Graduates

- 251 ADVANCED PHARMACEUTICAL TECHNOLOGY I (3-7). Prerequisite, Pharmacy 52, 53 or 162. Drug regulatory affairs, dosage forms, large scale production, process validation, quality control and product evaluation. *Fall.* Olsen, Sadek; staff.
- 252 ADVANCED PHARMACEUTICAL TECHNOLOGY II (3-7). Prerequisite, Pharmacy 52, 53 or 162. Dosage form design, special drug delivery systems, unit operation-process optimization, scale up techniques, drug product components, new drug regulations. *Spring.* Olsen, Sadek; staff.
- 255 ADVANCED PHARMACOKINETICS I (3). Prerequisites, Math 32, Pharmacy 181 or equivalents. Advanced considerations on classical linear multicompartment models. Emphasis on mathematical methods, assessment of absorption and disposition parameters from blood and urinary data, multiple dosing and design of dosage regimens. *Fall, 1981 and alternate years.* Wargin, Blum, Shrewsbury, Lai.

- 256 ADVANCED PHARMACOKINETICS II (3). Prerequisite, Pharmacy 255. Consideration of special topics including bioavailability assessment, nonlinear and perfusion modeling, and analog and digital computational methods in pharmacokinetics. *Spring, 1982 and alternate years.* Wargin, Shrewsbury; staff.
- 291 ADVANCED PHYSICAL PHARMACY I (3-6). Prerequisites, Chemistry 163, Math 33 or equivalent, and permission of the professor. The study of physical-chemical principles and their applications to pharmacy. *Spring, 1982 and alternate years.* Hadzija, Wurster.
- 292 ADVANCED PHYSICAL PHARMACY II (3-6). Prerequisites, Pharmacy 291 and permission of the instructor. Specialized topics pertaining to the physical chemistry of pharmaceutical systems. *Fall.* Hadzija, Wurster.
- 361 SEMINAR (1). *Fall and spring.* Staff.
- 362
- 391 RESEARCH IN PHARMACY (1-5). Graduate course consisting of laboratory work, conferences with the major professor, and library investigations relating to research. *One conference and nine laboratory hours a week per course. Fall and spring.* Staff.
- 392
- 393 MASTER'S THESIS (3 or more). *Fall and spring.* Staff.
- 394 DOCTORAL DISSERTATION (3-5). *Fall and spring.* Staff.
- 400 GENERAL REGISTRATION (0).

PHARMACY ADMINISTRATION

Courses for Graduates

- 180 PHARMACEUTICAL MARKETING AND ECONOMICS (3). A survey of the U.S. drug distribution system from pharmaceutical manufacturer to community pharmacy operation. Marketing strategies, management practices, pricing, research and development, promotion and advertising, and the structure of the drug industry are analyzed. *Three lecture hours per week, fall.* (Alternate years.) Gagnon, Jang.
- 190 SELECTED TOPICS IN PHARMACY ADMINISTRATION (3). A reading and/or special projects course for both undergraduate and graduate students interested in pursuing additional work in the administration and social sciences as they pertain to pharmacy practice. *Three hours per week.* (Alternate years.) Gagnon, Jang.
- 201 PHARMACEUTICAL SERVICES AND HEALTH CARE SYSTEMS (3). Pharmacy's current and future position in America's health care system is the underlying topic of this course. Special emphasis is placed on evaluative studies and pharmacy's role in third-party prescription plans, drug utilization review, governmental programs and other health organizations. *Three lecture hours per week, spring.* (Alternate years.) Gagnon, Jang.
- 202 PHARMACY MANAGEMENT (3). Assigned readings in financial and personnel management followed by discussion, lectures, oral and written reports, a research project, case studies and visitations to drug companies and chain store organizations will form an important part of this course. Topics to be covered include: automation, in retailing and in pharmacy, buying, merchandising, pricing and others. *Three lecture hours per week, summer.* (Alternate years.) Gagnon, Jang.
- 203 ATTITUDINAL RESEARCH METHODS (3). The principles and theories of attitudinal research in the evaluation of services delivered in pharmacy practices are presented. Included in this course are lectures on survey and questionnaire development and use of various attitudinal measurement devices, e.g. semantic differential, likert scale, etc. *Three lecture hours per week, summer.* (Alternate years.) Gagnon, Jang.
- 361 PHARMACY ADMINISTRATION SEMINAR (1 each). Prerequisites, enrollment in master's program. *Fall, spring, and summer.* Gagnon, Jang.
- 362

- 391 RESEARCH IN PHARMACY ADMINISTRATION (1-6). Consists of laboratory
392 work, conferences with the major professor and library investigations relating to re-
search. *Fall, spring and summer.* Gagnon, Jang.

PHARMACY PRACTICE

Courses for Graduates and Advanced Undergraduates

- 108 CLINICAL PHARMACY CLERKSHIP (3-6). Prerequisite, permission of the in-
structor. Through assigned responsibility in Clinical Pharmacy Services students are
exposed to and learn how to solve drug therapy problems. *Fall and spring.* Eckel; staff.
- 109 TOPICS IN ACUTE CARE PHARMACY PRACTICE (2). Prerequisites, Phar-
macy Practice 76, 77, permission of instructor. Lecture and seminar discussion on
pathophysiology and drug management of problems commonly seen in acute care
pharmacy practice settings. Focus on choice and rationale for therapy, dosing guide-
lines and monitoring parameters for assessment of efficacy and toxicity of therapy.
Fall and spring. Dennis, Dunham.
- 110 AMBULATORY CARE PHARMACY PRACTICE (3). Prerequisites, Pharmacy
Practice 76, 77 and permission of instructor. Didactic instruction is provided on
selected subjects in therapeutics relevant in ambulatory patient care. Proficiency in
ambulatory clinical pharmacy practice is gained through discussion sessions and
laboratory experiences in specific ambulatory patient care environments. *Three lec-
tures per week, fall and spring.* Caiola and staff.
- 132 TOPICS IN HOSPITAL PHARMACY (1-3). Prerequisite, graduate standing or per-
133 mission of the instructor. Various topics of interest to the students and faculty are pre-
sented in a seminar format. Topics presented are related to pharmacy management
and/or clinical practice. *Fall and spring.* Eckel; staff.
- 134 CLINICAL THERAPEUTICS CONFERENCE (3). Prerequisites, Physiology 93,
Pharmacy Practice 76, 77. Utilizes lectures, seminars and case presentations to intro-
duce the student to the knowledge system of clinical pharmacy. Didactic skills in
laboratory methods, physical assessment, medical terminology and utilization of the
medical record are taught. Individual case presentations are utilized to emphasize oral
and written communication skills. *Fall and spring.* Staff.
- 135 INTRODUCTION TO RESEARCH IN PHARMACY PRACTICE (1-3). Prerequi-
136 site, permission of the instructor. Students participate in ongoing faculty projects.
Involvement varies from laboratory work, literature searches, to patient studies. *Fall
and spring.* Eckel; staff.
- 193 INTRODUCTION TO RESEARCH METHODS IN PHARMACY PRACTICE
(3). Prerequisites, Biostatistics 105 and permission of instructor. An introductory
course on research methods focusing on the components of research in health service,
epidemiologic and clinical aspects of pharmacy practice. *Spring.* Pulliam.
- 201 ADVANCED CLINICAL PHARMACY (3). Prerequisite, graduate standing.
202 Discussions, workshops and lectures to develop the student's skills and abilities to
make therapeutic recommendations, utilize the drug literature, educate patients and
health professionals and record observations, plans and actions in a problem-oriented
record. *Three lectures per week, fall and spring.* Staff.
- 203 METABOLIC MANAGEMENT OF THE HOSPITALIZED PATIENT (2). Pre-
requisite, graduate standing. Presents a comprehensive discussion of the fluid, electro-
lyte, acid-base and nutritional management of the hospitalized patient. *Spring.* Hak.
- 210 THE DEVELOPMENT AND CLINICAL INVESTIGATION OF DRUGS (2). In-
cludes preclinical drug safety evaluation, preclinical pharmacology, design of protoc-
ols for Phases I-IV, FDA guidelines for clinical study, preparation of study plan,
statistics in clinical trials, data analyzing and FDA interactions with industry. *Two
lectures per week, fall.* Cato.

- 249 HOSPITAL PHARMACY AND THE HOSPITAL ORGANIZATION (3). This course discusses the principles in health care delivery and their impact on the role of the hospital. The hospital as an organized unit for the delivery of health care is discussed. How the pharmacist might contribute to the hospital's role is reviewed. *Three lectures per week, fall.* Eckel.
- 250 PRINCIPLES OF PHARMACY PRACTICE (3). Prerequisite, Pharmacy Practice 249. The modern role of the hospital pharmacist and how it integrates progressive management with innovative services offered are discussed. The problems with implementing these programs are evaluated. *Three lectures per week, spring.* Eckel.
- 361 SEMINAR (1 each). *Fall and spring.* Pittman; staff.
- 362
- 391 RESEARCH IN PHARMACY PRACTICE (1-5). Consists of conferences with major professor; library, laboratory and/or field investigations relating to research. Professor in charge is responsible for the assignments and approval of the subject and character of the degree paper. Staff.
- 392
- 393 MASTER'S THESIS (3 or more). *Fall and spring.* Staff.
- 400 GENERAL REGISTRATION (0).

DEPARTMENT OF PHILOSOPHY

MICHAEL D. RESNIK, *Chairman*

Professors

E. M. ADAMS	(1)	Epistemology, Metaphysics, Value Theory
DOUGLAS C. LONG	(8)	Philosophy of Mind, Ethics, Epistemology
STANLEY MUNSAT	(9)	Philosophy of Mind, Epistemology
MICHAEL D. RESNIK	(11)	Logic, Philosophy of Mathematics, Decision Theory
JAY F. ROSENBERG	(12)	Epistemology, Metaphysics, Recent Analytic Philosophy
GEORGE SCHLESINGER	(13)	Philosophy and History of Science
RICHARD A. SMYTH	(14)	History of Modern Philosophy, Logic of Science
PAUL ZIFF	(17)	Aesthetics, Philosophy of Language

Associate Professors

STEPHEN L. DARWALL	(2)	Ethics, Political Philosophy
EDWARD M. GALLIGAN	(5)	Ancient, Medieval, Recent Analytic Philosophy
GERALD J. POSTEMA	(20)	Ethics, Political Philosophy, Legal Philosophy
LAURENCE L. THOMAS	(21)	Social Philosophy, Moral Theory

Assistant Professors

ROBERT D. VANCE	(15)	Philosophy of Mind, History of Modern Philosophy
RICHARD H. ZAFFRON	(16)	Philosophy of the Social Sciences

Visiting Associate Professor

DAVID A. LLOYD THOMAS	Ethics, Political Philosophy
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Emeritus Professor

W. D. FALK	(4)	Ethics, Value Theory, Political Philosophy
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The graduate courses in philosophy are designed to present and discuss its classics, current literature, and basic problems; to stimulate critical and original philosophical thought; to prepare students for college and university positions in philosophy.

The Department offers programs of study leading to the degrees of Master of Arts and Doctor of Philosophy. Prerequisite for admission to graduate work in the Department is a B.A. degree or equivalent, normally with a major in philosophy, with courses in logic, ethics, ancient and modern philosophy. Admission may be granted with the provision that deficiencies are made up.

Candidates for the master's degree must satisfactorily complete thirty semester hours of graduate work. They are normally required to participate in a first-year program including Philosophy 300, and for students intending to proceed to the doctorate, Philosophy 101; there may be adjustments with the consent of the Department. Successfully passing a written comprehensive examination is a condition for receiving the degree of Master of Arts.

Candidates for the doctoral degree must satisfactorily complete fifty-one semester hours of graduate work.

There are three examinations, which must be passed by the candidate for the degree of Doctor of Philosophy. First, the student must pass the comprehensive examination for the degree of Master of Arts, mentioned above, and complete an M.A. thesis. Second, there is the Admissions to Candidacy examination which will normally be taken in the third year and must be taken at least one academic year before the degree is to be conferred. This examination consists of a written general portion and a special oral portion. The written is in the student's field of specialization. The oral is on the feasibility of the dissertation proposal and will be taken one semester after the general portion. Finally, there is an oral defense of the dissertation. For further details on degree requirements, see pages 98-106 of this catalogue.

The Department has several nonservice fellowships. They include a Graham Kenan Fellowship and the Mary Taylor Williams and Bertha Colton Williams Fellowships. The Department has available teaching assistantships with stipends up to \$4,500 and other awards with stipends up to \$6,000. Also the Graduate School offers a variety of fellowships with stipends up to \$7,500 which are open to students in philosophy.

Close relations are maintained with the Department of Philosophy at Duke University. Graduate students in either institution may register for credit in graduate courses or seminars at the other institution for a nominal fee and without special matriculation. Combined library facilities are available to students at each institution.

Courses for Graduates and Advanced Undergraduates

(Prerequisite, one course below 100, or consent of instructor)

- 101 SYMBOLIC LOGIC (Linguistics 104) (3). *Fall*. Resnik.
- 102 SELECTED TOPICS IN THE HISTORY OF MORAL PHILOSOPHY (3). *Spring*. Darwall.
- 103 PHILOSOPHY OF ART (3). *Spring*. (Not offered in 1981-1982.)
- 104 HEGEL, MARX AND THE PHILOSOPHICAL CRITIQUE OF SOCIETY (3). Postema.
- 105 POLITICAL PHILOSOPHY FROM HOBBS TO ROUSSEAU (Political Science 161) (3). *Fall*. Postema.
- 106 PHILOSOPHY OF MATHEMATICS (3). Prerequisite, Philosophy 101 or equivalent background in logic or mathematics. *Fall*. Resnik.

- 107 PHILOSOPHY, HISTORY AND THE SOCIAL SCIENCES (3). *Fall*. Zaffron.
 108 PHILOSOPHY OF NATURAL SCIENCES (3). *Fall*. Schlesinger.
 109 PHILOSOPHICAL PROBLEMS IN PSYCHOLOGY (3). *Spring*. Zaffron.
 110 PHILOSOPHY OF LANGUAGE (Linguistics 110) (3). *Fall or spring*. Ziff, Munsat.
 111 ADVANCED SYMBOLIC LOGIC (3). *Spring*. Resnik.
 112 CONTEMPORARY MORAL PHILOSOPHY (3). *Fall or spring*. Long, Thomas, Darwall.
 113 PHILOSOPHY OF LAW (3). *Fall*. Postema.
 114 THE BEGINNINGS OF ANALYTIC PHILOSOPHY (3). *Spring*. Rosenberg.
 115 FOUNDATIONS OF MATHEMATICS (3). *Fall or spring*. Resnik.
 116 CURRENT ISSUES IN ANALYTIC PHILOSOPHY (3). *Spring*. Schlesinger.
 121 SPACE AND TIME (Physics 113) (3). *Spring*. Schlesinger, Van Dam.
 130 RECENT DEVELOPMENTS IN POLITICAL PHILOSOPHY (Political Science 168) (*Spring*. Postema.
 142 PHILOSOPHY IN LITERATURE (Comparative Literature 142) (3). *Spring*. Smyth.
 150 PLATO (3). *Fall*. Galligan.
 151 ARISTOTLE (3). *Spring*. Galligan.
 152 TOPICS IN MEDIEVAL PHILOSOPHY (Religion 132) (3). *Spring*. Galligan.
 153 CONTINENTAL RATIONALISM (3). *Fall*. Smyth.
 154 BRITISH EMPIRICISM (3). *Spring*. Munsat, Vance.
 155 KANT (3). *Fall*. Rosenberg, Smyth, Vance.
 156 HEGEL (3). *Spring*. Smyth.
 158 EXISTENTIALISM AND PHENOMENOLOGY (3). (Not offered in 1981-1982.) *Spring*. Smyth.
 159 TOPICS IN AMERICAN PHILOSOPHY (3). *Spring*. Smyth.
 185 ALGEBRAIC LOGIC I (Mathematics 185) (3). *Spring*.
 190 SET THEORY AND LOGIC (3). *Spring*. Resnik.

Courses for Graduates

- 201 STUDIES IN LOGIC (3). Advanced. Prerequisite, Philosophy 101 or equivalent; Philosophy 111 recommended. May be repeated for credit. *Spring*. Resnik.
 203 METAPHYSICS (3). May be repeated for credit. *Spring*. Adams.
 204 EPISTEMOLOGY (3). May be repeated for credit. *Fall*. Adams, Long.
 205 VALUE THEORY (3). May be repeated for credit. *Spring*.
 206 STUDIES IN CONTEMPORARY ANALYTIC PHILOSOPHY (3). May be repeated for credit. *Fall and spring*. Rosenberg, Munsat, Schlesinger.
 207 STUDIES IN THE PHILOSOPHY OF SCIENCE (3). May be repeated for credit. *Fall or spring*. Schlesinger.
 212 ADVANCED PROBLEMS IN PHILOSOPHY OF LANGUAGE (Linguistics 212) (3). *Fall or spring*. Munsat.
 300 PROTO-SEMINAR IN PHILOSOPHY (3). For first-year graduate students in the Department. *Spring*. Staff.
 304 SEMINAR IN HISTORY OF PHILOSOPHY (3). May be repeated for credit. Staff.
 305 SEMINAR IN SYSTEMATIC PHILOSOPHY (3). May be repeated for credit. *Fall and spring*. Staff.
 311 READINGS IN PHILOSOPHY (3). May be repeated for credit. *Fall and spring*. Staff.
 393 MASTER'S THESIS (3 or more). *Fall and spring*. Staff.
 394 DOCTORAL DISSERTATION (3 or more). *Fall and spring*. Staff.
 400 GENERAL REGISTRATION (0).

DEPARTMENT OF PHYSICAL EDUCATION

JOHN E. BILLING, *Chairman*

Professors

JOHN E. BILLING	(014)	Physiology of Exercise; Administration
CARL S. BLYTH	(002)	Sports Medicine; Physiology of Exercise
PATRICK F. EAREY	(003)	Health Education; Sports Medicine
RONALD W. HYATT	(005)	Intramurals; Health Education; Administration
FREDERICK O. MUELLER	(007)	Administration; Sports Medicine
FRANK PLEASANTS, JR.	(008)	Motor Learning; Sports Medicine

Associate Professors

BILL W. LOVINGOOD	(006)	Health; Physiology of Exercise
ANGELA LUMPKIN	(004)	History; Sociology; Administration
BOYD L. NEWNAM	(011)	Adapted Physical Education
PAMELA S. ROBINSON	(009)	Physiology of Exercise; Sports Medicine

Assistant Professors

ROBERT G. McMURRAY	(013)	Physiology of Exercise
WILLIAM E. PRENTICE	(015)	Athletic Training; Sports Medicine
JAMES A. SAWHILL	(016)	Biomechanics
EDGAR W. SHIELDS, JR.	(010)	Measurement and Evaluation
JOHN M. SILVA	(017)	Sports Psychology/Sociology

Emeritus Professors

E. MARVIN ALLEN
RUTH W. FINK
WILLIAM H. PEACOCK
GEORGE E. SHEPARD

The Department of Physical Education offers graduate training leading to the Master of Arts degree. It also offers, through the School of Education, the Master of Arts in Teaching degree. Additionally, through cooperative effort with the Division of Curriculum and Instruction in the School of Education, the Department contributes to the training of those doctoral students who wish to prepare themselves for positions in teaching and research in colleges and universities.

Master of Arts

The Master of Arts degree provides advanced course work in the sub-fields of physical education. Additionally, the program provides training for research and clinical positions in a variety of fitness and rehabilitation programs in government, business and private industry.

Thirty hours of graduate work are required, including a minimum of 18 hours in physical education. Up to 12 hours may be taken in supporting courses from other departments, or 9 to 12 hours from a single department can be acquired to constitute a minor. Physical Education 225 (Research Techniques) and Physical Education 393 (Thesis) are required of all M.A. students. Additional course requirements depend upon the area the student wishes to emphasize. Areas of emphasis include exercise physiology, motor learning, athletic training, social sciences of sport, biomechanics, and sport administration. The area of emphasis in athletic training also involves working toward the National Athletic Trainers Association Graduate Certificate (see Athletic Training Certificate). Other formal requirements for the Master of Arts include a written comprehensive examination covering the program, a formal thesis, and a final oral defense of the thesis. If a North Carolina Public School Graduate Teaching Certificate is desired, the student must complete those courses required for a Master of Arts in Teaching, including the practicum.

A limited number of applicants who have not majored in physical education may be accepted into the Master of Arts program. Prior to enrolling in the graduate program, these individuals must have completed a minimum of 24 semester hours (8 courses) of specified undergraduate physical education major courses including the following: Human Anatomy, Human Physiology, Organization and Administration of Physical Education, and History-Principles of Physical Education. The remaining courses must be selected from: Adapted Physical Education, Measurement and Evaluation in Physical Education, Kinesiology, Exercise Physiology, Motor Learning, Elementary School Physical Education, First Aid-Athletic Injuries, and Physical Education Teaching Methods courses. These students will not be eligible for the North Carolina Public School Graduate Teaching Certificate.

Master of Arts in Teaching

The Master of Arts in Teaching is offered for those graduate students who are interested in advanced preparation for teaching at the junior and senior high school levels. Students entering the program must have an undergraduate major in physical education, and must either have, or acquire, a public school teaching certificate in physical education. Thirty-three hours of graduate work are required to complete the degree. Eighteen hours must be selected from the graduate courses in the Department of Physical Education. Nine of those hours (3 courses) must come from the following: PHYE 113 (The Health Coordinator); PHYE 175 (Adapted Physical Education); and either PHYE 240 (Administration of Physical Education and Sport) or PHYE 147 (Intramural and Extramural Activities). A core of 12 hours (4 courses) and a 3-hour practicum are required by

the School of Education. The specific core course requirements are: EDCI 200 (The School Curriculum); EDFO 106 (Educational Measurement & Evaluation); PHYE 270 (Motor Learning); and either EDFO 100 (Psychological Foundations of Education), EDFO 101 (Psychology of Childhood and Adolescence), or EDFO 201 (Psychology of Learning in the School). The remaining nine hours in physical education are selected by the student depending upon his or her special interest.

At the conclusion of the program, students must pass a written comprehensive examination covering all the course work in physical education. Completion of the degree qualifies one for the North Carolina Public School Graduate Teaching Certificate.

Athletic Training Certification

The Department of Physical Education offers graduate courses and clinical experience in athletic training which can lead to certification by the National Athletic Trainers Association. The department can allow only a limited number of graduate students to work toward certification each year. Those interested in such certification must submit a Graduate Student Trainer Application Form. That application form and specific information describing the requirements for graduate certification in athletic training can be obtained by writing to the Director of Graduate Studies in the Department of Physical Education.

Teaching Assistantships

A number of Graduate Teaching Assistantships are awarded annually by the Department of Physical Education. The primary duties of a teaching assistant involve instruction of sport skill classes to non-majors. Those wishing to apply for one of these assistantships should complete and return the appropriate application form. This form can be obtained by writing to the Director of Graduate Studies in the Department of Physical Education.

Courses for Graduates and Advanced Undergraduates

- 113 THE HEALTH COORDINATOR (3). Prerequisite, PHYE 78 or equivalent. An introduction to leadership skills required of local health coordinators. Emphasis is placed on practical work experience involving supervisory and facilitative responsibilities. *Fall*. Earey.
- 147 INTRAMURAL AND EXTRAMURAL ACTIVITIES FOR SCHOOLS AND COLLEGE (3). Designed for physical education majors and students from allied areas. Study of the history, philosophy, principles, status, and problems of intramural programs. Organizational and administrative patterns, program of activities, evaluation, and other administrative areas are also covered. Theoretical and practical experiences are provided. *Summer*. Hyatt, Shields.

- 175 ADAPTED PHYSICAL EDUCATION (3). Prerequisites, anatomy and physiology, or equivalents. This course is concerned with physical education for the handicapped, with emphasis on the problems of specific disabilities. Actual experience of working with the handicapped is provided. *Spring*. Newnam.

Courses for Graduates

- 220 MEASUREMENT AND EVALUATION IN PHYSICAL EDUCATION (3). Prerequisite, graduate standing in physical education or permission of instructor. Designed to present essential statistical methods so that the physical educator may scientifically evaluate tests and analyze data, and to emphasize techniques of test administration and application of results to the physical education program. *Fall, spring*. Shields, Silva.
- 225 RESEARCH TECHNIQUES IN PHYSICAL EDUCATION (3). Prerequisite, graduate standing in physical education or permission of instructor. Study of the various techniques and designs used in research. Practical experience in the identification and delimitation of problems for research and the preparation of a research prospectus. *Fall, spring*. Pleasants, Silva.
- 230 MANAGEMENT OF ATHLETIC INJURIES (3). Prerequisite, permission of instructor for non-majors. Designed to provide basic knowledge and skill that aid in the prevention and treatment of injuries common to athletics. *Fall*. Prentice.
- 235 SPORTS MEDICINE ANALYSIS: SPECIAL PROBLEMS RELATED TO SPORTS MEDICINE (3). Prerequisite, permission of instructor for non-majors. Problem and research oriented. *Spring*. Blyth.
- 236 CLINICAL METHODS IN ATHLETIC TRAINING (3). Prerequisite, 230. Analysis of theories and techniques used in clinical sports medicine settings. *Spring*. Prentice.
- 239 PRACTICUM IN ATHLETIC TRAINING (3). Prerequisite, graduate standing in physical education or permission of instructor. The implementation of theories and practices in a professional setting under the direction of a competent practitioner. *Spring*. Prentice.
- 240 ADMINISTRATION OF PHYSICAL EDUCATION AND SPORT (3). Prerequisite, permission of instructor for non-majors. Policies and problems of organization and administration of physical education and athletic programs in schools and colleges. Emphasis on the case study approach. *Fall*. Mueller.
- 249 PRACTICUM IN SPORT ADMINISTRATION (3). Prerequisite, 240. The implementation of theories and practices in a professional setting under the direction of a competent practitioner. *Spring*. Graduate Faculty.
- 250 HISTORY OF PHYSICAL EDUCATION (3). Comprehensive study of the historical development of physical education from prehistoric societies to the present time with emphasis in the 1880's and the 1900's and in the United States. *Fall*. Lumpkin.
- 251 SPORT PSYCHOLOGY (3). Prerequisite, undergraduate course in sport psychology or permission of instructor. A study of the personality and psychological variables affecting an individual's performance in sport and exercise. *Fall*. Silva.
- 253 SPORT SOCIOLOGY (3). Prerequisite, undergraduate course in sociology or permission of instructor. A study of the socio-cultural milieu and societal significance of sport and exercise. *Spring*. Silva.
- 255 CONTEMPORARY PROBLEMS IN PHYSICAL EDUCATION AND SPORT (3). Prerequisite, graduate standing in physical education or permission of instructor. A critical analysis of contemporary and relevant topics in physical education and sport. *Summer*. Lumpkin.
- 260 ADVANCED BIOMECHANICS OF SPORT (3). Prerequisite, undergraduate course in biomechanics or permission of instructor. The applied study of physical laws which influence human movement in sport and exercise. *Fall*. Sawhill.

- 270 **MOTOR LEARNING (3)**. Prerequisite, permission of instructor for non-majors. A study of the physiological and psychological factors that affect skill acquisition, including the application of principles of learning to the teaching and learning of motor skills. *Fall*. Pleasants.
- 275 **INFORMATION PROCESSING AND MOTOR CONTROL (3)**. Prerequisite, graduate standing in physical education or permission of instructor. Research and study of selected topics pertaining to the learning and performance of physical skills. Emphasis on cybernetic processes, information processing and retention. *Spring or summer*. Pleasants.
- 280 **PHYSIOLOGY OF EXERCISE (3)**. Prerequisites, zoology, anatomy and physiology. The application of physiological principles relevant to the effect of exercise on man. Emphasis is placed on collection and evaluation of experimental data. Laboratory work shall be conducted in facilities provided by the Department of Physical Education and the Medical School. Two hours of lecture and four laboratory hours per week. *Fall*. McMurray.
- 283 **ASSESSMENT OF PHYSIOLOGICAL FUNCTIONS IN EXERCISE (3)**. Prerequisite, undergraduate course in exercise physiology. Theories and laboratory techniques for assessing human physiological responses to exercise and training. *Spring*. McMurray.
- 285 **ADVANCED EXERCISE PHYSIOLOGY (3)**. Prerequisite, graduate standing in physical education or permission of instructor. Research and in-depth study of selected topics in exercise physiology. Emphasis on respiratory gas analysis, human calorimetry, exercise electrocardiography, body composition, and physical work capacity. *Spring or summer*. Robinson.
- 289 **PRACTICUM IN EXERCISE PHYSIOLOGY (3)**. Prerequisites, 280, 283, 285, or permission of instructor. The implementation of theories and practices in a professional setting under the direction of a competent practitioner. Graduate Faculty.
- 300 **SPECIAL TOPICS IN PHYSICAL EDUCATION (3)**. Prerequisite, graduate standing in physical education. The study of special topics directed by an authority in the field. Graduate Faculty.
- 320 **RESEARCH IN PHYSICAL EDUCATION (3)**. Prerequisite, graduate standing in physical education or permission of instructor. *Fall, spring*. Graduate Faculty.
- 393 **MASTER'S THESIS (3 or more)**. *Fall and spring*. Graduate Faculty.
- 400 **GENERAL REGISTRATION (0)**.

DIVISION OF PHYSICAL THERAPY

CHARLES P. SCHUCH, *Director*

Professor

- RUTH U. MITCHELL (6) Delivery of Health Care, Health Professions, Interpersonal and Organizational Relationships

Associate Professors

- SUZANN K. CAMPBELL (1) Infant Motor Behavior, Neuro-developmental Theory, Instructional Methodology
- BARRY R. HOWES (3) Organization and Administration, Medical Chest and Cardiology
- MARJORY W. JOHNSON (4) Neurophysiologic Approaches to Therapeutic Exercise, Functional Anatomy
- BARNEY F. LEVEAU (5) Biomechanics, Sports Medicine, Research Methods
- CHARLENE M. NELSON (8) Electromyography, Clinical Education, Clinical Research
- CHARLES P. SCHUCH (12) Organization and Administration, Physical Therapy in Mental Health, Clinical Education

Assistant Professors

- JOYCE L. MACKINNON (21) Electrotherapy, Peripheral Vascular Disease, Manual Therapy
- CAROL A. PARR (10) Developmental Disabilities, Clinical Education, Clinical Research

Instructors

- SUSAN M. ATTERMEIER (19) Developmental Disabilities, Neuro-physiological Approaches to Therapeutic Exercise
- PHILIP L. WITT (22) Research Design, Exercise Physiology, Statistics
- JOHN H. YACK (23) EMG Kinesiology, Biomechanics, Electronics

Clinical Assistant Professor

- JEAN R. SENTER (11) Rehabilitation, Activities of Daily Living, Wheelchair Sports

Research Assistant Professor

- IRMA WILHELM (24) Infant Motor Behavior, Research

Professors Emeriti

MARGARET L. MOORE

MABEL M. PARKER

MARY CLYDE SINGLETON

The Division of Physical Therapy of the Department of Medical Allied Health Professions offers a graduate program leading to the degree of Master of Science in Medical Allied Health Professions with a major in physical therapy.

Requirements for Admission

1. A bachelor's degree and graduation from a physical therapy curriculum approved by the American Physical Therapy Association.
2. A grade point average of *B* or better in the professional physical therapy curriculum.
3. Submission of Scores from the Aptitude Section of the Graduate Record Examination.
4. Three letters of recommendation.
5. A statement of goals, personal strengths and weaknesses, for graduate study.

Physical Therapy course requirements:

PHYT 301 Seminar in Physical Therapy
(two semesters)

PHYT 376 The Allied Health Professions in Health Care Systems (2)

The M.S. in Medical Allied Health Professions with a major in physical therapy is designed to prepare faculty specialists and leadership personnel in physical therapy by providing educational preparation for undergraduate faculty and directors of physical therapy facilities. The offerings include preparation in specialized areas and the opportunity to pursue research.

The M.S. program requires a minimum of thirty-six semester credit hours, 18-21 of which must be in the major area and 12 hours in a supporting program(s) or 9-12 in a formal minor. For some specialties within the major area, more than the minimal required credit hours may be necessary. One course of research design and statistics is required of all students enrolled in this program. The other required course is PHYT 393, Master's Thesis (6). A final oral defense of the thesis is required.

Specialty Areas

The following specialty areas are offered for the interests of graduate students in the Division of Physical Therapy. Faculty members with

special education and experience in each of the areas serve as advisors and supervisors of student teaching practicums or research as well as instructors of courses on the specifically related content material. Students may pursue one of the particular areas or may design a program of study which includes courses from more than one area.

Administration

A program in administration is designed to provide knowledge, skills and insight into management of physical therapy services. It includes relevant courses in the Division of Physical Therapy and in other departments of the University. Clinical facilities in the North Carolina Memorial Hospital offers opportunities for the practicum. If the student has previous experience in this area, emphasis may be placed on specific areas of organization, administration or curriculum design. The subject of personnel management is an integral part of the program particularly in relation to the selection, training and supervision of employees.

Biomechanics

The study of human motion relating mechanical analysis to anatomical structure is offered. Courses are conducted and research facilities are present in a newly constructed laboratory for investigation of movement. Methods of study include cinematography, stroboscopy, electromyography, electrogoniometry and force analysis.

Clinical Education

In addition to taking relevant courses in psychology, education and physical therapy, the student specializing in this area may organize and participate in supervision of the clinical education experience of students in the basic undergraduate physical therapist and physical therapist assistant programs. Clinical facilities for these curriculums include those at North Carolina Memorial Hospital as well as affiliated centers located throughout North Carolina.

Maternal and Child Health

The maternal and child health program in physical therapy is highly flexible to allow individuals with diverse backgrounds to plan a period of concentrated effort based on their interests and experience in pediatrics. Particular areas which may be explored include hemophilia, birth defects, developmental disabilities and mental retardation, cardiopulmonary problems, normal child development, high-risk infant care, and acute general hospital pediatric service.

Sports Medicine

This program offers an outstanding opportunity for the graduate student to gain advanced physical therapy skill and to become a qualified athletic trainer. The necessary courses and work experience requisite for certification by the National Association of Athletic Trainers are possible through cooperation with the Department of Physical Education and the Division of Sports Medicine.

Therapeutic Exercise

This specialty includes study of the principles, theory, application and critique of methods of therapeutic exercise. It encompasses evaluative procedures of patients with neurological deficits or disease. Approaches to physical therapy management of children with central nervous system dysfunction and neurological approaches to treatment of the adult are offered. Courses integrate neuromuscular maturation, neurophysiology, and the various neurodevelopmental theories of proprioceptive neuromuscular facilitation. Study of kinesiological and biomechanical principles of specific aspects of therapeutic exercise allow flexibility for particular student interests.

Physical Therapy courses listed are available to graduate students enrolled in other areas of the University. They may be utilized for a minor in physical therapy by students who are graduates of a physical therapy curriculum approved by the American Physical Therapy Association.

Courses for Graduates and Advanced Undergraduates

- 102 INTRODUCTION TO MAMMALIAN PHYSIOLOGY (Physiology 102) (5). A general course in vertebrate physiology with emphasis on morphological and function correlations. Suitable for graduate students with a minimal biology background. *Fall*. Faust; staff.
- 105 DEVELOPMENTALLY HANDICAPPED CHILDREN AND THEIR FAMILIES, AN INTERDISCIPLINARY APPROACH (3). Provides content on the range and complexities of developmental disabilities; presents a model of interdisciplinary diagnosis and management of developmentally disabled children and their families. *Fall, spring, and summer*. Knobloch and DDDL staff.
- 105L LABORATORY IN DISORDERS OF DEVELOPMENT AND LEARNING IN CHILDHOOD (1). Prerequisite, permission of instructor. Students enrolled in PHYT 105 have the option of registering for an additional hour of credit which requires 2 hours of observation per week in the clinic, attendance at seminars and workshops, or observations of committee sessions, or a combination of these experiences. *Fall, spring, summer*. Knobloch; staff.
- 139 ADVANCED PEDIATRIC ASSESSMENT AND PROGRAM PLANNING IN PHYSICAL THERAPY (3-6). Prerequisites, PHYT 105 or equivalent and permission of instructor. Laboratory for the physical therapist in diagnostic evaluation and program planning for children with developmental and/or learning problems. *Six to twelve laboratory hours a week, fall, spring and summer*. Parr.

- 172 ELECTROTHERAPY (3). Prerequisites, college physics and permission of instructor. Physical aspects, physiological effects, indications and contraindications of electrical currents and their therapeutic value. Basic principles and techniques of electrodiagnostic testing, electromyography, and nerve condition are included. *Two lecture and two laboratory hours a week, fall.* Nelson.
- 175 COMMUNICATIONS FOR PHYSICAL THERAPY (1). Prerequisite, permission of instructor. The use of audiovisual aids; writing for professional journals; and basic principles of research design for physical therapy. *One lecture hour each week, fall and spring.* Witt.
- 177 ORGANIZATION AND ADMINISTRATION OF A PHYSICAL THERAPY SERVICE (3). Prerequisite, permission of instructor. Includes material on planning, organizing, and managing a physical therapy service in an institution or agency. Deals with personnel, facility planning, fiscal management, communication, and medical-legal aspects of service. *Three lecture hours a week, spring and summer.* Howes, Schuch.
- 180 INTRODUCTION TO HUMAN GROWTH AND DEVELOPMENT (4). Prerequisite, permission of instructor. Emphasis is given to the stages in life during which greatest changes occur and development defects related to each. Included in the course is laboratory study of developmental disorders and library investigation of current research in these areas. *Fall.* Staff.
- 183 OVERVIEW OF CLINICAL EDUCATION (3). Prerequisite, permission of instructor. An overview of clinical education with information collected through literature search and discussions with instructor and guests responsible for areas in clinical education. *Three lecture hours a week, fall and summer.* Staff.
- 191 GROSS ANATOMY FOR PHYSICAL THERAPISTS (Anatomy 191) (6). Prerequisites, Zoology 11 and Zoology 41 or equivalents and permission of instructor. Fundamental principles and concepts of human gross anatomy for physical therapists taught by lectures and cadaver dissection. Emphasis on functional anatomy. *Three lecture and six laboratory hours a week, fall.* Hadler, Lay, Pollitzer.
- 192 ELECTROMYOGRAPHIC KINESIOLOGY (3). Prerequisites, Anatomy 191, PHYT 90 or equivalents and permission of instructor. Essential elements of electromyographic instrumentation, study of anatomical relationships in the human cadaver and laboratory analysis of muscle activity. Anatomical and electromyographic kinesiology publications will be discussed. *Two lecture and two laboratory hours a week, fall.* Yack, LeVeau, Nelson.
- 195 NEURODEVELOPMENTAL THEORY OF BRAIN DYSFUNCTION (3). Prerequisite, permission of instructor. Neurophysiological theory and application of neurodevelopmental (Bobath) approaches to understanding central nervous system dysfunction in children. *Two lecture and two laboratory hours a week, spring.* Staff.

Courses for Graduates

- 186 ROOD APPROACH TO NEUROMUSCULAR DISORDERS (3). Prerequisite, a recent course in neuroanatomy. Theoretical basis and practical application of the Rood Approach to neuromuscular disorders. Clinical emphasis will be on pediatrics. *Two lecture and two laboratory hours a week, spring.* Attermeier.
- 193 FUNCTIONAL NEUROANATOMY (Anatomy 193) (3). Prerequisites, Anatomy 191, Anatomy 107 or equivalent and permission of instructor. Study of basic structure of the brain and spinal cord, including both lecture and laboratory. *Four hours a week, spring and summer.* Singleton.
- 194 ADVANCED THERAPEUTIC EXERCISE (4). Prerequisite, permission of instructor. An advanced course in therapeutic exercise including theory, techniques, skills and analytical evaluation of neurophysiological approaches to therapeutic exercise. *Two lectures and two laboratory hours a week, spring and summer.* Johnson; staff.

- 272 ELECTRONEUROMYOGRAPHY (3). Prerequisite, PHYT 172 or equivalent and permission of instructor. Electrophysiology and advanced electromyographic and nerve conduction studies for kinesiological, clinical research applications are the bases of this course. Biomedical instrumentation and methods for analysis and quantitation of electromyographic data are included. *Two lecture and two laboratory hours a week, spring.* Nelson.
- 277 PHYSICAL THERAPY CURRICULUM DEVELOPMENT AND ADMINISTRATION (3). Prerequisite, permission of instructor. A study of the principles of curriculum design, content, and administration for physical therapy. *Spring.* Mitchell.
- 282 ASSESSMENT OF DEVELOPMENTAL PROCESSES IN INFANCY (2). Prerequisites, PHYT 385 or equivalent and permission of instructor. Theory and use of research/clinical methods for assessing behavior of infants 0-6 months, including Brazelton Scale, movement assessment, and psychophysiological methods. Laboratory develops basic competence in use of Brazelton Scale. Campbell.
- 290 ADVANCED KINESIOLOGY AND BIOMECHANICS (3). Prerequisites, PHYT 90 or equivalent and permission of instructor. A biomechanical and neurophysiological approach to the study of normal and pathological motion. *Two lecture and two laboratory hours a week, fall and summer.* LeVeau.
- 291 ANALYSIS OF HUMAN MOTION (3). Prerequisites, PHYT 90 or equivalent and permission of instructor. A lecture laboratory course on the rationale and basic principles of stroboscopy, cinematography, electrogoniometry, dynamometry, and electromyography as means of evaluating the biomechanics of human motion. *Two lecture and two laboratory hours a week, spring.* Yack, LeVeau.
- 292 DEVELOPMENTAL BIOMECHANICS (3). Prerequisite, permission of instructor. Applies the basic principles of mechanics and principles of growth to the musculoskeletal system for normal and abnormal development through the various stages of life. *Three lecture hours each week, spring.* LeVeau.
- 301 SEMINAR IN PHYSICAL THERAPY (1). Required of all graduate students in physical therapy. Group presentations and discussions by students and staff of selected topics related to physical therapy. *Five hours per month, fall and spring.* Wilhelm, Mitchell.
- 303 PROBLEMS IN PHYSICAL THERAPY (2-3). Prerequisite, permission of instructor. Advanced group study, analysis and discussion of issues related to the practice of physical therapy. *Fall, spring, and summer.* Staff.
- 307 SEMINAR IN DISORDERS OF DEVELOPMENT AND LEARNING IN CHILDHOOD (2). Prerequisite, permission of instructor. Seminar for students with prior background in child development or related areas on interdisciplinary diagnosis and management of developmental problems in childhood. Focus on staff and student prepared case material. *Fall, spring, and summer.* Knobloch; DDDL staff.
- 376 THE ALLIED HEALTH PROFESSIONS IN HEALTH CARE SYSTEMS (2). Prerequisite, permission of instructor. Required of all graduate students in physical therapy. Seminar on current developments in the allied health professions and their relation to social, economic and health aspects of society. *Summer.* Mitchell.
- 377 READINGS IN SELECTED TOPICS IN PHYSICAL THERAPY (1-3). Prerequisite, permission of instructor. The student explores areas of special interests pertinent to eventual goals in physical therapy. *Time to be arranged, fall, spring and summer.* Staff.
- 380 SEMINAR IN PHYSICAL ASPECTS OF HUMAN GROWTH AND DEVELOPMENT (2). Prerequisites, PHYT 180 or equivalent and permission of instructor. Selected topics on health related aspects of development and aging in the individual. *Fall and summer.* Campbell.
- 381 THE NEURAL BASIS OF MOTOR CONTROL (3). Prerequisite, neuroanatomy and permission of instructor. Advanced study of the neurophysiological basis of

- motor control, including physiology of the motoneuron, methods of research, and identification of unsolved problems in sensorimotor physiology. *Spring*. Campbell.
- 382 DEVELOPMENTAL REFLEXES AND MOTOR CONTROL (3). Prerequisite, permission of instructor. Advanced study of developmental reflexes and reactions and their role in voluntary motor behavior. *Spring*. Parr.
- 383 EDUCATIONAL ASPECTS OF CLINICAL EDUCATION IN PHYSICAL THERAPY (2). Corequisite, PHYT 383L. Prerequisites, PHYT 183, Overview of Clinical Education and permission of instructor. Application of the principles of teaching-learning and evaluation in the clinical setting; curriculum and program planning and integration of didactic education with clinical instruction; supervision and interpersonal relations; and continuing education for clinical faculty development. *Two seminar hours a week, spring*. Schuch.
- 383L LABORATORY IN EDUCATIONAL ASPECTS OF CLINICAL EDUCATION IN PHYSICAL THERAPY (1). Corequisite, PHYT 383. Prerequisite, permission of instructor. Offers experience with practical application of educational elements involved in clinical education as applicable to students and clinical facilities. *Two laboratory hours a week, spring*. Staff.
- 384 ADMINISTRATIVE ASPECTS OF CLINICAL EDUCATION IN PHYSICAL THERAPY (2). Corequisite, 384L. Prerequisites, PHYT 183, overview of Clinical Education; PHYT 177, Organization and Administration of a Physical Therapy Service or equivalent; and permission of instructor. The application of basic principles of administration pertaining to clinical education, such as: professional standards relating to students and clinical practice; medico-legal considerations; site selection; interinstitutional agreements; cost of clinical education; records and reporting; interpersonal and interdepartmental communications; and clinical faculty development. *Two seminar hours a week, summer*. Schuch.
- 384L LABORATORY IN ADMINISTRATIVE ASPECTS OF CLINICAL EDUCATION IN PHYSICAL THERAPY (1). Corequisite, PHYT 384. Prerequisite, permission of instructor. Offers experience with practical application of administrative elements involved in clinical education as applicable to the students, the University, and the clinical facilities. *Two laboratory hours a week, summer*. Staff.
- 385 TESTS AND MEASUREMENT IN CHILD DEVELOPMENT (3). Prerequisites, PHYT 180 or equivalent and permission of instructor. Introduction to measurement theory, including test reliability, validity and standardization. Laboratory develops basic skills in administering the Bayley Scales, Neonatal Behavioral Examination, Wolanski Motor Evaluation and other tests of sensorimotor function in infancy and childhood. *Two lecture and two laboratory hours a week, fall*. Campbell.
- 393 MASTER'S THESIS (6). *Fall, spring and summer*. Staff.

DEPARTMENT OF PHYSICS AND ASTRONOMY

EUGEN MERZBACHER, *Chairman*

Professors

WAYNE A. BOWERS	(1)	Statistical Mechanics, Solid State Theory
C. VICTOR BRISCOE	(2)	Low Temperature Physics
SANG-IL CHOI	(3)	Ionic Conductors, Organic Crystals, Condensed Matter Theory
THOMAS B. CLEGG	(5)	Nuclear Physics, Polarized Ion Source Development
JAMES H. CRAWFORD, JR.	(6)	Solid State Physics, Imperfections in Solids
MORRIS S. DAVIS	(7)	Celestial Mechanics, Astrometry, Appli- cations of Computers to Astronomy
JOHN P. HERNANDEZ	(10)	Condensed Matter Theory, Electron States
PAUL S. HUBBARD	(11)	Molecular Physics, Spin Relaxation
EDWARD J. LUDWIG	(13)	Experimental Nuclear Physics
J. ROSS MACDONALD	(28)	Condensed Matter Theory, Space Charge Polarization, Data Analysis Methods
EUGEN MERZBACHER	(14)	Quantum Mechanics, Atomic and Nuclear Theory
EARL N. MITCHELL	(15)	Applied Physics
EVERETT D. PALMATIER	(16)	Monte Carlo Diffusion Calculations
LOUIS D. ROBERTS	(17)	Electronic and Dynamical Properties of Alloys, Mossbauer Effect
DIETRICH SCHROEER	(19)	Mossbauer Spectroscopy of Lattice Defects, Science and Policy
STEPHEN M. SHAFROTH	(20)	Accelerator-Based Atomic and Nuclear Physics, Inelastic X-ray Scattering
MARVIN SILVER	(21)	Solid State, Electron Excitons in Disordered Matter, Photoconductivity
LAWRENCE M. SLIFKIN	(22)	Lattice Defects in Solids, Science and the Arts
WILLIAM J. THOMPSON	(25)	Theoretical Nuclear Physics, Nuclear Reactions
HENDRIK VAN DAM	(26)	Theoretical Physics
JAMES W. YORK, JR.	(27)	Gravitation, Relativity, Theoretical Physics

Associate Professors

JOHN M. BANE, JR.	(29)	Physical Oceanography
WAYNE A. CHRISTIANSEN	(4)	Theoretical Astrophysics, Radio Astronomy
KIAN S. DY	(8)	Condensed Matter Theory, Surface States
HORST KESSEMEIER	(12)	Nuclear Magnetic Relaxation in Solids
LAWRENCE G. ROWAN	(18)	Electron Paramagnetic Resonance, Physics of Music, Electronics

Assistant Professors

RICHARD E. ANDERSON	(31)	Experimental Nuclear Physics
BRUCE W. CARNEY	(32)	Optical Observational Astronomy
PAUL H. FRAMPTON	(33)	Theoretical Particle Physics including Gravity
Y. JACK NG	(30)	Theoretical Particle Physics, Gravitation

Research Professor

WEI-KAN CHU	(35)	Particle-Solid Interaction, Ion-Beam Microanalysis, Microelectronics Processing
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Research Assistant Professor

STEVEN M. CHRISTENSEN		General Relativity, Quantum Gravity, Supergravity
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Emeritus Professors

WALDO E. HAISLEY
 PAUL E. SHEARIN
 CHARLES S. SMITH, JR.
 JOSEPH W. STRALEY

The Department of Physics and Astronomy offers graduate work leading to the degrees of Master of Science and Doctor of Philosophy.

The active fields of research are condensed-matter physics, microelectronics, atomic, molecular, and nuclear physics, quantum field theory, theoretical particle physics, general relativity and gravitation, stellar astronomy and astrophysics. The chemical physics program combines courses from chemistry and physics with research in either department. The graduate courses are designed to give a broad foundation and to introduce the student to the special fields in which the research interests of the Department lie.

The general regulations of the Graduate School govern the work for the degrees of Master of Science and Doctor of Philosophy. To begin a graduate program in physics, the student should have completed the requirements for the degree of Bachelor of Science with a major in physics at the University, or their equivalent elsewhere. The minimum prerequisite for graduate study consists of the basic undergraduate courses Physics 26, 27, 28, 28L; 103, 104; 105, 106, 107, 108; together with Mathematics 32, 33, and 124. In the first spring as a graduate student in physics at UNC a student who has not passed a similar examination elsewhere must take the Qualifying Examination, which covers the content of first year course work and includes a review of undergraduate physics. This examination serves as a comprehensive examination for the M.S. degree and/or a qualifying examination for the Ph.D. degree. A Ph.D. candidate must also

take the Ph.D. Written Examination within the first three years of graduate study in physics at UNC. This examination, offered each spring, is based upon the graduate student's course work.

The M.S. degree in Physics may be taken with or without thesis. If one chooses not to do a thesis, then one must complete one semester of Advanced Laboratory (Physics 201 or 202) and do three to six hours of Research (Physics 301) under the supervision of a graduate faculty member and report on this activity. A minor is not required for the M.S. degree, but one may be chosen in accord with the regular graduate requirements for this option. The equivalent of one semester teaching experience is required of all M.S. degree candidates.

The requirements for a Ph.D. in Physics are: (a) A student must pass the following courses at The University of North Carolina at Chapel Hill, or have passed their equivalents elsewhere, as an undergraduate or graduate student: 161, 169, 191-192, 201, 203, 204-205, 221, 260-261; and (b) a student must pass at least three other graduate level courses approved by the Department. A student is expected to take at least the two-semester sequence of courses appropriate to a field of research specialization, or such other courses as are recommended by the thesis adviser. A minor is not required, but may be elected, in which case requirement (b) above is replaced by the requirement that the student pass at least five graduate level courses selected from no more than two departments, with no fewer than two courses in either department. The minor program must be approved in advance by the minor department. Teaching experience, as part of professional training, is required of all doctoral candidates through laboratory or lecture instruction as a half-time teaching assistant for two semesters, or until teaching competence is acquired.

Research Interests

Astronomy and Astrophysics. Spectroscopic and photometric observations are made with 38-cm and 60-cm reflector telescopes. Research includes radio and x-ray astronomy, study of globular clusters and metallicity of stars.

Atomic, Molecular, and Chemical Physics. Theoretical and experimental areas include magnetic resonance and relaxation, properties of solids and surfaces, excited states of molecules, charge transport in solids and fluids. The chemical physics program involves collaboration with the Department of Chemistry.

Condensed-Matter Physics. Research activities include experiments on NMR in solids, Mössbauer studies of crystals and alloys, the mechanism of photography, lattice dynamics, defects and radiation damage of crystals, and the theory of molecular properties at solid surfaces, and amorphous materials. A basic research program supports a new microelectronics center at nearby Research Triangle Park.

Field Theory, Particle Physics, Gravitation and Relativity. Gauge field theories, quantum chromodynamics, electroweak theory, grand unified theories, supersymmetry, supergravity, Cauchy problem of general relativity, gravitational radiation, and the classical and quantal structure of gravitational fields.

Nuclear and Accelerator-Based Atomic Physics. Experimental nuclear and atomic physics is carried out using spin-polarized protons, neutrons and deuterons, and heavy ions, x-rays and gamma rays. Experimental and theoretical research emphasizes using polarized beams in nuclear interaction studies, and inner-shell ionization phenomena in ion-atom collisions.

Facilities and Equipment

Research in physics and astronomy is carried out in several laboratory facilities. In Phillips Hall, where the Department's offices are located, are research laboratories with an area of 3,000m², used mainly for atomic, molecular, and condensed-matter physics research. Equipment includes spectrometers covering x-rays to microwaves, an electron microscope, NMR, EPR, and ESR systems, Mössbauer spectrometers, high-pressure apparatus, lasers, cryogenic equipment, an intense gamma-ray source, crystal growth facilities, and a 2-MeV Van de Graaff accelerator. Two astronomy observatories, the Morehead Observatory on the UNC campus and the University Observatory south of Chapel Hill, have excellent facilities for photographic and photometric research, while the Morehead Planetarium may be used for special projects. Atomic and nuclear physics research is carried out at UNC and at Triangle Universities Nuclear Laboratory (TUNL) in Durham, a facility with three Van de Graaff accelerators and a cyclotron, operated in collaboration with Duke University and North Carolina State University. (For a more complete description see Research Institutes and Centers.)

Computing facilities include microprocessors and minicomputers within the Department, three minicomputers at TUNL, as well as terminals to the UNC Computation Center in Phillips Hall and to the network of Triangle Universities Computation Center 20 km from Chapel Hill.

Library facilities include the Alfred T. Brauer Library (mathematics, physics, statistics, computer science, and operations research) in Phillips Hall, which has 60,000 volumes and subscribes to 200 physics and astronomy journals, and access to 17 other libraries on the Chapel Hill campus having a total of over three million volumes.

Fellowships and Assistantships

A teaching fellowship with a stipend of \$5,375 and many teaching assistantships (with stipends beginning at \$4,725 for 9 months) are available to qualified graduate students. The duties of assistants include supervision of

laboratory classes in elementary physics or astronomy, assisting in the supervision of advanced laboratories, and grading papers. Graduate School fellowships, including a microelectronics fellowship for first-year students, are available for well-qualified applicants to the Department's graduate program. Teaching assistants can usually be supported in the summer by teaching or research.

Research assistantships are also offered, especially to those who have completed a year or two of graduate work. The stipends range from \$6,300 to \$6,700 for the calendar year, depending on experience. Summer employment usually is available.

Application forms for admission, including graduate appointments, may be obtained from the Graduate Admissions Committee, Department of Physics and Astronomy, Phillips Hall 039A, The University of North Carolina at Chapel Hill, Chapel Hill, NC 27514, U.S.A. Application for fall admission should be made by February 1.

Courses for Graduates and Advanced Undergraduates

For courses with Staff indicated as instructor, the name following in parentheses is that of a professor who can advise on the course.

ASTRONOMY

- 131 INTRODUCTION TO CELESTIAL MECHANICS (3). Prerequisites, Physics 26 and Mathematics 31 and 32, or permission of the instructor. The differential equations and their integrals in the two-body problem. Computation of orbits. The three-body problem. Perturbation theory. Satellite theory. *Fall and/or spring*. Davis.
- 135 ASTROPHYSICS I (3). Prerequisite, Physics 108; corequisite, Physics 105 (or permission). The application of physical principles of astronomy. Topics include radio and x-ray astronomy, interstellar gas dynamics, and galactic dynamics. *Fall*. Christiansen.
- 136 ASTROPHYSICS II (3). Prerequisite, Physics 105 (or permission). Stellar astrophysics, the study of stellar atmospheres and interiors. Stellar evolution and nucleosynthesis. *Spring*. Christiansen.
- 137 OBSERVATIONAL ASTRONOMY (3). Prerequisites, Astronomy 31 or 32, or permission of instructor. A course designed to familiarize the student with observational techniques in optical and radio astronomy, including applications of photography, spectroscopy, photometry, and radio methods. *Two lecture and three laboratory hours a week, fall or spring*. Staff. (Carney.)

PHYSICS

- 101 INTRODUCTORY ELECTRONICS I¹ (4). Prerequisites, introductory physics and Mathematics 31, or permission of the instructor. This course is designed to give students a sound working knowledge of basic electronic principles. Physics 101 and 141 may not both be taken for credit. *Three lecture and three laboratory hours a week, fall and spring*. Ludwig.

1. Physics 101-104 and 107-115 are not to be taken for graduate credit by graduate students in physics.

- 102 INTRODUCTORY ELECTRONICS II¹ (4). Prerequisite, Physics 101 or permission of the instructor. This course, which is based directly on Physics 101, emphasizes the functional aspect of electronic equipment. *Three lecture and three laboratory hours a week, spring.* Ludwig.
- 103 MECHANICS I¹ (3). Prerequisites, Physics 26 (or permission) and Mathematics 33. Particle kinematics. Central forces, planetary motion. Systems of particles and conservation laws. Statics. Motion of rigid bodies. Constrained motion. Wave motion on a string. *Spring.* Staff. (Frampton.)
- 104 MECHANICS II¹ (3). Prerequisite, Physics 103. Deformable bodies and wave motion Lagrange's and Hamilton's equations, Euler's equations, small oscillations, normal coordinates. *Fall.* Staff. (Hubbard.)
- 105 HEAT AND THERMODYNAMICS (3). Prerequisite, Physics 27 (or 25 by permission) and Mathematics 33. Equilibrium statistical mechanics; the thermodynamics laws, internal energy, enthalpy, entropy, thermodynamic potentials. Maxwell equations. *Fall.* Staff. (Kessemeier).
- 106 OPTICS (3). Prerequisites, Physics 107 and 108 (or 58 by permission). Elements of geometrical optics. Huyghens' principle, interference, diffraction, and polarization. Elements of the electromagnetic theory of light; Fresnel's equations, dispersion, absorption and scattering. Photons. Lasers and quantum optics. *Spring.* Merzbacher.
- 107 ELECTRICITY AND MAGNETISM¹ (3 each). Prerequisites, Physics 61 and
- 108 Mathematics 34 (or permission). Brief treatment of DC and AC circuit theory. Electrostatics; dielectrics; the magnetic field; magnetic materials. Maxwell's equations and their application to electromagnetic waves. *Fall and spring.* Bowers.
- 113 SPACE AND TIME IN PHYSICS AND PHILOSOPHY¹ (Philosophy 121) (3). Contingent and necessary properties of space and time. The direction and flow of time. Fatalism. Effects preceding their causes. *Spring.* Schlesinger, Van Dam.
- 115 THE EVOLUTION OF PHYSICAL IDEAS^P (History 153) (3). Prerequisites, Physics 25 and Mathematics 15 (or by permission). A systematic study of the growth of physics from the time of Copernicus, concentrating on the Newtonian synthesis and on the nineteenth-century emergence of electromagnetism, wave optics, and thermodynamics. *Spring.* Staff. (Haisley.)
- 126 MODERN PHYSICS FOR HIGH SCHOOL TEACHERS (3). Prerequisite, Physics 27 (or 25 with permission of the instructor). *Spring.* Staff.
- 127 INTRODUCTION TO MODERN PHYSICS LABORATORY (1). Corequisite, Physics 126. Laboratory courses to accompany Physics 126. *Three laboratory hours a week, spring.* Staff.
- 141 ELECTRONICS (4). Prerequisites, Physics 27 (or 58), Mathematics 34. Basic electronics with emphasis on circuitry. DC and AC circuits, diodes and application, transistors, amplifiers, wave form generators, operational amplifiers, digital electronics, transmission lines. Physics 101 and 141 may not both be taken for credit. *Three lecture and three laboratory hours a week, spring.* Macdonald.
- 142 INTERMEDIATE LABORATORY I AND II (2 each). Prerequisite, Physics 141 or
- 143 permission. Selected experiments illustrating modern techniques such as the use of laser technology to study the interaction of electromagnetic fields and matter. *Six laboratory hours a week, fall and spring.* Briscoe.
- 151 FLUID DYNAMICS (Marine Sciences 151) (3). Prerequisite, Physics 103 or permission. The physical properties of fluids, kinematics, governing equations, viscous incompressible flow, vorticity dynamics, boundary layers, irrotational incompressible flow. *Fall.* Bane, Bowers.

1. Physics 101-104 and 107-115 are not to be taken for graduate credit by graduate students in physics.

- 160 INTRODUCTION TO QUANTUM MECHANICS (3). Prerequisites, Physics 103 and 108, or permission. Origins of quantum theory. Uncertainty principle. Schroedinger equation for simple systems, including hydrogen atom. Perturbation theory. *Fall*. Hubbard.
- 161 NUCLEAR PHYSICS (3). Prerequisite, Physics 160 or equivalent. Nuclear structure, nuclear reactions, experimental techniques of producing and studying nuclear particles; models of the nucleus; nuclear forces. *Spring*. Staff. (Shafroth).
- 163 APPLICATIONS OF QUANTUM MECHANICS (3). Prerequisite, Physics 160. Emphasizes atomic physics but includes topics from nuclear, solid state and particle physics, such as energy levels, the periodic system, selection rules, and fundamentals of spectroscopy. *Spring*. Staff. (Hubbard).
- 169 INTRODUCTORY SOLID STATE PHYSICS (3). Prerequisite, Physics 160 or equivalent. Crystal symmetry, types of crystalline solids; electron and mechanical waves in crystals, electrical and magnetic properties of solids, semiconductors; low temperature phenomena; imperfections in nearly perfect crystals. *Fall*. Slifkin.
- 181 ADVANCED LABORATORY (3 each). Prerequisites, Physics 103, 108, or permission. See Physics 201, 202. *Six laboratory hours a week, fall and spring*. Staff. (Shafroth).
- 191 MATHEMATICAL METHODS OF THEORETICAL PHYSICS I (3). Prerequisites, Physics 28, or equivalent; Mathematics 121 or 128. Vector fields, curvilinear coordinates, functions of complex variables, linear differential equations of second order, Fourier series, integral transforms, delta sequence. *Fall*. Ng.
- 192 MATHEMATICAL METHODS OF THEORETICAL PHYSICS II (3). Prerequisite, Physics 191 or permission. Partial differential equations, special functions, Green functions, variational methods, traveling waves and scattering. *Spring*. Bowers.
- 193 SCIENTIFIC PROGRAMMING (Computer Science 112) (3). Prerequisites, Mathematics 128 or 129, or Physics 191 or 192; elementary FORTRAN, PL/I or Pascal programming. Structured programming in FORTRAN or Pascal; use of secondary storage and program packages; numerical methods for advanced problems, and computational efficiency; symbolic mathematics by computer. *Fall*. Thompson.

Courses for Graduates

- 201 ADVANCED LABORATORY (3 each). Prerequisites, Physics 103, 108, or by permission. Experimental projects with research groups, or individual projects in atomic and sub-atomic physics. *Six laboratory hours a week, fall and spring*. Staff. (Shafroth).
- 203 CLASSICAL DYNAMICS (3). Prerequisite, advanced undergraduate mechanics. Variational principles, Lagrangian and Hamiltonian mechanics. Symmetries and conservation laws. Two-body problems, perturbations, and small oscillations, rigid-body motion. Relation of classical to quantum mechanics. *Fall*. Ng.
- 204 ELECTROMAGNETIC THEORY I (3). Prerequisites, Physics 191-192 or equivalent. Electrostatics, magnetostatics, time-varying fields, Maxwell's equations. *Fall*. Staff. (York).
- 205 ELECTROMAGNETIC THEORY II (3). Prerequisites, Physics 204 or equivalent. Plane electromagnetic waves and wave propagation, wave guides and resonant cavities, simple radiating systems, scattering and diffraction, special theory of relativity, radiation by moving charges. *Spring*. Staff. (York).
- 221 STATISTICAL MECHANICS (3). Prerequisites, Physics 203 and 260. Classical and quantal statistical mechanics, ensembles, partition functions, ideal Fermi and Bose gases. *Spring*. Kessemeier.

- 230 NUCLEAR PHYSICS (3 each). Prerequisites, Physics 161 and 260. Nuclear interactions at non-relativistic energies. Charge and spin dependence in nuclear reactions.
- 231 Decay modes and electromagnetic properties. Collective and single particle states. *Fall and spring, alternate years.* Thompson.
- 260 QUANTUM MECHANICS (3 each). Prerequisite, Physics 160 or equivalent. Non-relativistic wave mechanics, spin, linear vector spaces in quantum mechanics, angular momentum, perturbation theory, scattering, identical particles. *Fall and spring.* Choi.
- 261 ADVANCED QUANTUM MECHANICS² (3). Prerequisite, Physics 261. Second quantization, applications to many-body problems, Hartree-Fock method, quasi-particles, Dirac theory of electron, elementary radiation theory, scattering. *Fall, alternate years.* Staff. (Merzbacher).
- 263 FIELD THEORY² (3). Prerequisite, Physics 261. Dirac equation, free fields, Feynman rules, quantum electrodynamics. *Fall, alternate years.* Staff. (Van Dam).
- 264 THEORY OF PARTICLES AND FIELDS² (3). Prerequisites, Physics 262 or 263. Quantum electrodynamics, renormalization, dispersion relations, gauge theories. *Spring, alternate years.* Staff. (Frampton).
- 267 CURRENT ADVANCES IN PHYSICS (3). Prerequisite, by permission. In recent years, nuclear physics, elementary particle physics and coherence in quantum optics have been among the topics discussed. *Either semester, as announced.* Staff.
- 270 SOLID STATE PHYSICS (3 each). Prerequisite, Physics 160 or equivalent. Topics considered include those of Physics 169, but at a more advanced level, and in addition a detailed discussion of the interaction of waves (electromagnetic, elastic, and electron waves) with periodic structures; e.g., X-ray diffraction, phonons, band theory of metals and semiconductors. *Fall and spring.* Hernandez.
- 271 THEORY OF THE SOLID STATE (3). Prerequisite, Physics 261. Calculation of one-electron energy band structure. Electron-hole correlation effect and excitons. Theory of spin waves. Many-body techniques in solid state problems including theory of superconductivity. *As announced.* Dy.
- 272 SPECIAL THEORY OF RELATIVITY (3). Prerequisites, Physics 203, 204. The elements of special relativity will be applied to a number of problems, both conceptual and practical, including many of the "paradoxes." Tensor analysis, mechanics of continuous media, classical electrodynamics, relativistic thermodynamics. *Either semester, as announced.* York.
- 274 GENERAL THEORY OF RELATIVITY (3). Prerequisite, Physics 274 or permission of the instructor. Differential geometry of space-time. Tensor fields and forms. Curvature, geodesics. Einstein's gravitational field equations. Tests of Einstein's theory. Applications to astrophysics and cosmology. *Either semester, as announced.* York.
- 288 PRINCIPLES OF CHEMICAL PHYSICS (Chemistry 288, 289) (3 each). Prerequisite, Physics 160 or Chemistry 281 or permission of the instructor. The quantum mechanics of molecules and their aggregates. Atomic orbitals, Hartree-Fock methods for atoms and molecules. Special topics of interest to the instructor and research students. *As announced.* (Choi).
- 289 PRINCIPLES OF MAGNETIC RESONANCE (3). Prerequisite, Physics 260, or Chemistry 281, or permission of the instructor. *Either semester, as announced.* Kessemeier.
- 291 GROUP THEORY AND ITS APPLICATIONS (3). Prerequisites, knowledge of matrices, mechanics, and quantum mechanics. Discrete and continuous groups. Representation theory. Application to atomic, molecular, solid state, nuclear and particle physics. *As announced.* (Van Dam.)

2. The Physics 262 and Physics 380 sequence alternates with Physics 263-264. Not both Physics 262 and Physics 263 can be taken for credit.

Research Courses

- 301 RESEARCH (3 or more). *Ten or more laboratory or computation hours a week, fall and spring.* Staff.
- 302 SEMINAR IN THE TEACHING OF UNDERGRADUATE PHYSICS (3). For teachers of college-level physics courses, a seminar dealing with innovation in teaching methods, new physics curricula, teacher's lecture style, demonstration and laboratory equipment, and testing. *One lecture and three seminar hours a week. Upon demand.* Staff. (Straley).
- 310 SEMINAR IN THEORETICAL PHYSICS (1 or more). Topics from current theoretical research including, but not restricted to, field theory, particle physics, gravitation, and relativity. *Fall and spring.* Staff. (Frampton).
- 360 SEMINAR IN NUCLEAR PHYSICS (1 or more). Current research topics in low-energy nuclear physics, especially as related to the interests of Triangle Universities Nuclear Laboratory. *Fall and spring.* Staff. (Anderson).
- 364 SEMINAR IN ATOMIC AND MOLECULAR PHYSICS (1 or more). Experimental and theoretical topics in atomic collision physics, chemical physics, molecular states, and surface properties. *Fall and spring.* Staff. (Shafroth).
- 370 SEMINAR IN SOLID STATE PHYSICS (1 or more). Research topics in condensed-matter physics, with emphasis on current experimental and theoretical studies. *Fall and spring.* Staff. (Dy).
- 380 SEMINAR IN PARTICLE PHYSICS³ (1 or more). Symmetries, gauge theories, asymptotic freedom, unified theories of weak and electromagnetic interactions, and recent developments in field theory. *Fall and spring.* Staff. (Ng).
- 393 MASTER'S THESIS (3 or more). *Either semester.* Staff.
- 394 DOCTORAL DISSERTATION (3 or more). *Either semester.* Staff.
- 400 GENERAL REGISTRATION (0).

DEPARTMENT OF PHYSIOLOGY

EDWARD R. PERL, *Chairman*

Professors

NORMAN A. COULTER	(2)	Biomedical Engineering
FREDERIC L. ELDRIDGE	(4)	Control of Respiration
ROBERT G. FAUST	(6)	Membrane Transport
ARTHUR L. FINN	(35)	Transport and Electrophysiology in Epithelia
CARL W. GOTTSCHALK	(8)	Renal Physiology
MOTOY KUNO	(12)	Neurophysiology of Central Synapses
AUGUSTUS T. MILLER, JR.	(15)	Aging
EDWARD R. PERL	(18)	Sensory and Integrative Neurophysiology
JOSEPH H. PERLMUTT	(19)	Endocrine and Renal Physiology
BARRY L. WHITSEL	(23)	Sensory Neurophysiology and Neuropharmacology

Associate Professors

WILLIAM J. ARENDSHORT	(25)	Renal Physiology
DUANE A. DREYER	(31)	Sensory Neurophysiology and Neuropharmacology
PAUL B. FAREL	(5)	Neurophysiological Basis of Behavior
RICHARD L. GLASSER	(7)	Neurophysiology of Respiration and Memory
ENID R. KAFER	(9)	Respiratory Physiology
RICHARD A. KING	(10)	Visual System and Memory
GEORGE M. LANGFORD	(44)	Structure and Function of Microtubules
DAVID L. MCILWAIN	(14)	Motoneuron Biochemistry
GERHARD W. D. MEISSNER	(26)	Sarcoplasmic Reticulum Function
ALDO RUSTIONI	(30)	Neuroanatomy of Sensory Systems
ANN E. STUART	(41)	Cellular Neurophysiology of Sensory Systems
JAMES N. WEAKLY	(22)	Synaptic Transmission
LOYD R. YONCE	(24)	Cardiovascular Physiology

Assistant Professors

LAWRENCE M. MARSHALL	(45)	Structure and Function of Developing Synapses
DAVID E. MILLHORN	(46)	Control of Respiration
GERRY S. OXFORD	(36)	Physiology and Biophysics of Excitable Membranes
ROBERT W. SEALOCK	(32)	Molecular Basis of Excitable Membranes

Lecturer

ELLA GRAY ENNIS	(33)	Cardiovascular Physiology
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Adjunct Assistant Professor

JOHN C. DAW	(3)	Cardiac Metabolism
CHARLES G. LINEBERRY	(47)	Neuropharmacology of Narcotic Analgesics

Research Assistant Professor

VIRGINIA NEELON	(27)	Intestinal Transport of Sugars and Amino Acids
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Emeritus Professors

JOHN H. FERGUSON
ESZTER B. KOKAS

Several programs of graduate study leading to the Ph.D. degree are offered for students with an interest in a mechanistic approach to biological function. In addition, the department is active in offering postdoctoral training in advanced research skills. In an attempt to prepare students better for present day occupational and research opportunities, the graduate training will emphasize extensive knowledge of comparative physiology and/or participation in the interdisciplinary programs such as neurobiology, biomathematics-bioengineering and genetics.

Physiology holds a key position in the sciences concerned with biological functions. On the one hand, it has traditionally used tools from the basic physical sciences and mathematics in the analysis of biological mechanisms, while on the other, it has been concerned with processes often disturbed in disease. It is unique among the biological sciences in examining the interaction between various processes in living cells at all levels from the molecular through the behavioral. Thus, physiology represents a discipline bridging questions pertinent to basic life processes and those applicable to the practice of the health professions.

Students seriously contemplating physiology as a career should have a background in physics, chemistry, mathematics and basic biology. Graduate students will be accepted in limited numbers. The major research emphases of the department include organizational neurophysiology, transport and excretory mechanisms, neurochemistry, biophysics of excitable membranes, cellular respiration, regulation of respiration and cardiovascular function.

Students seeking the M.S. degree only *are not accepted*.

Courses for Graduate and Professional Students

- 102 INTRODUCTION TO MAMMALIAN PHYSIOLOGY (Physical Therapy 102) (5). Prerequisite, permission of the instructor. A general course in vertebrate physiology with emphasis on morphological and functional correlations suitable for graduate students with a biology and chemistry background. *Fall*. Staff.

- 103 PHYSIOLOGY FOR DENTAL STUDENTS (Dent 103s) (3). Prerequisites, Chem 41, 61, 62 or equivalents. A general course in mammalian physiology with emphasis on basic concepts applicable to all organ systems and on concepts with particular relevance to dentistry. For graduate credit to selected students. *Fall and spring*. Dreyer; staff.
- 111 BIOMEDICAL INSTRUMENTATION (Biomedical Engineering-Biomedical Mathematics 111) (3). Prerequisites, Mathematics 32 or equivalent, permission of the instructor. Designed for students who do not have and want experience in electronics. The fundamentals of circuit theory and practical circuit design are presented in the context of biological applications. This course includes a laboratory and individual student projects. *Fall*. Hsiao.
- 121 INTRODUCTION TO BIOMEDICAL DATA PROCESSING (Biomedical Engineering-Biomedical Mathematics 121) (3). Prerequisites, Computer Science 16 or equivalent. This is an introduction to methods of automatic computation of special relevance to biomedical problems. Sampling theory, analog-to-digital conversion, digital filtering will be explored in depth. *Spring*. Lucas.
- 131 INTRODUCTION TO BIOMATHEMATICS (Biomedical Engineering-Biomedical Mathematics 131) (3). Prerequisite, Mathematics 32 or equivalent. An introduction to the dynamic analysis of biological systems, including: differential equations of behavior, transient response, Fourier analysis and frequency response, and applications of the LaPlace transform in biology and medicine. *Fall*. Lucas.
- 140 CELL AND ORGAN SYSTEM PHYSIOLOGY (Neurobiology 140) (5). Prerequisite, permission of the instructor. Principles of cell and organ system physiology suitable for students with a biology and chemistry background. *Fall*. Perlmutter; staff.
- 202 ADVANCED PHYSIOLOGY I (3). Prerequisites, Physiology 140 or equivalent and permission of instructor. Selected topics in cellular, gastrointestinal and respiratory physiology covered in depth through lectures, seminars and demonstrations. *Spring*. Finn; staff.
- 203 ADVANCED PHYSIOLOGY II (3). Prerequisites, Physiology 140 or equivalent and permission of instructor. Selected topics in cardiovascular, renal and endocrine physiology covered in depth through lectures, seminars, demonstrations. *Spring*. Arendshorst; staff.
- 204 ADVANCED NEUROPHYSIOLOGY (Neurobiology 200) (3). Prerequisites, Physiology 140, working knowledge of mammalian neuroanatomy and permission of the instructor. A course designed to provide detailed analysis of selected areas of neurophysiology such as synaptic transmission, sensory and motor systems, and higher integrative mechanism. *Fall*. Stuart; staff.
- 211 SPECIAL TOPICS IN PHYSIOLOGY (Neurobiology 211) (3-5). Prerequisite, permission of the instructor. Individually arranged programs of study in depth of selected topics such as membrane function, transport physiology, renal physiology, etc. *Fall*. Staff.
- 212 SPECIAL TOPICS IN PHYSIOLOGY (Neurobiology 212) (3-5). Prerequisite, permission of the instructor. Individually arranged programs of study in depth of selected topics such as membrane function, transport physiology, renal physiology, etc. *Spring*. Staff.
- 220 SEMINAR IN PHYSIOLOGY (1). Prerequisite, permission of the Departmental Director of Graduate Studies. Weekly seminars emphasizing current literature. *Fall*. Staff.
- 221 SEMINAR IN PHYSIOLOGY (1). Prerequisite, permission of the Departmental Director of Graduate Studies. Weekly seminars emphasizing current literature. *Spring*. Staff.

- 225 NEURAL INFORMATION PROCESSING (Biomedical Engineering-Biomedical Mathematics 221) (3). Prerequisites, Biomedical Engineering-Biomedical Mathematics 101 and Physiology 140 or equivalent. This approaches the nervous system as a data processing network, the brain as the computer for a homeostat. *Spring*. (Alternate years.) Coulter.
- 227 CURRENT TOPICS IN PHYSIOLOGY (Zoology 227) (3). Prerequisite, one introductory course in physiology. Lecture and seminar consideration of selected advanced aspects of physiology. Topics will vary from year to year; may be repeated for credit. *Spring*. Staff.
- 290 SEMINAR IN NEUROBIOLOGY (Biochemistry 290) (Neurobiology 290) (Pathology 290) (Pharmacology 290) (Psychology 290) (3). Prerequisite, permission of the Director of Training of the Neurobiology Program. An intensive consideration of selected topics and problems. Participation required of Neurobiology Trainees. *Spring*. Faculty of the Neurobiology Program.
- 301 RESEARCH PHYSIOLOGY (3-10 each). *Fall, spring, and summer*. Staff.
- 302
- 303
- 310 RESEARCH IN NEUROBIOLOGY (Biochemistry 310) (Neurobiology 310) (Pathology 310) (Pharmacology 310) (Psychology 310) (Zoology 302) (3-12). Prerequisite, permission of a staff member. Research in various aspects of neurobiology. *Six to twenty-four hours a week, fall and spring*. Faculty of the Neurobiology Program.
- 393 MASTER'S THESIS (3 or more). *Fall and spring*. Staff.
- 394 DOCTORAL DISSERTATION (3 or more). *Fall and spring*. Staff.
- 400 GENERAL REGISTRATION (0).

DEPARTMENT OF POLITICAL SCIENCE

JAMES W. PROTHRO, *Chairman*

Professors

ENRIQUE BALOYRA	(2)	Latin American Politics
THAD BEYLE	(3)	State and Local, Policy Studies
LEE BOUNDS	(5)	Criminal Justice
GORDON CLEVELAND	(7)	Political Theory, Jurisprudence
ROBERT DALAND	(9)	Administrative and Public Policy, Comparative Bureaucracy
DONALD HAYMAN	(13)	Public Administration
WILLIAM KEECH	(16)	Electoral and Policy Processes in U.S. and Western Europe
PAUL KRESS	(17)	Normative and Empirical Political Theory, Philosophy of Social Science
LEWIS LIPSITZ	(19)	Political Philosophy and Empirical Political Theory
DUNCAN MACRAE	(21)	Policy Analysis
JAMES W. PROTHRO	(24)	American Politics, Public Opinion
RICHARD J. RICHARDSON	(26)	Judicial Politics and Policy
ROBERT RUPEN	(27)	Soviet Government, Communism in Asia
JOEL SCHWARTZ	(28)	Soviet Politics and Social Policy
ANDREW SCOTT	(29)	International Relations and Foreign Policy
DONALD SEARING	(30)	Socialization in Elite Organizations, Politics in England
JURG STEINER	(31)	Comparative Politics
JAMES WHITE	(34)	Comparative Politics, Political Demography, East Asia-Japanese Politics
DEIL S. WRIGHT	(37)	Public Administration, Intergovernmental Relations, Organization Theory

Associate Professors

MERLE BLACK	(4)	Political Behavior in South, State Government
CHI HSI-SHENG	(6)	East Asian Affairs, Comparative Politics, Contemporary China
JEFFREY OBLER	(23)	Comparative European Politics and International Relations
GEORGE RABINOWITZ	(25)	Social Statistics and Dimensional Analysis
LARS SCHOULTZ	(20)	Comparative Politics, Latin American Politics, U.S. Foreign Policy
ALAN STERN	(32)	Comparative Politics, Personality and Politics
GORDON WHITAKER	(36)	Public Administration, Urban Politics, Policy Analysis

Assistant Professors

CLAUDIO CIOFFI-REVILLA	(10)	Mathematical Models and International Relations Theory
DAVID J. GARROW	(42)	Civil Rights, Public Law, American Politics
BEVERLY GRIER	(12)	African Politics
MICHAEL LIENESCH	(38)	Classical Theory, American Political Thought
FRED LEE	(18)	American Politics, U.S. Presidency, Mass Media
CHARLES PHILLIPS	(40)	Public Law, Criminal Justice, Public Policy toward Crime and Delinquency
CARLISLE FORD RUNGE	(43)	Environmental Policy, Public Policy, Formal Theory

Lecturer

STUART RABINOWITZ	(39)	Political Behavior, Quantitative Methods, Mathematical Physiology
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Visiting Assistant Professors

JOHN K. JACOBSON	International Relations
DAVID HARRIS KIEL	Public Administration

Emeritus Professors

FEDERICO GIL
 S. SHEPARD JONES
 DAVID MONROE
 CHARLES B. ROBSON
 PAUL WAGER
 EARLE WALLACE

The Department of Political Science offers courses of study leading to the Master of Arts in Political Science, Master of Arts in Political Science with a certificate in Latin American Studies, and the Doctor of Philosophy in Political Science. The Department, with the collaboration of the Institute of Government, also offers a program of professional graduate study leading to the degree of Master of Public Administration.

Admission

The general prerequisite for admission to graduate study is a Bachelor of Arts degree or equivalent. A student is not required to have an undergraduate major in political science but will normally be expected to have had a minimum of nine semester hours of course work in political science.

All applicants for admission to graduate study are expected to have taken the Graduate Record Examinations. Prospective applicants should take these tests early enough to enable them to submit official reports of

scores with their application for admission. In some cases decisions on admission of applicants may be withheld until test scores are provided. In considering applications for fellowship award, these test scores are given heavy emphasis. Applicants are encouraged to have their applications complete by January 15.

Graduate Study in Political Science

Departmental programs of graduate study are intended to train professionally competent political scientists. Thus graduate work is expected to be qualitatively different from undergraduate work. Its emphasis is upon the acquisition of tools, skills, and knowledge at a level qualifying the student to teach, to carry on research, to fill active political and administrative duties, and in other roles to carry on the profession of practicing political scientists.

All candidates for graduate degrees will be expected to achieve broad mastery at the professional level of the literature, problems and skills of the academic fields and subfields offered for the degree, and will have gained experience in teaching and research. Much more is required of the candidate than a mere compilation of credits in relevant courses.

At the doctoral level, preliminary examinations are both written and oral, in that order. Written examinations are given twice each year, in September and in the spring semester, that date to be determined prior to that semester. The final part of the examination is an oral defense of the dissertation proposal. Successful completion of these examinations permits a student to become a doctoral candidate. Following completion of the dissertation, a final oral examination will be held, which is primarily a defense of the dissertation but may include such excursions into underlying theory and related fields as are germane to the dissertation.

At the M.A. level (excluding specialized programs described below), the student is required, in addition to passing successfully the course programs, to write a thesis and to be examined orally on both the major field of interest and in defense of the thesis.

Field and Course Requirements

The political science curriculum is designed to insure that graduate students develop both a professional competence in the discipline as a whole and expertise in one major and two minor fields of political science. The courses in the Department are grouped under the following broad categories: International Relations, Comparative Politics, Political Philosophy, American Politics, Public Policy/Public Administration, and Methodology.

Students are required to demonstrate competence in *three* fields of study, one of which may be in a related discipline of political science. A

minimum of four courses *and* a comprehensive examination is required in the major field. In each of the two minor fields, a comprehensive examination *or* three courses will be required.

Master of Public Administration Degree Program

Program Overview. The University of North Carolina at Chapel Hill offers a two-year graduate program leading to the MPA degree. The aim of the program is to provide a generalized background and selective specific training necessary to educate students for responsible administrative roles in the public service. The curriculum is flexible, including a structured core of seven courses combined with elective coursework suited to individual interests and particular career goals.

The MPA Program is offered by the Department of Political Science with the support of the Institute of Government. The wide-ranging resources of the University permit course options and concentrations in such fields as Urban Management, Personnel Administration, Finance and Budgeting, Urban Policy, Health Administration, Public Policy Analysis and others. Students with an interest in a particular level of government may concentrate the course work in that field. The degree program is intended, however, to prepare administrative generalists rather than specialized technicians.

Admission Requirements. The MPA Program is open to men and women from many differing backgrounds. A majority of past entrants into the program have had undergraduate majors in the social sciences, especially Political Science, but applicants have been accepted with undergraduate majors in Architecture, Business Administration, Engineering, English, History, and Industrial Relations. Minorities have comprised approximately one-third of each 20-member class in recent years.

Preference is given to applicants with demonstrated and clear career interests in the public service. A significant segment of the enrollees come directly from full-time employment. The remainder enter immediately after receiving undergraduate or graduate degrees. Admission to the program is highly selective because of the large number of applicants and the small size of the program.

The requirements for admission are:

A bachelor's degree;

At least a "B" average in the undergraduate major and a generally strong academic record;

A minimum of nine credit hours in political science or the equivalent, including course work in American government;

Submission of verbal and quantitative scores on the Graduate Record Examinations;

An oral interview with the MPA Admissions Committee.

Admission to the program is made only for the fall semester (starting in August) of each year. Applications are normally accepted until April 1, but since nearly all admission decisions are made by late March, applications and all supporting materials should be submitted by January 22. The GRE should be taken by October or December at the latest. Application blanks may be requested from the Graduate School, 200 Bynum Hall. After a preliminary screening of applications, notifications are made concerning the oral interview. In most cases, letters of acceptance and financial awards will be sent by April 15.

Financial Aid. Financial aid is available for students with outstanding records. Also, nonresidents who have special skills as research assistants may qualify to pay in-state tuition. Loans are available on the student's own initiative from the Insured Student Loan Program. Information about this program is available from the Student Aid Office, 300 Vance Hall.

Several types of financial aids are available through the MPA Program: Harry V. Anderson, Jr., Fellowship, granted by the Management Improvement Corporation of America; John Gold Scholarship, granted annually by the North Carolina County and City Management Association; Research Assistantships provided by the Institute of Government and the Department of Political Science; Local Government Traineeships; Public Service Fellowships (U.S. Office of Education).

Prospects for financial assistance are improved if applications are received early.

Course Work and Degree Requirements. The MPA Program requirements include a full calendar year of on-campus coursework followed by a nine-month professional work experience in a public agency. This off-campus year of the program is augmented by six two-day seminars during the fall and spring semesters. A research paper and final oral examination are also required of all candidates. A total of 45 semester hours of course credit is necessary for completion of the degree.

Seven required core courses are designed to give the political, organizational and analytic backgrounds necessary to the modern administrator. These are:

- 1) *Organizational Theory:* Examination and comparison of major organizational and administrative models including case studies and individual research. (3 credit hours.)
- 2) *Administrative Behavior:* Group dynamics learning exercises relating to communication and decision making in organizations. Development of understandings and skills involved in interpersonal relationships. (3 credit hours.)

- 3) *Program Evaluation and Quantitative Analysis*: Designed to teach students how to apply science research techniques to administrative program operation. Includes theory and basic methods of quantitative analysis and data interpretation. (3 credit hours.)
- 4) *Public Administration and Policy Making*: Study of the process of policy making within government organizations, including consideration of the social and political environmental factors which influence public policy. Emphasis on program planning, policy implementation and the value systems of administrators. (3 credit hours.)
- 5) *Government Budgeting*: The processes and politics used to allocate limited public resources; special attention given to diverse budgetary theories and techniques and to selected analytical methods of evaluation. Brief introduction to governmental accounting and work on a field problem whenever possible. (3 credit hours.)
- 6) *Governmental Accounting Lab*: Principles of accounting in public and non-profit organizations within the context of the general fund. Provides skills necessary for analyzing efficiency and effectiveness of government programs. (1 credit hour.)
- 7) *Administrative Writing Lab*: Improves the quality of administrative writing by developing a style characterized by clarity, brevity and precision. Seminar sessions are supplemented by individual meetings with the instructor. (1 credit hour.)

In addition to the core courses, each student has the option to elect an area of concentration and selects elective courses with the assistance of the Director of the MPA Program. The curriculum is thus tailored to each student's needs.

Professional Work Experience. The second-year of the MPA Program extends MPA education into a work situation in a public agency. This off campus work experience is generally pursued after twelve consecutive months of full-time, on-campus study. Six seminar sessions are conducted during the two-semester period. They represent a series of discussions, lectures and group experiences designed to tie academic training and developments in the field of public administration with the realities of public service work. During this experience, degree candidates are paid a full salary by the employing agency and are expected to work as regular members of the organization. Students are responsible for securing their own positions in public agencies. The assistance of MPA faculty and staff is an important part of this process.

Master of Arts Certificate Program in Latin American Studies

The increased participation of the United States in world politics has opened a variety of new careers in international affairs. Excellent opportunities in national and international government service—such as the

U.S. Foreign Service, the United Nations Secretariat, the U.S. Armed Services—as well as in business and journalism are open to persons with a basic knowledge of the processes of international politics, and of the public affairs of specific world areas. Often these careers require special competence in foreign languages, social science and history, public administration, or other subjects in addition to training in political science.

In order to provide training for a variety of careers in this field the Department offers programs leading to a Master of Arts in Political Science with a certificate in Latin American Studies.

This special program will normally require two years of graduate residence. The additional time invested is believed to yield correspondingly greater returns in professional placement and advancement.

Requirements for the Master of Arts in Political Science with the Certificate in Latin American Studies

The requirements are:

1. minimum of two (2) semesters of residence
2. twenty-seven (27) hours of coursework (including a minimum of twelve (12) in courses about Latin America)
3. three (3) hours of thesis in a topic related to Latin America
4. Oral defense of the thesis
5. Proficiency in Spanish or Portuguese.

The Louis Harris Data Center

National pollster Louis Harris has been surveying Americans' opinions on issues of national importance since the late 1950s. Harris surveys cover many topics, including national morale, the arts, energy policy, women's roles, political candidates, violence, health, housing, and so on. Because of the breadth and scope of the Harris surveys, they are a rich source for secondary analysis by social scientists. In addition, Harris data provide information about attitudes and opinions among many different social groups. Although most Harris surveys are cross-sectional, polls have also been conducted to tap the opinions of college students, political and business elites, Vietnam veterans, community residents, and many others.

In 1965, Louis Harris agreed to make his data available for secondary analysis by researchers. Mr. Harris and the University of North Carolina jointly agreed to establish at Chapel Hill the Louis Harris Data Center as the national archive for all Harris data. Since 1965, over 200 national, state, and community studies conducted by Louis Harris and Associates have been deposited at the Harris Data Center for use by researchers at the University of North Carolina and elsewhere.

The data holdings of the center available to students and faculty of the Department of Political Science are not restricted to the Harris material.

The University of North Carolina at Chapel Hill is a charter member of the Inter-University Consortium for Political and Social Research and holds the largest collection of ICPSR data sets of any American university save only the Consortium headquarters at Ann Arbor, Michigan. Through the Center the University is also a member of the International Survey Library Association, providing access to the data collections of the Roper Public Opinion Research Center, including surveys conducted by the American Institute of Public Opinion (Gallup Poll) and its international affiliates. In addition the Center has become the repository for many other valuable studies, such as the *Miami News Herald* and *Detroit Free Press* urban surveys conducted for the Knight-Ridder newspapers, and the in-depth survey of 11,600 low-income families in North Carolina conducted by the North Carolina Fund.

The main objectives of the Harris Political Data Center are the efficient indexing and retrieval of social science data; the promotion and utilization of these bodies of data in the research and related teaching activities of faculty and graduate students; and the provision of hardware and software data facilities for students and faculty, including training in the use of these facilities.

The Department of Political Science and the Institute of Government

The Institute of Government is the University's principal agency to provide training, consulting and research services for state and local governments in North Carolina. As one of the oldest university-based governmental research and training organizations in the United States, the Institute has gained distinction for the high quality and diversity of its professional staff and for the comprehensive character of its program.

Recognizing their strong mutual interest in encouraging fuller understanding of and improvement in government and public administration in North Carolina, the Institute and the Department of Political Science work together in pursuing these ends. They collaborate for example in offering the professional training program leading to the Master of Public Administration degree. Several members of the Institute faculty regularly teach courses in this program. Institute staff members also carry major responsibility for placing and supervising MPA students during their internship assignments.

In addition, Institute staff members teach other courses for the Department of Political Science and from time to time serve on thesis and dissertation committees. On occasion, a political science faculty member or advanced graduate student joins the Institute staff on a part-time basis to pursue research important to the Institute program. Finally, political science graduate students regularly make use of the Institute's library collection of state and local government research materials and call upon

Institute faculty for informal consultation and guidance in their research. In short, the Department of Political Science finds the professional staff, the program and the facilities provided by the Institute of Government a major resource supporting creative scholarly work in American government and public administration.

Publications

Under the direction of the departments involved, there is published *The James Sprunt Studies in History and Political Science*, established by the late Dr. James Sprunt, of Wilmington, North Carolina.

Courses for Graduates and Advanced Undergraduates

- 102 URBAN POLITICAL SYSTEMS (3). Characteristics, political processes, and actor behavior in urban political systems. *Spring*. Daland, Whitaker.
- 104 MUNICIPAL ADMINISTRATION IN THE UNITED STATES (3). An examination of the programs, processes, techniques, and problems of municipal government. A budget simulation project is used to examine the process by which policy decisions are made. *Spring*. Hayman.
- 105 PUBLIC PERSONNEL ADMINISTRATION (3). A review of theory and practice of public personnel administration with an emphasis on the major current policy problems. *Fall*. Hayman.
- 110 POLITICS AND LITERATURE (3). Prerequisite: One political science course other than Political Science 41 or any literature course. Models of politics available in literature and literature as political activity. Draws from English and other literature in translation. *Spring*. Baloyra, Lipsitz, Kress.
- 117 POLITICAL ECONOMY I: THE DOMESTIC SYSTEM (3). Prerequisites, Economics 31 or 32, Political Science 52 or permission of instructor. Problems of the national government in managing capitalist development and economic growth; political constraints, patterns of conflict among domestic actors; emphasis on underdeveloped countries. *Fall*. Baloyra.
- 118 POLITICAL ECONOMY II: THE NATION-STATE IN THE WORLD SYSTEM (3). Prerequisites, Political Science 52 and 86/Economics 161 or 163 or permission of instructor. The nation-state as manager of a nation's economic role in the world system; problems of vulnerabilities and policy; patterns of conflict and cooperation with other actors. *Fall*. Baloyra.
- 119 POLITICS OF AUTHORITARIAN REGIMES (3). comparative analysis of basic processes, strategies and structural features of contemporary authoritarian regimes. Student selects preferred region or country for concentrated study. *Fall*. Baloyra, Daland.
- 123 COMPARATIVE COMMUNIST SYSTEMS (3). Comparative analysis of such issues as revolution, socialization, social control work in industrialized societies, economic and social inequality. Emphasis is upon short position papers and small group discussions. *Spring*. Schwartz.
- 124 COMMUNISM IN ASIA (3). This course deals primarily with Russian-Chinese relations but also analyzes the USSR in Asia and the borderlands of Sinkiang and Mongolia. *Fall*. Rupen.
- 127 GOVERNMENT AND POLITICS IN LATIN AMERICA (3). Prerequisite, Political Science 56 or permission of the instructor. The forms of organization, the functions, and the operations and dynamics of government in Latin America with emphasis on present conditions and trends. *Fall*. Gil.

- 128 EUROPEAN POLITICS (3). Deals with the major and some of the smaller European countries. Discussion of current events; theoretical work; partly in small groups. *Fall and spring*. Steiner.
- 130 SOUTHERN AFRICA IN CONFLICT (3). The problems of race, class and ideology are explored in the countries south of the Zambesi River along with the political and economic ties that bind these countries. *Spring*. Grier.
- 131 COMPARATIVE SOCIAL POLICY (3). An evaluation of such social policies as welfare, social security, health, education and fiscal policies in the context of alternative conceptions of distributive justice. The social policies of the United States, England, and, to a lesser extent, France and Sweden will be examined. *Spring*. Obler.
- 132 HEALTH SYSTEMS AND POLITICAL SYSTEMS (3). An examination of the impact of politics and ideology on the organization and delivery of medical care services in the U.S., Great Britain, and the U.S.S.R. *Spring*. Schwartz.
- 134 NORTH CAROLINA POLITICS AND PUBLIC POLICY (3). An intensive study of politics, government and public policy in the State of North Carolina. Emphasis is placed on student research projects, with a major paper the main requirement. *Fall*. Beyle, Howes.
- 135 STATE POLITICS AND PUBLIC POLICY (3). The comparison of development and implementation of public policy in the states. Special emphasis is placed on the impact of the political process and intergovernment relations. *Spring*. Black.
- 136 CONTEMPORARY SOUTHERN POLITICS (3). Southern political behavior after 1954, with emphasis on following topics: southern political culture, caste and class divisions within the region, nature and effects of historic one-party system, revival of black political participation, the Wallace movement, growth of presidential and gubernatorial Republicanism, and changing roles of the South in national politics. *Spring*. Black.
- 139 EAST EUROPEAN COMMUNISM (History 189) (3). *Fall*. Anderle.
- 141 THE THEORIES OF WAR AND PEACE (3). Reviews various theories and studies of causes of international and intra-national conflict situations and explores theoretical and empirical bases of conflict resolutions. *Fall, spring*. Staff.
- 142 QUANTITATIVE INTERNATIONAL RELATIONS (3). The use of quantitative theory, methods and data in analyzing international relations and forecasting conflict and cooperations. *Spring*. Staff.
- 143 CONTEMPORARY PROBLEMS OF SOVIET FOREIGN POLICY (3). General propositions about contemporary foreign relations of the USSR will be examined through analysis of selected case studies. *Spring*. Rupen.
- 144 AMERICAN FOREIGN POLICY: FORMULATION AND CONDUCT (3). This course focuses on the making of American foreign policy. It deals with the role of Congress, the press, public opinion, the President, the Secretary and the Department of State, the military, and the intelligence community. Emphasis is placed on the impact of the bureaucratic process on the content of foreign policy. *Fall and spring*. Scott.
- 145 CONTEMPORARY INTERNATIONAL RELATIONS OF THE UNITED STATES (3). A study of selected United States foreign policy problems since World War II; analysis of the process of policy formulation from Truman to Reagan; and of the impact of the external environment and domestic politics on the White House and Department of State. *Spring*. Staff.
- 146 INTERNATIONAL COMMUNICATIONS AND COMPARATIVE JOURNALISM (Journalism 146) (RTVMP 146) (3). *Fall, spring*. Cole.
- 147 CONTEMPORARY INTER-AMERICAN RELATIONS (3). Stresses new patterns of hemispheric international relations and foreign policies of individual Latin American nations; also such topics as transnational corporations, Third World relations, and specific problem areas involving the United States. *Fall*. Staff.

- 148 THE MIDDLE EAST IN WORLD POLITICS (3). A study of the contemporary international relations of the Middle East, including an analysis of country, regional, and global factors shaping the foreign relations of Middle East states and non-state actors. Emphasis on problems of war, diplomacy, and peace in the Arab-Israel and Persian Gulf areas since World War II. *Fall*. Staff.
- 149 DEFENSE POLICY AND NATIONAL SECURITY (3). A study of national defense policy as affected by the constitutional and political setting, as well as its relation to foreign policy. Some attention to strategic doctrine. *Fall and spring*. Rupen.
- 150 EUROPEAN FOREIGN POLICIES (3). Foreign policies of European countries towards each other, towards superpowers, European Community, NATO, and developing countries. Foreign policy sectors considered include political, technological, security, and economic areas. *Spring*. Cioffi.
- 152 ADMINISTRATION OF JUSTICE: PRETRIAL (3). Reading, discussions and case studies dealing with the problems of politics, law and the administration of justice prior to the trial. *Spring*. Cleveland.
- 153 CONSTITUTIONAL POLITICS AND THE JUDICIAL PROCESS (3). Analysis of the structure and functions of judicial systems emphasizing the organization, administration and politics of judicial bureaucracies and roles of judges, juries, counsel, litigants, and interest groups in adjudication process. *Fall*. Richardson.
- 154 THE JUDICIAL SYSTEM AND NATIONAL SECURITY (Cross-listed with PWAD 154) (3). Analysis of the critical role of the American judicial system in questions of national security with special attention to constraints of the powers of President, Congress, and security agencies. *Fall, alternate years*. Richardson.
- 155 THE CONSTITUTION OF THE UNITED STATES (History 175) (3). A study of the fundamental principles of constitutional interpretation and practice in the United States by means of lectures, textbooks, and cases. Emphasis will be on the political context surrounding and the impact following Supreme Court decisions. *Fall and spring*. Garrow.
- 157 CIVIL LIBERTIES UNDER THE CONSTITUTION (3). An analysis of the complex problems created by the expansion of protections for individual liberties in the United States. Emphasis will be on contemporary problems with some supplement involved in effecting changes in correctional administration. *Spring*. Garrow.
- 158 THE PROBLEMS OF CHANGE IN CORRECTIONAL ADMINISTRATION (ADJU 103). An analysis of the political, legal, and administrative problems involved in effecting changes in correctional administration. *Spring*. Bounds.
- 159 CRIMINAL LAW—DEVELOPMENT AND ADMINISTRATION (ADJU 101) (3). Analysis of problems in defining, invoking, and administering criminal law as a governmental process. *Spring*. Bounds.
- 160 SOCIAL CLASS INEQUALITIES AND POLITICAL CHANGE (3). A comparative analysis of the political consequences of the stratification systems in industrial societies. Topics include: the development of class consciousness, the acquisition of psychological skills and orientations. *Fall*. Stern.
- 161 SOCIAL AND POLITICAL PHILOSOPHY (Philosophy 105) (3). An examination of the logic of social and political thought with an emphasis of such concepts as society, state, power, authority, freedom, social and political obligation, law, rights. *Spring*. Falk.
- 162 AMERICAN POLITICAL THOUGHT (3). A historical and analytic examination of the ideas underlying the political culture and institutions of the United States. *Spring*. Kress, Lienesch.
- 163 MARXISM AND SOCIALISM (3). A consideration of the political thought of major Marxist and socialist schools, including Marxism, Leninism, contemporary Democratic and Revolutionary Socialism—with reference to Utopian socialism, and recent controversies on the left. *Fall*. Lipsitz.

- 165 PROBLEMS OF MODERN DEMOCRATIC THEORY (3). Major problem areas: definitions, presuppositions, and justifications of democracy, liberty, equality, minority rights, public interest, participation, dissent and civil disobedience. *Fall*. Keech, Runge.
- 166 RECENT AND CONTEMPORARY POLITICAL THOUGHT (3). Prerequisite, Political Science 63, 64 or equivalent. Political theory since Marx with emphasis upon the contributions from other social sciences, the theoretical implications of recent methodological developments and related normative theory. *Spring*. Kress.
- 167 POLITICAL THOUGHT AND IDEOLOGY IN CONTEMPORARY LATIN AMERICA (3). Prerequisite, Political Science 56 or 127 or permission of instructor. Surveys of nineteenth and twentieth century political thought, with major focus placed on contemporary ideologies and movements. *Spring*.
- 168 RECENT DEVELOPMENTS IN POLITICAL PHILOSOPHY (Philosophy 130) (3). A philosophical study of works by major contemporary contributors (e.g., Rawls, Arrow, Wolff, Walzer, Nozick) to such topics as justice, democratic decision-making, legitimate authority, political obligation, natural rights. *Spring*.
- 170 U.S. NATIONAL ELECTIONS (3). Course studies U.S. Presidential and Congressional elections. Emphasis on individual vote, changing party strengths, and the relation of outcomes to policy. *Spring*. G. Rabinowitz.
- 171 RACE, POVERTY, AND POLITICS (Human Services Administration 171) (3). Definitions of poverty and their policy implications; the composition and causation of poverty; an examination of public policies directed at the alleviation, reduction, and elimination of poverty. *Spring*. Schwartz.
- 172 EXECUTIVE POLITICS (3). An examination of political roles and behavior of chief executives and their advisory networks, with emphasis on the American presidency. *Spring*. Staff.
- 173 GOVERNMENT AND THE ENVIRONMENT (3). Examines political implications of environmental problems; environmental policy making and implementation processes in the U.S., and management problems in selected policy areas such as population, energy, pollution, the ocean, land, hazardous waste, wilderness areas. *Fall*. Daland.
- 174 MASS MEDIA AND AMERICAN POLITICS (3). Prerequisites, junior/senior standing and Political Science 41. Examination of the role, behavior, and influence of the mass media in American politics. Lee.
- 175 METHODS FOR POLICY ANALYSIS AND EVALUATION (PUPA 175) (3). Introduction to selected techniques such as the following: multiple regression, decision theory, research design, social experiments and quasi-experiments, program evaluation, and policy-related models. *Fall*. Staff.
- 179 SCIENCE AND POLICY (Sociology 179) (PUPA 179) (3). The problems of using expert knowledge in democratic policy formation. These relate to communication within scientific disciplines; scientists' values; and the use of scientific information and personnel in decision making. *Fall and spring*. MacRae, Schroerer.
- 182 ISSUES OF NATIONAL POLICY (3). An examination of the politics, development and administration of recent national public policies, with emphasis on welfare, education, housing, poverty, urban, renewal, and federal metropolitan programs. *Spring*. Keech.
- 183 STATISTICS (3). Elementary descriptive statistics and basic principles of statistical inference including estimation and tests of hypotheses. *Fall*. S. Rabinowitz.
- 184 INTERMEDIATE STATISTICS (3). This course will extend the coverage of Political Science 183. Topics to be covered will include analysis of variance, multiple and partial correlation, and multiple regression. *Spring*. G. Rabinowitz.
- 185 CAUSAL ANALYSIS OF POLITICAL DATA (3). Prerequisite, Political Science 184 or equivalent. Use of regression and other techniques in political research. Special

- emphasis on attribution of causation and its role in analysis of political data. *Fall*. S. Rabinowitz.
- 186 DIMENSIONAL ANALYSIS (3). Prerequisite, Political Science 184 or equivalent. Deals with methods used to scale political data, and the assumptions underlying their use. Topics include German scaling, difference scaling. *Spring*. G. Rabinowitz.
- 187 AGGREGATE AND TIME SERIES ANALYSIS (3). Prerequisites, Poli. 196 or permission of instructor. The course will extend the coverage of Poli. 186. Topics to be covered include problems of inference across levels in political research and the analysis of political data over time. *Spring*. (Alternate years.) Staff.
- 191 INTRODUCTION TO PUBLIC FINANCE (Economics 140) (3). Principles and practices of the budgetary activities of American governments—federal, state, and local. Students may not receive credit for both Econ 140 and 141. *Fall or spring*. Akin, Wertz, Wilde.

Courses for Graduates

- 200 PRINCIPLES AND PROBLEMS OF POLITICAL INQUIRY (3). Prerequisite, permission of instructor. A consideration of the theory and process of political analysis including philosophy of science, research design, the methods of drawing casual inferences, and of generating and analyzing data. *Fall and spring*. Prothro, Kress.
- 201 COMPARATIVE POLITICAL RESEARCH AND ANALYSIS (3). The seminar introduces the beginning graduate student to the central issues and major developments in the field of comparative government and politics. *Fall and spring*. Steiner, Searing.
- 202 THEORY AND METHOD IN INTERNATIONAL RELATIONS (3). The seminar introduces the beginning graduate student to the central issues and major developments in the field of international relations and foreign policy. Students practice writing research designs, evaluating theoretical models, methodologies and data sets. *Fall and spring*. Azar, Scott, Cioffi-Revilla.
- 203 CLASSICS IN THE STUDY OF AMERICAN POLITICS (3). An analysis of major works on American politics. *Fall*. Staff.
- 206 INTERVIEWING IN SOCIAL SCIENCE RESEARCH (3). This seminar deals with the theoretical underpinnings and practical execution of interview techniques ranging from the short survey instrument to the adaptation of prolonged clinical interviews. Most of the work will emphasize different varieties of in-depth interviewing. *Fall*. Stern.
- 208 RESEARCH AND PUBLIC POLICY (3). Introduction to the theory and practice of action research. Basic concepts and the philosophical issues involved in action research. Experimental learning activities introduce the main personal capacities and skills needed for doing action research. Involves an action research project in public organization with class members working as a team. *Spring*. Daland.
- 209 PLANNING AND GOVERNMENT (City and Regional Planning 209) (3). A survey of nature and scope of government planning, its relation to other governmental activities, and its administrative and organizational problems. *Spring*. Howes, Beyle.
- 210 ORGANIZATION THEORY (3). Examination of major theories dealing with organizational characteristics and processes. The relationship between theories and supporting empirical research. *Fall; spring*. D. Wright.
- 211 ADMINISTRATIVE BEHAVIOR (3). Theories and empirical studies about human behavior in large organizations and the impact of organizations on human interrelationships. Skills and strategies in organizational development and change. *Spring*. Staff.
- 212 PROGRAM EVALUATION AND QUANTITATIVE ANALYSIS (3). The application of social science research to administrative problems, including practical methods

- of gathering, analyzing and interpreting data. Theory and basic techniques underlying quantitative analysis of public programs. *Fall*. MacRae, Whitaker.
- 213 PUBLIC ADMINISTRATION AND POLICY MAKING (3). Public policy in terms of static and dynamic models of the process and a synthesis which attempts to resolve the two. Policy from the perspective of the policy maker; cases exploring the relation of theory to actual policy processes. Students complete modules at their own pace; work evaluated by the instructor in individual conferences. *Fall, spring*. Daland.
- 214 GOVERNMENT BUDGETING (3). The processes and politics used to allocate limited public resources; special attention given to diverse budgetary theories and techniques and to selected analytical methods of evaluation. Brief introduction to governmental accounting and work on a field problem whenever possible. *Spring*. Staff.
- 215 ADMINISTRATION IN CLIENT-CENTERED SERVICES (3). Examination of organizational alternatives and administrative practice employed in agencies involved in changing client behavior. *Spring*. Whitaker.
- 216 LEGAL ISSUES IN STATE/LOCAL GOVERNMENT (3). Prerequisite, graduate standing. Substantive law applied to aspects of governmental and administrative operations in state and local government. Topics include: state-local relations, government structures, liabilities of officials, financial and regulatory activities. *Spring*. Staff.
- *217 INTERNSHIP SEMINAR IN ADMINISTRATIVE BEHAVIOR AND HUMAN RELATIONS (2). The administrator's role within an agency, leadership, supervision, delegation, programming, developing high morale, and resolving human relations problems. *Fall*. Staff.
- *218 INTERNSHIP SEMINAR IN THE ADMINISTRATIVE PROCESS (2). The agency's mission and authority, administrative procedures, exercise of controls over administrative action, the role of the line administrator and staff specialist, and the applicability of administrative theory to practice. *Spring*. Staff.
- 220 THE POLITICS OF DEVELOPMENT AND CHANGE (3). Prerequisite, permission of instructor. The theories, concepts and mechanisms of political change, with particular attention to processes of development and modernization in new nations of Africa, Asia, and Latin America. *Fall*.
- 224 COMMUNIST POLITICAL SYSTEMS (3). An examination of the political evolution and process in societies governed by communist parties. *Fall*. Rupen, Schwartz.
- 227 MODERN POLITICAL PARTIES AND MOVEMENTS IN LATIN AMERICA (3). Development, structure, functioning, and role of contemporary political parties and movements in Latin America. The role of political parties in modernization and revolutionary change. *Spring*. Gil.
- 228 LATIN AMERICAN POLITICS: PROBLEMS OF RESEARCH AND ANALYSIS (3). Examines problems of field research, assesses contemporary political science research on Latin America, and reviews major works in the literature. *Fall*.
- 229 CENTRAL ASIA (3). Contemporary political and social institutions of area including Mongolia, Sinkiang, and Tibet. Rupen.
- 231 COMPARATIVE BUREAUCRACY (3). A cross-national examination of functions, career patterns, role behavior, and relationships of bureaucratic elites within the context of national political systems. Research on particular countries will be emphasized. *Fall*. Daland.
- 232 GOVERNMENT AND POLITICS IN METROPOLITAN AREAS (3). Changing patterns of political cooperation and conflict in metropolitan areas; political behavior in central and suburban areas; the large metropolis as a political system; and national policies toward metropolitan problems. *Spring*. Daland.

- 233 GOVERNMENTAL ACCOUNTING LAB (1). Prerequisite, enrollment in the MPA Program. Teaches the principles of accounting in public and non-profit organizations within the context of the general fund. Provides skills necessary for analyzing efficiency and effectiveness of government programs. *Spring*. Staff.
- 234 ADMINISTRATIVE WRITING LAB (1). Prerequisite, enrollment in the MPA Program. Improves clarity, brevity and precision in administrative writing. Seminar sessions supplemented by individual tutorials with the instructor. *Fall*. Staff.
- 235 ENVIRONMENTAL POLICY ANALYSIS (3). Analytic techniques, issues and cases in environmental policy. Economics and politics of regulation in selected areas with emphasis on interdisciplinary approaches. *Fall*. Runge.
- 236 RESEARCH TOPICS IN CONTEMPORARY SOUTHERN POLITICS (3). Topics will vary, but will include minority politics in the region, the counter-mobilization of whites during the 1960's, party realignment and the decline of one-party politics, and the impact of the region on national politics. *Fall or spring*. Black.
- 238 INTERGOVERNMENTAL RELATIONS (3). Conflict and cooperation among governmental officials representing national, state and local governments in the U.S.; changing roles of governments, and new mechanisms for intergovernmental collaboration. *Spring*. Wright.
- 244 THEORY-BUILDING IN INTERNATIONAL RELATIONS (3). An advanced research seminar focusing on alternative approaches to theory-building in international relations. Students' written work is expected to be of publishable quality. *Spring*. Azar.
- 247 THEORIES OF INTERNATIONAL CONFLICT AND COOPERATION (3). A practical workshop on contemporary empirical theory and research with an emphasis on conflict and conflict resolution. Seminar leads to the preparation of a final research report. *Spring*. Cioffi-Revilla.
- 248 INTRODUCTION TO MATHEMATICAL INTERNATIONAL RELATIONS (3). Surveys research in mathematical models of international decisionmaking, bargaining, systemic change, arms races, coalitions, and perception. Philosophic and historical considerations about this field are also discussed. *Spring*. Cioffi-Revilla.
- 249 SEMINAR IN PROBLEMS OF U.S. MILITARY POLICY AND CIVIL-MILITARY POLITICS (3). Research seminar in problems of U.S. military policy and civil-military problems, focused chiefly on deterrence, arms control and disarmament. *Rupen*.
- 252 THEORIES OF POLITICAL CONFLICT (3). Logical analysis and empirical application of current theories of political conflict (exchange theories, game theories, bargaining theories, etc.) *Spring*. Steiner.
- 253 JUDICIAL BEHAVIOR (3). Survey of the theory, method, and substantive findings of recent empirical research in the political culture, personal attributes and attitudes, and institutional roles to adjudicatory decision-making behavior. *Spring*. Richardson.
- 255 PROBLEMS IN CONSTITUTIONAL LAW (3). Wallace.
- 261 MAJOR ISSUES IN POLITICAL THEORY (3). An introduction to the major issues of political theory, with emphasis on the major thinkers in the history of Western political thought. *Fall or spring*. Lipsitz, Kress, Lienesch.
- 262 AMERICAN POLITICAL THEORY (3). Survey of issues and problems in American political thought, with analysis of major thinkers and selected topics, and emphasis on the role of family, society and economy in political theory. *Spring*. Lienesch.
- 263 CLASSICAL POLITICAL THEORY (3). An introduction to ancient and medieval political thought, its major thinkers and issues. *Spring or fall*. Lipsitz, Kress, Cleveland, Lienesch.
- 264 MODERN POLITICAL THEORY (3). An introduction to modern political thought, its major thinkers and issues. *Fall or spring*. Lipsitz, Kress, Lienesch, Cleveland.

- 265 SOCIAL SCIENCE AND POLITICAL THEORY (3). Examination of images and problems of a 'science' of society emerging from the Enlightenment, nineteenth and twentieth centuries. Liberalism, Marxism, Phenomenology, and Existentialism compared to 'traditional' claims to knowledge. *Fall*. Kress.
- 270 PUBLIC OPINION (3). A study of public opinion, its formation, expression, and impact on political systems and public policy. *Spring*. Prothro.
- 271 DYNAMICS OF ELECTORAL POLITICS (3). Change within mass electorates. Topics will include issue and attitude change, political realignments, and models of electoral competition. *Spring*. Rabinowitz.
- 272 POLITICAL SOCIALIZATION (3). The learning process by which individuals acquire values, attitudes, and norms affecting their behavior in the political community, with emphasis on major agencies of socialization: family, schools, peer groups, and media. *Spring*. Stern.
- 275 POLITICAL PARTIES (3). Selected problems and issues in the study of American and comparative parties and party systems. *Spring*. Keech.
- 280 LEGISLATIVE SYSTEMS (3). Institutions and processes in the U.S. Congress with some cross national comparisons. *Spring*. Keech.
- 285 AMERICAN PRESIDENCY (3). Survey of the substantial literature and research on the American Presidency. *Fall*. Lee.
- 299 TEACHING OF POLITICAL SCIENCE (3). The teaching of political science—a consideration of instructional and educational methods relevant to the teaching of political science to undergraduates. *Fall*. Staff.
- 300 POLITICAL SCIENCE RESEARCH (3). Permission of instructor required. Presentation of theory, method, and data analysis in political science research reports. *Spring*. Searing.
- 301 INTERNATIONAL POLITICS (3). *Fall*. Azar, Scott.
- 302 SEMINAR IN INTERNATIONAL INTERACTIONS (3). Prerequisites, Political Science 202 or permission of instructor. Empirical research seminar on structural and behavioral correlates of conflictive and cooperative interactions.
- 303 THEORIES OF INTERNATIONAL POLITICS (3). Topics relating to the development of theory in the realm of international politics. *Spring*. Scott.
- 305 SEMINAR ON APPLICATION OF POLITICAL BEHAVIOR RESEARCH TO PUBLIC PROBLEMS (3). Exploration and examination of the ways in which political behavior research can be applied to understanding and ameliorating public problems. *Spring*. Beyle, Keech.
- 306 COMPARATIVE URBAN POLITICS (3). Cross-national analysis of urban problems and decision-making processes. *Fall*. Staff.
- 307 SEMINAR ON POLICY ANALYSIS (3). Common normative, political, and behavioral aspects of policy choice in diverse fields; e.g., urban education, health, welfare, population, and foreign policy. Public policies may modify or replace the market. *Fall or spring*. MacRae.
- 308 COMPARATIVE PUBLIC POLICY (3). Cross-national analysis of various public policy areas. *Fall*. Obler.
- 309 PUBLIC POLICY (3). An examination of the recent literature in the field of public policy. *Fall*. Beyle.
- 311 SEMINAR IN POLITICAL SOCIOLOGY (Sociology 311) (3). The relationships between social structure and political decisions. Regimes and social structure; bureaucracies, political associations, and professions; science and politics; closed and open politics; political movements and change. *Spring*. MacRae.
- 321 SEMINAR IN AMERICAN GOVERNMENT AND POLITICS (3). *Fall*. Beyle, Black.

- 341 DIRECTED READINGS IN POLITICAL SCIENCE (Variable). Directed readings in a special field under the direction of a member of the graduate faculty. By permission only. *Fall and spring*. Graduate Faculty.
- 342 SPECIAL TOPICS IN POLITICAL SCIENCE (1-3). Prerequisite, permission of the instructor. Seminar in selected areas of Political Science. Topics will vary from year to year. May be repeated for credit. *Fall, spring, summer*. Graduate Faculty.
- 346 SEMINAR IN INTERNATIONAL COMMUNICATION (Journalism 346) (3). Prerequisite, Journalism 146 or permission of the instructor. *Spring*. Cole.
- 361 SEMINAR IN POLITICAL THEORY (3). Special topics in political theory such as Marxism and Socialism, Democratic theory, contemporary political thought, or related topics. *Fall or spring*. Lipsitz, Kress, Cleveland, Lienesch.
- 353 JUDICIAL BEHAVIOR RESEARCH (3).
- 393 MASTER'S THESIS (3 or more). *Fall and spring*. Members of the graduate faculty.
- 394 DOCTORAL DISSERTATION (3 or more). *Fall and spring*. Members of the graduate faculty.
- 395 RESEARCH IN PUBLIC ADMINISTRATION (3-6). *Fall, spring, and summer*. Staff.
- 400 GENERAL REGISTRATION (0).

DEPARTMENT OF PSYCHOLOGY

JOHN H. SCHOPLER, *Chairman*

Professors

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| MARK I. APPELBAUM | (1) | Applied Multivariate Statistics, Experimental Design, Psychological Aspects of Population |
| GEORGE BAROFF | (2) | Mental Retardation |
| ROBERT CAIRNS | (4) | Origins and Plasticity of Social Interchanges |
| JOHN B. CARROLL | (6) | Psycholinguistics, Psychometrics of Individual Differences in Learning and Cognitive Abilities |
| ELLIOT M. CRAMER | (7) | Applied Statistics in Psychology and Education, Computational Methods in Statistics, Multivariate Analysis |
| W. GRANT DAHLSTROM | (8) | Personality Assessment, Psychopathology and Behavioral Change |
| DAVID ECKERMAN | (10) | Operant Conditioning, Learning Theory, Application to Behavioral Problems |
| J. WILBERT EDGERTON | (51) | Community Mental Health Programs, Group Processes, Psychosomatic Reactions, Community Psychology |
| WILLIAM J. EICHMAN | (11) | Personality Assessment, Individual Psychotherapy, Mental Hospital Programming |
| SAMUEL FILLENBAUM | (13) | Psychology of Language |
| M. DAVID GALINSKY | (14) | Community Psychology, Theories of Psychotherapy, Personality Theory |
| CHESTER A. INSKO | (18) | Attitude Change, Balance Theory, Interpersonal Attraction |
| LYLE V. JONES | (20) | Evaluation and Measurement, Data Analysis |
| RICHARD A. KING | (21) | Brain-Behavior Relationships |
| EUGENE R. LONG | (23) | Perception and Memory |
| BARCLAY MARTIN | (26) | Therapy, Life Stress, Social Support and Personality Variables |
| PAUL A. OBRIST | (50) | Psychophysiology, Stress and Cardiovascular Disease |
| PETER A. ORNSTEIN | (28) | Cognitive Development, Development of Learning and Memory |
| ERIC SCHOPLER | (49) | Childhood Psychosis, Autism, Family and Treatment Interaction |
| JOHN SCHOPLER | (32) | Small Group Processes, Social Power, Crowding |
| PAUL G. SHINKMAN | (33) | Visual Neurophysiology, Early Development |
| JOHN W. THIBAUT | (35) | Interpersonal Relations, Social Psychology of Legal Processes |

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| VAIDA D. THOMPSON | (36) | Attitude Structure and Change, Attribution and Causality, Psychological Applications to Population Issues |
| MARCUS B. WALLER | (37) | Analysis of Verbal Behavior, Operant Conditioning |
| GEORGE S. WELSH | (39) | Personality Theory, Personality Assessment, Creativity and Intelligence |
| FORREST W. YOUNG | (41) | Methods of Qualifying Qualitative Data |

Associate Professors

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| LINDA DYKSTRA | (9) | Behavioral Pharmacology, Stimulus Control Processes |
| PAUL B. FIDDLEMAN | (12) | Psychopharmacology, Social Aspects of Psychopathology |
| BERNADETTE GRAY-LITTLE | (16) | Sociocultural Influences on Personality, Children's Perception of Equity, Psychotherapy |
| MARK HOLLINS | (17) | Visual Processes |
| EDWARD S. JOHNSON | (19) | Human Problem Solving, Concept Learning, Intellectual Ability |
| JOSEPH LOWMAN | (24) | Community Mental Health, Family Processes |
| OWEN MCCONNELL | (27) | Child Development, Child Clinical (Assessment, Psychotherapy, and Consultation) |
| GARY B. MESIBOV | (94) | Normalization and Community Programs for Handicapped People, Normal Social and Personality Development |
| DAVID PRICE ROGERS | (31) | Deviance, Empirical and Theoretical Studies of Phenomenological and Existential Issues, Experimental Parapsychology |
| THOMAS WALLSTEN | (38) | Individual Decision Behavior, Inference and Judgemental Processes, Processes in Reading |
| JOHN WEISZ | (96) | Developmental Theory and Familial Mental Retardation, Development of Control-Oriented Belief and Behavior |
| MEREDITH J. WEST | (45) | Development of Communication, Learning and Evolution |

Assistant Professors

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| DEIRDRE BARRETT | (112) | Hypnosis, Dreams, Fantasy and their Applications in Psychotherapy |
| DONALD H. BAUCOM | (104) | Sex Roles, Marital Therapy, Depression Assessment |
| GERALDINE DAWSON | (105) | Developmental Divorders, Autism, Neuropsychology of Learning Disorders |

- CATHY DENT (106) Language Development, Cognitive Development, Psycholinguistics
- MICHELA GALLAGHER (107) Biological Basis of Memory and Learning
- LYNN KAHLE (108) Attitudes, Interactionism, Social Cognition
- MARTHA PUTALLAZ-SHEPPARD (113) Children's Peer Relationships, Social Acceptance by Groups, Social Cognition
- JAAN VALSINER (114) Child Socialization, Cross-Cultural Studies, Ecological Development Psychology

Lecturer

- RICHARD HELWIG Computer Applications in Psychology

Research Professors

- J. STACY ADAMS (64) Behavior in Organizations, Boundary Social Roles, Social Exchange
- B. J. CAMPBELL (54) Human and Vehicle Factors in Driver Injuries
- JAMES J. GALLAGHER (52) Research Design, Developmental Psychology, Gifted Children
- CRAIG RAMEY (46) Learning in Infancy, Other-Child Interaction Patterns, Prevention of Developmental Retardation
- AMNON RAPOPORT (29) Decision Making, Multistage Betting Games, Coalition Formation and Bargaining in Small Groups
- HARRIET RHEINGOLD (30) Development of the Social and Exploratory Behavior of Human Infants and Young Children

Research Associate Professor

- STEPHEN SCHROEDER (48) Basic and Applied Operant Principles, Oculomotor Perception and Control, Retarded Development

Research Assistant Professor

- VERNON BENIGNUS (65) Olfactory Electrophysiology, Effects of Environmental Factors on Behavior

Clinical Associate Professors

- WILLIAM BURLINGAME (66) Psychotherapy, Residential Treatment of Adolescents
- ROBERT JOHNSON (72) Relaxation Therapy, Biofeedback Training, Behavioral Programs for Institutionalized Patients
- JOHN L. LUBKER (25) Behavioral Modification, Hospital Programming

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| FRANCIS T. MILLER | (59) | Organizational Development and Pathology, Group Psychotherapy, Psychodiagnostics |
| CHARLES NEWMARK | (75) | Objective Personality Assessment, Rational-Emotive Psychotherapy, State-Trait Anxiety |

Clinical Assistant Professors

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| DENISE BARNES | (110) | Cultural Issues in Psychology, Geropsychiatry |
| JUDITH COOK | (109) | Sex Roles, Self Disclosure |
| SHERMAN JAMES | (87) | Applied Social Psychology, Psychosocial Factors in Chronic Disease Epidemiology |
| DAPHNE MCKEE | (98) | Psychological Aspects of Medical Disorders, Neuropsychology |
| LEE MARCUS | (111) | Diagnostic and Treatment Factors in Autism |
| LON E. USSERY | (80) | Diagnosis, Individual Psychotherapy, Community Consultation |
| ROSILENE ZIEGLER | (99) | Therapy and Assessment of Children and Families |

Adjunct Research Professor

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| GILBERT GOTTLIEB | (82) | Behavioral Embryology, Sensory Processes, Imprinting |
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Adjunct Associate Professor

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| RICHARD L. GLASSER | (56) | Memory Consolidation, Central Nervous System Regulation of Respiration |
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Adjunct Assistant Professors

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| PATRICK CABE | (102) | Animal Psychophysics, Perception |
| ROBERT MILLER | (89) | Developmental Disabilities, Behavior Modification, Assessment |
| JAMES GEORGE | (86) | Application of Small Group Dynamics, Anxiety Reduction During Dental Treatment, Management Styles |
| RICHARD LUCAS | (60) | Psychology of Death and Dying, Psychotherapy with the Terminally and and Chronically Ill |

Emeritus Professors

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| E. EARL BAUGHMAN | (3) | |
| HAROLD G. MCCURDY | (62) | |

The Department offers training for the Master of Arts and Doctor of Philosophy degrees in the recognized areas of psychology: developmental, experimental, clinical, quantitative, and social. Brochures describing

graduate training in these areas may be obtained by writing the Department of Psychology. New students are accepted for admission in the Fall Semester only. Students seeking the M.A. degree only *are not accepted*.

Courses for Graduates and Advanced Undergraduates

The prerequisites for each course are provided for the general guidance of the student in consultation with an adviser. Any deviation from the required prerequisite sequence must be approved by the instructor teaching the course. Such clearance must be obtained before registering for the course.

Note: General Psychology 10 or the equivalent is prerequisite to all courses numbered above 100.

- 100 THINKING AND COGNITION (3). Prerequisite, Psychology 21 or 22. Considers problems in intelligence, concept formation, problem-solving and thinking. Emphasis will be on an examination of the experimental literature with attention to recent developments in information processing models and computer simulation. *Fall and spring, as announced.* Johnson.
- 101 CONDITIONING AND LEARNING (Neurobiology 101C) (3). Prerequisites, Psychology 10 and 22. A comprehensive survey of the methods, findings, and theories of classical and operant conditioning. Skills necessary to evaluate, integrate and summarize significant original literature will be developed. *Fall.* Dykstra, Eckerman, Waller.
- 101L RESEARCH METHODS IN CONDITIONING AND LEARNING (3). Prerequisites, Psychology 10, 22 and corequisite or prerequisite of Psychology 101. A series of research projects of limited scope in animal conditioning and learning that teach programming switching circuits, use of recording instruments, data reduction, experimental design, and report writing. Individual research projects are developed and completed. *Six laboratory hours a week, fall.* Dykstra, Eckerman, Waller.
- 102 BIOLOGICAL FOUNDATIONS OF BEHAVIOR (Neurobiology 102) (4). Prerequisite, Psychology 22 or Zoology 11. Ethological, genetic, and physiological variables will be studied in relation to their behavioral effects. *Two lecture and three laboratory hours a week, as announced.* Staff.
- 103 INTRODUCTION TO MATHEMATICAL PSYCHOLOGY (3). Prerequisites, Psychology 10, 21 or 22, and 30, Mathematics 32, or permission of the instructor. The use of mathematical models in psychology, with topics selected from measurement, scaling, psychophysics, learning, decision, and choice theory. *As announced.* Wallsten.
- 104 CURRENT TOPICS IN PSYCHOLOGY (3). Prerequisites, Psychology 10 and permission of the instructor. Various special areas of psychological study as needed. Course may be taken more than once. *Fall and spring.* Staff.
NOTE: Psychology 104 will not fulfill a 100-level course requirement for a B.A. degree in Psychology.
- 106 PHYSIOLOGICAL PSYCHOLOGY (Neurobiology 106B) (3). Prerequisites, Psychology 10, or a course in Zoology. Elements of neurophysiology, neuroanatomy, and neurochemistry as they apply to the understanding of behavior and conscious experience. *Fall and spring.* King, M. Gallagher.
- 109 APPLIED BEHAVIORAL ANALYSIS (3). Prerequisites, Psychology 10, 22, and 80 or permission of instructor. A survey of applications of learning theory in solving clinical, educational, and societal problems. Practicum experience included. *Spring.* Eckerman.

- 110 MOTIVATION (3). Prerequisites, Psychology 10 and 22. Major theories and supporting research on motivational processes in the control of behavior. *Spring*. Staff.
- 112 HISTORICAL TRENDS IN PSYCHOLOGY (3). Prerequisites, Psychology 21 or 22 and 28. Limited to senior majors or to graduate students in psychology; others by permission of the instructor. Overview of the origins of psychological concepts, movements, and fields of study. *Fall and spring as announced*. Fillenbaum.
- 120 SENSORY PROCESSES (3). Prerequisite, Psychology 10, 21 and permission of instructor. Each year the course will deal with a specific sensory topic, such as "color vision" or "the chemical senses." *Fall*. Hollins.
- 121 ADVANCED PERCEPTUAL PROCESSES (3). Prerequisite, Psychology 21. The perception of shape, space, and motion; also, the role of past experience, set and motivation in perception. *Fall and spring*. Long.
- 122 HUMAN LEARNING (3). Prerequisite, Psychology 22. Interference theory, long- and short-term memory, organizational processes in memory, and human discrimination learning and concept formation. *Fall and spring*. Long.
- 123 BEHAVIORAL PHARMACOLOGY (Pharmacology 123) (3). Prerequisites, Pharmacology 216 or Psychology 101 and 106. Basic principles of pharmacology and of the experimental analysis of animal behavior will be considered in relation to drugs that affect the central nervous system. *Spring*. Staff.
- 124 PSYCHOLOGICAL APPLICATIONS OF DRUGS (3). Prerequisite, Psychology 10, 22 and 80. This course will investigate the pharmacological effects and the clinical efficacy of drugs used to treat behavior disorders. *Fall*. Dykstra.
- 125 PSYCHOLOGY OF LANGUAGE (3). Prerequisites, Psychology 21 or 22. After an examination of the possible relations between psychology and linguistics, this course will consider problems in the acquisition of language and particularly recent work in experimental psycholinguistics. *Fall*. Fillenbaum.
- 127 DEVELOPMENT OF LEARNING AND PERCEPTION (3). Prerequisites, Psychology 24 and 30. Examination of age-related changes in learning, perception, and related cognitive processes. *Fall, or spring, as announced*. Ornstein, Ramey.
- 128 DEVELOPMENT OF LANGUAGE AND THOUGHT (3). Prerequisites, Psychology 24 and 30. Study of the development of thought and language in normal children. *Spring*. Dent.
- 129 DEVELOPMENT OF SOCIAL BEHAVIOR AND PERSONALITY (3). Prerequisites, Psychology 24, 28, and 30. Developmental processes during early childhood as these relate to social behavior and personality. *Fall and spring*. Cairns, West.
- 130 DESIGN AND INTERPRETATION OF PSYCHOLOGICAL RESEARCH (3). Prerequisite, Psychology 30. Emphasis on methodological principles underlying experimental and correlational research. Interaction of theory and practice in the design and interpretation of psychological studies. *Spring*. Cramer, Appelbaum.
- 131 INTERMEDIATE PSYCHOLOGICAL STATISTICS (3). Prerequisites, Psychology 21 or 22 and 30. Elements of probability theory, principles of statistical inference, including applications of binomial, normal, t , X^2 and F distributions. *Two lecture and two laboratory hours a week, fall*. Appelbaum.
- 132 ADVANCED PSYCHOLOGICAL STATISTICS (3). Prerequisite, Psychology 131 or equivalent. Statistical estimation, hypothesis testing, use of quantitative models in design and analysis of experiments. *Two lecture and two laboratory hours a week, spring*. Cramer, Appelbaum.
- 135 INDIVIDUAL CHOICE BEHAVIOR (3). Permission of instructor. Descriptive and normative algebraic and stochastic models for individual decision making with applications to behavioral science. *Fall*. (1981 and alternate years.) Wallsten.
- 136 INTRODUCTION TO MULTIVARIATE TECHNIQUES FOR THE BEHAVIORAL SCIENCES (3). Prerequisite, Psychology 131 or permission of instructor. An introduction to linear regression and multivariate statistical techniques as employed in

the behavioral sciences with particular emphasis on analytic techniques and interpretation of results. *Fall*. Appelbaum, Cramer.

- 137 GROUP CHOICE BEHAVIOR (3). Permission of instructor. Mathematical models for two and N-person zero and non-zero sum games with applications to the behavioral sciences. *As announced*. Wallsten.
- 138 APPLIED MATRIX ALGEBRA FOR BEHAVIORAL STATISTICS (3). Corequisite, psychology 132 and familiarity with basic matrix operations. Geometric interpretation of vectors and matrices. Applications to linear statistical models, multivariate analysis and factor analysis. Relation of eigen problems to maximization of statistical functions. *Spring*. Cramer.
- 140 ADVANCED PERSONALITY (3). Prerequisite, Psychology 28 or graduate standing. An in-depth analysis of major theoretical issues in personality study. *Fall and spring*. Welsh, Gray-Little, Dahlstrom, Lowman.
- 141 PSYCHOLOGY OF ADULTHOOD AND AGING (3). Prerequisite, Psychology 10, A developmental approach to the study of adulthood, from young adulthood through death. Topic includes adult issues in personality, family dynamics, work, leisure and retirement, biological and intellectual aspects of aging, dying and bereavement. *Fall or spring, as announced*. Staff.
- 142 PSYCHOLOGY OF BLACK AMERICANS (3). Prerequisites, Psychology 28 and permission of instructor. This course will focus upon the personal characteristics of black Americans as these have been identified and studied by psychologists and other behavioral scientists. Various methodological approaches will be considered. *Fall and spring*. Gray-Little.
- 144 PSYCHOLOGICAL DISORDERS OF CHILDHOOD AND ADOLESCENCE (3). Prerequisites, Psychology 10, 24 and 80, or graduate standing. A survey of theories bearing on atypical development and disordered behavior, and an examination of major child and adolescent behavior problems and clinical syndromes. *Fall*. Weisz, Dawson.
- 145 PSYCHOLOGICAL ASPECTS OF PHYSICAL ILLNESS (3). Prerequisites, Psychology 10, 28 or graduate standing. An in-depth coverage of theoretical issues and clinical manifestations of psychological responses characteristic of individuals with chronic physical disorders. *Fall*. Mitchell.
- 148 PERSONALITY ASSESSMENT (3). Prerequisites, Psychology 30 and Psychology 140. Survey of the principal techniques used for assessing personality, including its intellectual components; students will take and score representative tests in these areas. *Fall and spring*. Welsh.
- 149 ADVANCED BEHAVIOR PATHOLOGY (3). Prerequisite, graduate standing. An indepth coverage of major emotional disorders, their causes and treatment. *Fall and spring*. Martin, Dahlstrom.
- NOTE: No student may register or receive credit for both Psychology 80 and Psychology 149.
- 152 ATYPICAL PERSONALITIES AND GROUPS I (3). Prerequisite, Psychology 80. This course studies persons and groups labelled as different, outsiders, deviant, stigmatized, or occupying disvalued roles. Focus is placed on how these individuals present themselves in person and in writing. *Fall*. Rogers, R. Johnson.
- 153 ATYPICAL PERSONALITIES AND GROUPS II (3). Prerequisite, Psychology 152. This course studies persons and groups labelled as different, outsiders, deviant, stigmatized, or occupying disvalued roles. Focus is placed on how these individuals present themselves in person and writing. *Spring*. Rogers, R. Johnson.
- 170 RESEARCH IN DEVELOPMENTAL PSYCHOLOGY (3). Prerequisites, Psychology 10, 24, and 30. Introduction to the issues, methods and outcomes of research in developmental psychology. Demonstrational projects designed and completed. *One lecture and four laboratory hours*. *Fall*. Cairns, Ornstein, West.

- 180 INTRODUCTION TO THE STUDY OF EXCEPTIONAL CHILDREN (3). Prerequisites, Psychology 10 and 28 or equivalent. Overview of mental retardation, autism, and learning disabilities; students devote some time each week in work with a handicapped child in addition to the regular class meetings. *Fall and spring*. Baroff.
- 183 CONTEMPORARY SEX ROLES (Women's Studies 183) (3). Prerequisites, Psychology 10, 24 and 28. Covers theories and research in the areas of constitutional and social learning influences on sex differences; sex-role identification and the assessment of masculinity and femininity; sex differences in such areas as intellectual accomplishment, achievement, dependency and aggression; and sex differences in relation to behavior disorders. *As announced*. Staff.
- 188 SMALL GROUPS (3). Prerequisite, Psychology 33 or permission of the professor. Intensive survey of research and theory on behavior in small groups combined with appropriate experience in studying various structured groups. *Fall or spring*. Schopler.
- 189 INTERPERSONAL PROCESSES (3). Prerequisites, Psychology 30 and 33, or permission. Intensive coverage of normal interpersonal processes, focusing on the dyad. *Fall or spring*. Schopler, Thibaut.
- 190 PSYCHOLOGICAL ISSUES IN POPULATION STUDIES (3). Prerequisites, Psychology 30 and 33 or permission of instructor. Selected population topics will be discussed from a psychological perspective with an emphasis on psychological interpretation of these problems. *Spring*. Thompson.
- 191 ATTITUDE CHANGE (3). Prerequisites, Psychology 30 and 33, or permission. A detailed consideration of the theoretical issues in attitude and belief change. *Fall or spring, as announced*. Thompson, Kahle.

Courses for Graduates

- 200 EXPERIMENTAL METHODS: COGNITIVE PROCESSES (3). Principal topics include: psychophysics, information processing, memory, cognition. *Spring*. Staff.
- 201 EXPERIMENTAL METHODS: CONDITIONING AND LEARNING (Neurobiology 201) (3). Principal topics include: classical conditioning, operant conditioning, stimulus control of behavior. *Fall*. Staff.
- 202 BIOLOGICAL PSYCHOLOGY (Neurobiology 202) (3). Prerequisite, graduate standing in psychology or permission of instructor. The course will have two parts: a survey of basic brain-behavior relations, (e.g., in perception, learning, and motivation) and a survey of topics in applied neuropsychology, including behavioral effects of brain damage, brain mechanisms in language, and normal brain functioning in man. *Spring*. Shinkman.
- 203 PERSONALITY RESEARCH METHODS (3). Prerequisites, Psychology 220, 221 and 248 are advisable. Covers empirical research on personality structure and processes, person-situation interactions, and other current issues in the area. *Spring*. Dahlstrom.
- 204 ADVANCED BIOLOGICAL PSYCHOLOGY: CENTRAL NERVOUS SYSTEM (Neurobiology 204) (3). Prerequisite, Psychology 106 or equivalent. Each fall one special topic will be covered in depth, e.g., neural basis of memory storage, homeostasis, and perception. Format will include lectures and seminar meetings with student presentations. *Fall*. Shinkman.
- 205 ADVANCED BIOLOGICAL PSYCHOLOGY: AUTONOMIC NERVOUS SYSTEM (neurobiology 205) (3). Prerequisites, Psychology 106 and/or 202, or permission of the instructor. Autonomic nervous system bases of emotion, motivation, and learning. *Two lecture and two laboratory hours a week, on demand*. Obrist.

- 206 ADVANCED DEVELOPMENTAL PSYCHOLOGY (3). Prerequisite, graduate
207 standing. A critical examination of the main facts and principles of developmental
psychology, human and animal. *Fall and spring*. Staff.
- 208 PROSEMINAR IN QUANTITATIVE PSYCHOLOGY I (1). An introduction to con-
A,B,C cepts in: (A) Measurement, scaling, and test theory; (B) Methods of descriptive data
analysis; (C) Classical inferential statistics and basic concepts of experimental design.
Fall. Staff.
- 209 PROSEMINAR IN QUANTITATIVE PSYCHOLOGY II (1). An introduction to
A,B,C concepts in: (A) Psycho-physical and decision processes; (B) Mathematical models of
learning and memory; (C) Models of complex mental processes. *Fall*. Staff.
- 212 CONTEMPORARY PSYCHOLOGICAL TRENDS (3). Prerequisite, graduate
standing. Different perspectives on the task of psychology with a discussion of selected
contemporary problems. *Fall*. Fillenbaum.
- 216 DEVELOPMENTAL PSYCHOLOGY: EXPERIMENTAL METHODS (3). Tech-
217 niques and research designs appropriate for the study of the development of behavior.
Fall and spring. *As announced*. Staff.
- 220 THEORIES OF PERSONALITY I (3). Permission of instructor required. Discussion
and analysis of psychodynamic theories of personality (Freud, Jung, Adler,
Sullivan, Erikson, and others). *Fall*. Staff.
- 221 THEORIES OF PERSONALITY II (3). Prerequisites, Psychology 220 or permission
of instructor. Discussion and analysis of social learning, behavioristic, humanistic,
and other theories of personality. Builds upon knowledge of psychodynamic theories.
Spring. Staff.
- 222 EXPERIMENTAL ANALYSIS OF BEHAVIOR (3). Prerequisite, Psychology 201
or permission of the instructor. Applications of operant conditioning procedures to
the analysis of complex behavior in man and animals. Original experiments will be
performed. *One lecture and six laboratory hour a week, fall*. Waller.
- 223 DIRECTED RESEARCH SEMINAR IN SOCIAL PSYCHOLOGY (3). Prerequisite,
224 first year Social graduate student or permission of instructor. Directed research
problems and seminar discussion of related issues. *Fall and spring*. Staff.
- 225 DEVELOPMENT PSYCHOLOGY: LABORATORY TRAINING (3). By permis-
226 sion. Supervised experience in the planning and conduct of experiments and in the
analysis of data. *Ten laboratory hours a week, fall and spring*. Staff.
- 227 INTRODUCTION TO CLINICAL PSYCHOLOGY (3). Graduate standing. Survey
of methods and findings in psychodiagnostics, psychotherapy, and mental health
practices. *Fall*. Eichman, Welsh.
- 228 ADVANCED SOCIAL PSYCHOLOGY (3). Prerequisite, Psychology 238 or per-
mission of the instructor. *Spring*. Thibaut.
- 230 MEASUREMENT AND SCALING I (3). Prerequisite, Psychology 132. Theory and
applications of uni- and multidimensional scaling as developed by Thurstone, Stev-
ens, Torgerson, Shepard and others. (1981 and alternate years.) *Fall*. Young.
- 231 MEASUREMENT AND SCALING II (3). Prerequisite, Psychology 230. Theory
and methods of nonmetric multidimensional scaling as developed by Kruskal, Gut-
tman, Carroll, deLeeux, and Young. *Spring*. (1981 and alternate years.) Young.
- 232 TEST THEORY AND ANALYSIS (3). Prerequisite, Psychology 136 and Psychol-
ogy 237 recommended. Survey of classical test theory and more recent developments
in item analysis and test construction. *Fall*. (1981 and alternate years.) Carroll and
Jones.
- 233 METHODS OF SOCIAL PSYCHOLOGY (3). Prerequisite, Psychology 238 or
permission of the instructor. Methods of investigation in social psychology with
primary emphasis upon experimental design and the nature of the experimental
situation. *Fall*. Insko.

- 234 MATHEMATICAL PSYCHOLOGY (3). Permission of instructor required. Development and applications of mathematical models in theoretical and experimental psychology. Topics selected from learning, memory, perception, thinking, attention, decision making. *Fall*. (1982 and alternate years.) Wallsten.
- 235 TOPICS IN ATTITUDE RESEARCH (3). Prerequisite, Psychology 238 or permission of instructor. A critical examination of selected topics in attitude theory and change. *As announced*. Insko.
- 236 FACTOR ANALYSIS (3). Prerequisites, Psychology 132 and 138. Advanced topics in factor analytic models, multivariate correlational models, and analysis of covariance structures as applied in behavioral research. *Fall*. (1982 and alternate years.) Appelbaum, Cramer, Young.
- 237 APPLIED MULTIVARIATE ANALYSIS (3). Prerequisites, Psychology 132 and 138. Sampling from the multivariate normal distribution, testing of multivariate hypotheses, the multivariate general linear model, and the multivariate analysis of variance as applied in behavioral speech. *Spring*. (1981 and alternate years.) Appelbaum, Cramer.
- 238 ADVANCED SURVEY OF SOCIAL PSYCHOLOGY (3). Prerequisite, Psychology graduate student or permission of instructor. Survey of research on and theories of attitude change, interpersonal behavioral, and small groups. *Fall*. Schopler, Insko.
- 240 INTRODUCTION TO CLINICAL ASSESSMENT (3). Prerequisite, first year graduate status in Clinical Psychology. Lecture and discussion on the nature and theory of psychological assessment. Training in administration, scoring and interpretation of such basic techniques as: WAIS-WISC, Rorschach, TAT, and MMPI. *Two lecture and two laboratory hour a week, fall and spring*. Dawson, Eichman.
- 241
- 242 INTRODUCTION TO PSYCHOTHERAPY (3). Prerequisite, first year graduate status in Clinical Psychology. Survey of basic concepts and processes relevant to individual psychotherapy with adults. The three representative approaches to psychotherapy that will be considered are: psychoanalytic, client-centered, and behavioral. Tapes, films, and other materials will be used as adjuncts to instruction. *Three lecture hours a week, fall and spring*. Galinsky, Gray-Little.
- 243
- 244 ADVANCED PSYCHOPATHOLOGY (3). Prerequisite, first year graduate status in Clinical Psychology. The major forms of psychopathology are examined within a development framework. *Fall and spring*. Burlingame, Dahlstrom, Weisz.
- 245
- 248 OBJECTIVE PERSONALITY MEASUREMENT (3). Intensive study of theory and research on objective techniques useful for personality assessment, standard and special inventories, checklist, and other devices will be investigated at item, scale and profile levels. *Fall*. Welsh.
- 250 ADVANCED ADULT ASSESSMENT (3). Prerequisite, Psychology 241. Consideration of how various forms of assessment data can be utilized in understanding the structure and dynamics of adult personalities; problems of differential diagnosis, brain damage, etc., are considered. *Two lecture and two laboratory hours a week, fall*. Rogers.
- 251 ADVANCED CHILD ASSESSMENT (3). Prerequisite, Psychology 241. Consideration of how various forms of assessment data can be utilized in understanding the structure and dynamics of child personalities; problems of differential diagnosis, appraisal of brain damage, etc. are considered. *Two lecture and two laboratory hours a week, spring*. Staff.
- 252 CHILD PSYCHOTHERAPY (3). Prerequisite, Psychology 243. Basic principles and techniques of therapy of common childhood disorders. *Three lecture hours a week, spring*. McConnell.
- 253 INTRODUCTION TO COMMUNITY PSYCHOLOGICAL APPROACHES (3). Survey of such topics as social contributions to psychopathology, comprehensive and

integrated service delivery systems, consultation, primary prevention, manpower innovations, program evaluation, and epidemiological approaches. *Fall*. Lowman.

- 254 CLINICAL PRACTICUM (3). Prerequisite, second year graduate status in Clinical
255 Psychology. Supervised experience in psychological assessment and psychotherapy.
Six to eight laboratory hours a week, fall and spring. Staff.
- 256 CLINICAL RESEARCH METHODS (3). Prerequisite, second year graduate status
257 in Clinical Psychology. Analysis of clinical and personality research as to their
contribution to knowledge, their limitations, possibilities for their improvement,
further research they suggest, etc. Preparation of individual research proposals for
class presentation and critical evaluation. *Three hours a week, fall and spring*. Staff.
- 258 METHODS OF APPLIED SOCIAL PSYCHOLOGY (3). Prerequisite, Graduate
standing. Detailed examination and practical experience in conceptual and other
nonquantitative aspects of advanced methodology of applied social psychology,
including evaluation of quasi-experimental and nonexperimental designs. *As
announced*. Kahle.
- 260 HUMAN COGNITIVE ABILITIES (3). Prerequisite, Psychology 239 recommended.
Applications of Psychometric and experimental methods to study of human intellec-
tual abilities and processes, with special attention to factor-analytic studies. *Spring*.
(1981 and alternate years.) Carroll.
- 264 ADVANCED CLINICAL PRACTICUM (3). Prerequisite, Psychology 255. Super-
265 vised clinical work in an area of particular interest to the student. Clinical activity is
coordinated with exploration of psychological literature relevant to the topic. *Six to
eight laboratory hours a week, fall and spring*. Staff.
- 270 MEASUREMENTS OF LANGUAGE BEHAVIOR (3). Prerequisite, permission of
the instructor. Procedures for the quantitative treatment of language elements (words,
text content, etc.) and performance (e.g. speech rate, language acquisition, vocabu-
lary, comprehension, verbal aptitudes). *As announced, spring*. Carroll.
- 300 SPECIAL READINGS IN PSYCHOLOGY (3). Prerequisite, permission of the
professor. Intended for advanced graduate students. *Fall and spring*. Staff.
- 301 SEMINAR IN THE EXPERIMENTAL ANALYSIS OF BEHAVIOR (3). Limited
to graduate students in psychology. Selected advanced topics depending on the
interests of the instructor and the students. *Three to six hours a week, fall and spring*.
Eckerman, Long, Waller.
- 302 SEMINAR IN THE BIOLOGICAL FOUNDATIONS OF PSYCHOLOGY (Neu-
robiology 302) (3). Prerequisite, permission of instructor. Limited to graduate stu-
dents in psychology and neurobiology. Lectures and seminar presentations on a wide
range of topics in the area of physiological psychology. *Fall and spring*. King,
Shinkman.
- 303 ADVANCED EXPERIMENTAL DESIGN (3). Prerequisite, Psychology 132.
Advanced topics in the design and analysis of psychological experiments. Emphasis is
placed on the general linear hypothesis. *As announced, fall*. Cramer, Appelbaum.
- 304 SEMINAR IN GENERAL PSYCHOLOGY (3). Limited to graduate students in
psychology. Selected advanced topics depending on the interests of the instructor and
students. *Three to six hours a week, fall and spring*. Staff.
- 306 SEMINAR IN DEVELOPMENTAL PSYCHOLOGY (3). Prerequisite, Psychology
206 or 226 or equivalent. Intensive study of selected topics in developmental psychol-
ogy. *Either semester, as announced*. Staff.
- 316 SEMINAR IN EXPERIMENTAL CHILD PSYCHOLOGY (3). Prerequisite, Psy-
chology 206 and 222 or equivalent. Topics vary from semester to semester; considera-
tion of specific contemporary research issues in developmental psychology. *Either
semester, as announced*. Staff.

- 320 SEMINAR IN PERSONALITY (3). Prerequisite, permission of instructor. Selected advanced topics depending on the interests of the instructor and students. *As announced*, Staff.
- 325 SEMINAR IN THEORETICAL-EXPERIMENTAL PSYCHOLOGY (1, 2, or 3). *Time to be arranged*. Staff.
- 326 SEMINAR IN CLINICAL PSYCHOLOGY (1, 2, or 3). *Time to be arranged*. Staff.
- 327 SEMINAR IN ABNORMAL PSYCHOLOGY (1, 2, or 3). *Time to be arranged*. Staff.
- 328 SEMINAR IN SOCIAL PSYCHOLOGY (3). Prerequisite, Psychology 238 or permission of the instructor. *Time to be arranged*. Staff.
- 330 SEMINAR IN QUANTITATIVE PSYCHOLOGY (1, 2, or 3). *Time to be arranged*. Staff.
- 331 PROFESSIONAL PROBLEMS IN PSYCHOLOGY (1). Prerequisite, permission of instructor. Consideration of problems facing academic psychologists. *Fall*. Appelbaum.
- 333 RESEARCH SEMINAR IN EXPERIMENTAL PSYCHOLOGY (3). Prerequisite, graduate standing in Psychology. Students will design and conduct a supervised research project and will engage in critical discussions of research performed by other students and faculty. *Fall and spring*. Staff.
- 336 SEMINAR IN COGNITIVE PSYCHOLOGY (3). Prerequisite, permission of instructor. Discussion and critical evaluation of various theories of thinking; theories of concept formation, problem solving, and reasoning. *Either semester, as announced*. Staff.
- 341 ADVANCED RESEARCH (3). *Six laboratory hours a week, fall and spring*. Staff.
- 361 SMALL COMPUTERS IN THE PSYCHOLOGY LABORATORY (3). Principal topics include a survey of small computers, their application to computational problems and their use as controllers and data acquisitions systems. *Fall*. Helwig.
- 362 SURVEY OF STATISTICAL COMPUTING PACKAGES FOR THE BEHAVIORAL SCIENCES (3). Emphasis is on the use of computers for inferential statistical methods in psychology. Principal topics treated are the critical use of statistical packages in psychology with particular emphasis on SAS, SPSS, BMD programs, Manova, etc.; essentials of JCL sufficient for communication between statistical packages and their efficient use; data preparation, reduction, and storage. *Spring*. Helwig.
- 393 MASTER'S THESIS (3 or more). *Fall and spring*. Staff.
- 394 DOCTORAL DISSERTATION (3 or more). *Fall and spring*. Staff.
- 400 GENERAL REGISTRATION (0).

SCHOOL OF PUBLIC HEALTH

BERNARD G. GREENBERG, *Dean*

The third school of public health in the nation, the University of North Carolina at Chapel Hill School of Public Health was the first established within a state university. It is one of twenty-two such schools in the United States accredited by the Council on Education for Public Health.

The mission of the school is to advance and apply knowledge drawn from all sciences to the understanding and promotion of the health of human populations and to assist people in translating this knowledge into reality in their own lives, whatever their culture or living conditions. The mission is realized through the education of students to assume professional careers in public health, through continuing education opportunities for professionals and the public, through applied and basic research, through consultation and technical assistance to health and human service agencies and to communities, and through innovative demonstration programs.

The School's nine Departments are: Biostatistics, Environmental Sciences and Engineering, Epidemiology, Health Policy and Administration, Health Education, Maternal and Child Health, Nutrition, Parasitology and Laboratory Practice, and Public Health Nursing. The Division of Community Health Service extends the service capabilities and promotes the School's commitment to community service as its public responsibility. All Departments participate in research and field service to the state, region, and the nation.

Graduate academic degrees offered by the School of Public Health are the Master of Science (M.S.) and the Doctor of Philosophy (Ph.D.), and the graduate professional degrees are the Master of Science in Public Health (M.S.P.H.), the Master of Science in Environmental Engineering (M.S.E.E.), the Master of Public Health (M.P.H.), and the Doctor of Public Health (Dr.P.H.). All requirements concerning these degrees are administered by the faculty of the School of Public Health with the approval of the Administrative Board of the Graduate School.

Close affiliations are maintained with other graduate schools and departments of the University of North Carolina campuses as well as with other schools and universities and health and human services and research organizations. These affiliations are local, statewide, national, and international in scope. The nature of the affiliations includes joint sponsorship and effort in teaching and research programs, joint faculty appointments, and establishment of field training centers for students in a number of official and voluntary federal, state, and local health and human services organizations.

For information concerning preparation and admission requirements and proposed curricula leading to degrees see the catalogue of the School of Public Health.

Public Health

- 101 **PROBLEM ORIENTED APPROACHES TO PUBLIC HEALTH (3).** Using the approaches of several relevant disciplines, the class will review the physical, biological, and social aspects of illustrative public health problems, and examine current and potential control mechanisms. *Spring.* Phillips and staff.

Department of Biostatistics (BIOS)

JAMES E. GRIZZLE, *Chairman*

Professors

JAMES R. ABERNATHY	(9)	General Statistics, Demography
DENNIS B. GILLINGS	(25)	Evaluation, Models
BERNARD G. GREENBERG	(1)	Research Methodology, Epidemiological and Survey Research
JAMES E. GRIZZLE	(2)	Multivariate Analysis, Design of Experiments
ELIZABETH J. COULTER	(11)	Health Statistics, Health Economics
REGINA C. ELANDT-JOHNSON	(7)	Statistical Genetics, Biometry, Mortality Analysis
GARY G. KOCH	(14)	Categorical Data Analysis, Nonparametric
LAWRENCE L. KUPPER	(19)	Regression Analysis, Response Surface Methodology, Statistical Applications in Epidemiology and in Environmental Health
DANA QUADE	(6)	Nonparametric Statistics
PRANAB K. SEN	(10)	Nonparametric Methods, Multivariate Analysis, Large Sample Theory
RICHARD H. SHACHTMAN	(18)	Stochastic Models, Decision Theory, Health Applications
MICHAEL J. SYMONS	(17)	Bayesian Inference Occupational Health Applications
O. DALE WILLIAMS	(23)	Collaborative Studies Research

Associate Professors

CLARENCE E. DAVIS	(27)	Clinical Trials
ROGER C. GRIMSON	(35)	Combinatorial Statistics, Applications in Epidemiology, Biomathematics
RONALD W. HELMS	(15)	Statistical Computation, Linear Statistical Models
DAVID G. KLEINBAUM	(20)	Epidemiological Applications, Multivariate Methods, Multi-media Instructional Materials
JAMES D. KNOKE	(39)	Statistical Methodology and Data Analysis
CHIRAYATH M. SUCHINDRAN	(29)	Mathematical Demography, Statistical Inference
CRAIG D. TURNBULL	(26)	Public Health Statistics, Applied Research

Assistant Professors

JAMES D. HOSKINS	(79)	Data Management, Multivariate Techniques
NORMAN J. JOHNSON	(71)	Data Analysis and Clustering, Time Series
WILLIAM D. KALSBECK	(55)	Sample Design, Survey Analysis

Adjunct Professors

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|-------------------|------|--|
| ROBERT C. ELSTON | (5) | Human Genetics Analysis |
| DAVID G. HOEL | (43) | Sequential Procedures, Biomathematics,
Biological Applications |
| DANIEL G. HORVITZ | (45) | Sample Survey Design, Measurement of
Non-Sampling Errors in Surveys,
Demographic Simulation Models |
| ANDERS LUNDE | (40) | Demography, Vital Statistics, Health
Statistics, Social Statistics |
| BABUBHAI V. SHAH | (49) | Simulation Models, Multivariate Data
Analysis and Design of Experiments |

Adjunct Associate Professors

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|----------------------|------|--|
| KERRY L. LEE | (52) | Multivariate Analysis, Classification and
Cluster Analysis |
| WILLIAM C. NELSON | (41) | Multivariate Techniques, Categorical Data
Methods, Environmental Applications |
| DONALD W. REINFURT | (60) | Categorical Data Analysis, Experimental
Design (Highway Safety) |
| WILSON B. RIGGAN | (48) | Regression Analysis, Time Series Analysis,
Multivariate Analysis |
| WILLIAM E. WILKINSON | (56) | Stochastic Processes, Epidemiology |
| DAVID L. ZALKIND | (65) | Operations Research, Health
Administration |

Adjunct Assistant Professors

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|-----------------------|------|---|
| JOHN P. CREASON | (66) | Statistical Application in Environmental
Health, Dose-response Methodology |
| EDWARD L. FROME | (68) | Statistical Computing and Biomedical
Data Analysis |
| SANDRA B. GREENE | (61) | Health Services Applications |
| FRANK E. HARRELL, JR. | (69) | Nonparametric Statistics, Survival
Analysis |

Adjunct Instructors

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|---------------------|------|--|
| PRISCILLA GUILD | (44) | Health Services, Planning and Evaluation
Research |
| CHARLES J. ROTHWELL | (63) | Data Management |

Research Associate Professors

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|-------------------------|------|---|
| ARJUN L. ADLAKHA | (36) | Population Change, Mortality, Fertility |
| RICHARD E. BILSBORROW | (30) | Economic Demography, Demography
Economic Development |
| JOHN M. KARON | (70) | Clinical Trials, Teratology and
Epidemiology |
| KADAMBARI K. NAMBOODIRI | (73) | Human Genetics, Quantitative and
Behavior Genetics |

JEREMIAH M. SULLIVAN (74) Estimation of Demographic Rates and Family Planning Evaluation

Research Assistant Professors

SHRIKANT I. BANGDIWALA (80) Sequential Procedures, Survivorship Analysis
 KEITH MULLER (76) Linear Models, Experimental Design
 OLEH WOLOWYNA (78) Demography

Emeritus Professors

ROY R. KUEBLER, JR. (3) Probability, Statistical Inference
 FORREST E. LINDER (13) Population Statistics, Population Policy, Public Health Statistics
 H. BRADLEY WELLS (4) Population Measurement, Family Planning Program Evaluation, Demographic Methods

- 101 PUBLIC HEALTH STATISTICS (3). Introduction to procedures in summarization, analysis, and presentation of data. Topics include data classification, graphics, measures of central tendency and variability, probability distributions, sampling, confidence intervals, and tests of hypotheses. *Three lecture hours a week, fall.* Bangdiwala and Quade.
- 105 PRINCIPLES OF STATISTICAL INFERENCE (3). An introduction to the methods of modern statistical analysis and their use in drawing conclusions from data collected in surveys and in the laboratory. Topics cover probability distributions, confidence interval estimation of population parameters, tests of significance, analysis of variance, correlation and regression. *Three lecture hours a week, fall, spring and summer.* Staff.
- 106 MATHEMATICAL METHODS IN BIostatISTICS (Mathematics 106) (3). Prerequisite, MATH 32 or equivalent. Special mathematical techniques in the theory and methods of biostatistics as related to the life sciences and public health. Includes brief review of calculus, selected topics from intermediate calculus, and introductory matrix theory for application in biostatistics. *Nine lecture hours a week. Second summer session.* Grimson.
- 111 INTRODUCTION TO STATISTICAL COMPUTING AND DATA MANAGEMENT (3). Introduction to use of computers to process and analyze data, components of digital computers, characteristics of magnetic storage devices, use of JCL and utility programs, concepts and techniques of research data management, use of statistical program packages and interpretation. *Three lecture hours a week, fall, spring, and summer.* Helms and Hosking.
- 120 SPECIAL TECHNIQUES IN BIOMETRY (1-3). Special topics of current interest in biometry. *One-three lecture hours a week, fall, spring and summer.* Staff.
- 135 PROBABILITY AND STATISTICS (4). Prerequisite, integral calculus. Basics of probability; random variables and their probability distributions; special distributions, including the binomial, Poisson, normal, gamma; expectation and moments; linear combinations of random variables. Elements of estimation and hypothesis testing; analysis of variance; multiple regression; analysis of categorical data; some nonparametric methods. Particular attention is given to the statistical treatment of environmental science and engineering problems. *Four lecture hours a week, fall.* Koch.

- 140 PROBLEMS IN BIOSTATISTICS (1 or more). Prerequisites to be arranged with the
141 faculty in each case. A course for students of public health who wish to make a study of
142 some special problem in the statistics of the life sciences and public health. *Two or
more hours a week, fall, spring and summer.* Staff.
- 145 PRINCIPLES OF EXPERIMENTAL ANALYSIS (3). Prerequisite, BIOS 105 or
equivalent. Continuation of BIOS 105; multiple regression, design and analysis of
simple experiments, nonparametric and other procedures. *Three lecture hours a week,
fall and spring.* Staff.
- 146 SOURCES OF HEALTH RELATED DATA AND DESCRIPTIVE METHODS
(1). A general survey of sources of health related data in the United States. Particular
attention is paid to the data gathered by the Bureau of the Census and the National
Center for Health Statistics. Methods of descriptive data analysis are summarized.
Quality of data, statistical and data management packages, and administrative princi-
ples are introduced. *One lecture hour a week, fall.* Gillings.
- 150 ELEMENTS OF PROBABILITY AND STATISTICAL INFERENCE (Statistics
101) (3). Prerequisite, integral calculus. Fundamentals of probability theory; descrip-
tive statistics; fundamentals of statistical inference, including estimation and hypothe-
sis testing. *Three lecture hours a week, fall.* Staff.
- 160 PROBABILITY AND STATISTICAL INFERENCE (Statistics 126-127) (6). Pre-
requisite, integral calculus. Introduction to the theory of probability; random vari-
ables, probability distributions, generating functions, sums and sequences of random
variables. Distributions of functions of random samples; theory of estimation,
hypothesis testing. *Six lecture hours a week, fall.* Kupper.
- 162 INTRODUCTORY APPLIED STATISTICS (3). Corequisite, BIOS 150 or equival-
ent. Approaches to problems of description, goodness of fit, univariate location and
scale, bivariate independence and correlation, and comparison of independent or
matched samples, involving categorical, discrete, normal, or ranked data. *Three
lecture hours a week, spring.* Quade.
- 163 INTRODUCTION TO LINEAR MODELS (3). Prerequisites, BIOS 150 and 162, or
equivalents, and elementary knowledge of matrix arithmetic and computing. The
general linear model in matrix terms, simple and multiple regression, analysis of
variance and covariance, elements of experimental design and analysis, random
effects models, discriminant analysis, simultaneous inference. *Three lecture hours a
week, spring.* Gillings.
- 164 SAMPLE SURVEY METHODOLOGY (Statistics 104) (3). Prerequisite, BIOS 150
or equivalent or permission of instructor. Fundamental principles and methods
associated with survey sampling, giving primary attention to as nonmathematical as
possible a treatment of simple random sampling, stratified sampling, and cluster
sampling. Also, techniques of questionnaire design, the problems of nonresponse, and
sources of nonsampling errors. Practical experience in the applied aspects of sampling
is provided by student participation in the design, execution, and analysis of an actual
survey. *Three lecture hours a week, spring.* Kalsbeek.
- 165 ANALYSIS OF CATEGORICAL DATA (Epidemiology 165) (3). Prerequisite.
BIOS 105 and EPID 160, or equivalents. Analysis of categorized data, with special
emphasis on methods of use in epidemiology; contingency tables, rates and relative
risk, survivorship and life table methods, linear models for categorical data. *Three
lecture hours a week, spring.* Symons.
- 166 APPLIED MULTIVARIATE ANALYSIS (Statistics 160) (3). Prerequisite, BIOS
145 or 163, or equivalent. Application of multivariate techniques, with emphasis on
the use of computer programs. Multivariate analysis of variance, principal compo-
nents, factor analysis, path analysis, discriminant analysis, canonical correlation, and
cluster analysis. *Three lecture hours a week, fall.* Staff.

- 167 APPLIED STOCHASTIC PROCESSES (Operations Research and Systems Analysis 167) (3). Prerequisite, BIOS 160 or equivalent. Survey of renewal theory. Markov chains, Poisson processes and extensions, epidemic models, branching processes and other stochastic models of empirical processes. Disease, population, and health services applications. *Three lecture hours a week, fall.* Shachtman.
- 170 DEMOGRAPHIC TECHNIQUES I (3). Prerequisite, BIOS 101 or equivalent. Sources and interpretation of demographic data; rates and ratios, standardization, complete and abridged life tables; estimation and projection of fertility, mortality, migration, and population composition. *Three lecture hours a week, fall.* Staff.
- 213 DATA MANAGEMENT IN BIostatISTICS (3). Prerequisite, BIOS 111 or equivalent. Techniques for designing, implementing, and operating computerized data management systems for large studies with particular emphasis on collaborative medical studies. *Three lecture hours a week, fall.* Hosking.
- 215 HEALTH DATA PROCESSING LABORATORY (1-3). Prerequisite, BIOS 213. A laboratory course for students who wish to gain experience in the data processing aspects of current projects and collaborative medical studies of the Department. *Two or more hours a week, fall, spring and summer.* Hosking.
- 224 SOME QUANTITATIVE METHODS IN PLANNING AND EVALUATION (Health Administration 224) (3). Prerequisites, BIOS 101 or equivalent or permission of instructor. Planning cycle, methods overview, data sources, PERT, budgeting, health indices, measurement of goal fulfillment, achievement, effectiveness, efficiency, research designs, benefit cost analysis, decision analysis, probability utility, and decision trees. *Two lecture and two laboratory hours a week, spring.* Gillings, Coulter.
- 230 RESEARCH ISSUES IN MENTAL HEALTH STATISTICS (3). Prerequisites, BIOS 105 and EPID 160, or permission of instructor. Concepts of measurement, history and current status of classification schemata for mental disorders, methods of data analysis, and research designs. *Three lecture hours a week, spring.* Turnbull.
- 240 SPECIALIZED METHODS IN HEALTH STATISTICS (1 or more). Prerequisite, permission of the instructor. Statistical theory applied to special problems area of timely importance in the life sciences and public health. Lectures, seminars and/or laboratory work, according to the nature of the special area under study. *One or more hours a week, fall, spring and summer.* Staff.
- 242
- 250 ADVANCED TECHNIQUES IN BIOMETRY (3). Prerequisites, BIOS 109, 160, and 163; or equivalents. Three separate modules presenting advanced techniques in biometry (not the same selection at each offering). *One-three lecture hours a week, first and second summer session.* Staff.
- 256 INTRODUCTION TO NONPARAMETRIC STATISTICS (Statistics 171) (3). Prerequisite BIOS 160 or equivalent. Theory and application of nonparametric methods for various problems in statistical analysis. Includes procedures based on randomization, ranks, and U-statistics. A knowledge of elementary computer programming is assumed. *Nine lecture hours a week, first summer session.* Quade.
- 257 NONPARAMETRIC PROCEDURES IN BIOMETRIC RESEARCH (3). Prerequisite, BIOS 256 or equivalent. Nonparametric point and interval estimation in linear models useful in biometric research. Robust procedures, including those based on ranks, for analyzing designed experiments and bioassays. (1981 and alternate years.) *Three lecture hours a week, spring.* Sen.
- 260 LARGE SAMPLE THEORY (3). Prerequisite, BIOS 160; corequisite, MATH 121. An introduction to limit theorems and laws of large numbers in probability, statistics, and stochastic processes. *Three lecture hours a week, fall.* Sen.
- 264 ADVANCED SURVEY SAMPLING METHODS (3). Prerequisite, BIOS 164 or equivalent. Continuation of BIOS 164 for advanced students: stratification, special designs, multistage sampling, cost studies, nonsampling errors, complex survey

- designs, employing auxiliary information, and other miscellaneous topics. (1981 and alternate years.) *Three lecture hours a week, fall.* Kalsbeek.
- 265 LINEAR MODELS IN CATEGORICAL DATA ANALYSIS (3). Prerequisite, BIOS 266. Theory of statistical methods for analyzing categorical data by means of linear models; multifactor and multiresponse situations; interpretation of interactions. *Three lecture hours a week, spring.* Koch.
- 266 LINEAR MODELS I (4). Prerequisites, BIOS 111, 162, 163, or equivalent. Multivariate normal and related distributions; basic univariate and multivariate linear models; computational aspects. *Four lecture hours a week, fall.* Helms.
- 267 LINEAR MODELS II (4). Prerequisite, BIOS 266. Principal components, discriminant functions, canonical variates, repeated measurements experiments, analysis of longitudinal data, components of variance. *Four lecture hours a week, spring.* Helms.
- 271 DEMOGRAPHIC TECHNIQUES II (3). Prerequisites, BIOS 170 and integral calculus. Methods of analysis when data are deficient; populations projection methods; stable and quasistable methods; interrelations among demographic variables; migration analysis; uses of population models. *Three lecture hours a week, spring.* Suchindran.
- 277 MATHEMATICAL MODELS IN DEMOGRAPHY (3). Prerequisite, permission of the instructor. A detailed presentation of natality models, including necessary mathematical methods, and applications; deterministic and stochastic models for population growth, migration. (1981 and alternate years.) *Three lecture hours a week, spring.* Suchindran.
- 280 SURVIVORSHIP ANALYSIS (3). Prerequisite, permission of instructor. Survival functions, hazard rates, life tables, estimation of survival functions from complete and censored data, fitting parametric models, comparisons of mortality experiences, competing risks, concomitant variables, applications to clinical trials. (1982 and alternate years.) *Three lecture hours a week, spring.* Elandt-Johnson.
- 281 STATISTICAL METHODS IN HUMAN GENETICS (Genetics 281) (3). Prerequisite, permission of instructor. An introduction to statistical procedures for genetic counseling, testing genetic hypotheses, and estimating genetic parameters from human data. Topics covered include models for monogenic autosomal and X-linkage, mutation and selection, ploygenic inheritance. Special emphasis will be given to segregation and linkage analysis. (1981 and alternate years.) *Three lecture hours a week, spring.* Staff.
- 301 FIELD OBSERVATION OF NATIONAL HEALTH STATISTICS (1). Orientation to the organization and operation of the major national agencies concerned with demographic and health statistics. Supervised visits to the U.S. Bureau of the Census, National Center for Health Statistics, and the National Institutes of Health; lectures and demonstrations by administrative and research personnel. *Field fee \$150. Fall.* Staff and agency counselors.
- 302 FIELD TRAINING IN PUBLIC HEALTH STATISTICS (1-6). This course is designed to offer students majoring in biostatistics an opportunity for supervised experience in all phases of the statistical programs in selected health agencies. Open only to students majoring in biostatistics. *Field fee \$450. Summer.* Staff; field counselors.
- 340 STATISTICAL CONSULTING IN THE HEALTH SCIENCES (2 or more). Pre-
341 requisite, a minimum of one year of graduate work in statistics. By actual participa-
342 tion in current projects, the advanced student will be given instruction in the processes of statistical consulting service for the health sciences; initial and continuing conference with the research worker in a health science, definition of the problem in statistical terms, design of experiment with reference to statistical implications, analysis of data, and report writing. *Four or more laboratory hours a week, fall, spring and summer.* Staff.

- 350 TRAINING IN STATISTICAL TEACHING IN THE HEALTH SCIENCES (2 or
351 more). Prerequisite, a master's degree or equivalent. Principles of statistical pedagogy.
352 Students will be responsible for assistance in teaching elementary statistics to students
in the health sciences. Students work under the supervision of the faculty with whom
they have regular discussions of methods, content, and evaluation of performance.
Four or more laboratory hours a week, fall, spring and summer. Staff.
- 389 RESEARCH SEMINAR IN BIostatISTICS (1-3). Prerequisite, permission of the
instructor. Seminar on new research developments in selected biostatistical topics.
One-three lecture hours a week, fall and spring. Staff.
- 390 RESEARCH IN BIostatISTICS (2 or more). Individual arrangements may be
391 made by the advanced student to spend part or all of his time in supervised investiga-
392 tion of selected problems in statistics. *Four or more laboratory hours a week, fall,
spring and summer.* Staff.
- 393 MASTER'S THESIS (0-6). *Fall, spring and summer.* Staff.
- 394 DOCTORAL DISSERTATION (0-9). *Fall, spring and summer.* Staff.
- 400 GENERAL REGISTRATION (0).

Department of Environmental Sciences and Engineering (ENVR)

RUSSELL F. CHRISTMAN, *Chairman*

Professors

RUSSELL FABRIQUE CHRISTMAN	(5)	Organic Water Chemistry, Pollutant Identification, Environmental Management Strategies
RICHARD N. L. ANDREWS	(50)	Environmental Policy
MARIO C. BATTIGELLI	(2)	Industrial Medicine, Occupational Health
FRANCIS A. DIGIANO	(51)	Water and Wastewater Treatment Processes, Mathematical Modeling of Mass Transport
DAVID ALLISON FRASER	(10)	Industrial Hygiene, Occupational Health
ROBERT L. HARRIS	(12)	Industrial Hygiene Engineering, Air Pollution Control
MILTON SYDNEY HEATH, JR.	(39)	Natural Resource Law
J. DONALD JOHNSON, JR.	(15)	Environmental, Analytical and Physical Chemistry of Water
EDWARD J. KUENZLER	(16)	Aquatic and Wetland Ecology, Nutrient Cycling
JAMES CHRISTIAN LAMB, III	(17)	Water Quality Control, Pollution, Industrial Wastes
DONALD T. LAURIA	(18)	Water and Wastewater Systems Analysis, Mathematical Modeling
DAVID H. MOREAU	(48)	Water Resources Planning
DANIEL ALEXANDER OKUN	(23)	Environmental Engineering, Water Supply and Water Pollution Control, Water Quality Management
PARKER CRAMER REIST	(26)	Aerosol Technology, Industrial Hygiene Engineering
MORRIS A. SHIFFMAN	(29)	Environmental Management
MARK S. SHUMAN	(30)	Environmental Chemistry, Analytical Chemistry, Electrochemistry
CARL M. SHY	(49)	Environmental, Occupational Epidemiology
PHILIP C. SINGER	(31)	Water and Wastewater Treatment Processes, Water Chemistry
ARTHUR W. WALTNER	(41)	Radiological Science
CHARLES MANUEL WEISS	(35)	Water Quality of Natural Waters, Limnology of Impoundments

Associate Professors

DONALD L. FOX	(8)	Smog Chamber Chemistry, Aerosols
HARVEY EDWARD JEFFRIES	(14)	Atmospheric Chemistry, Modeling and Computerized Data Acquisition
FREDERIC K. PFAENDER	(25)	Environmental Microbiology
R. EUGENE JOHNSON	(28)	Radiological Imaging

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|--------------------------|------|--|
| MARK D. SOBSEY | (38) | Environmental Microbiology, Virology,
Toxicology |
| ALVIS GREELY TURNER, JR. | (33) | Environmental Toxicology, Environmental
Risk Management, Hazardous Wastes |
| JAMES E. WATSON, JR. | (37) | Radiological Hygiene |
| DONALD G. WILLHOTT | (36) | Radiological Hygiene and Occupational
Health |

Assistant Professors

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|-------------------|------|---|
| JOHN BRISCOE | (53) | Water-Supply and Sanitation, Health
Problems in Developing Countries,
Mathematical Modeling |
| AVRAM GOLD | (43) | Environmental Toxicology |
| PAUL S. STANSBURY | (42) | Radiological Hygiene, Medical Physics |

Lecturer

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| DONALD E. FRANCISCO | (9) | Limnology and Aquatic Microbial Ecology |
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Research Associate Professors

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|---------------------|------|--|
| JOHN L. S. HICKEY | (45) | Industrial Hygiene Engineering, Industrial
Ventilation |
| DAVID S. MILLINGTON | (52) | Gas Chromatography/Mass Spectrometry,
Applications for Pollutant Identification |

Adjunct Professors

- | | | |
|----------------------|------|--|
| WARREN A. COOK | | Industrial Health |
| LEONARD J. GOLDWATER | | Occupational Medicine |
| NEIL S. GRIGG | | Water Resources Planning |
| JOHN LUMSDEN | | Occupational Health |
| FOREST O. MIXON | (21) | Environmental Engineering |
| CHARLES R. O'MELIA | (24) | Modeling of Natural Waters, Physio-
chemical Treatment of Water and
Wastewater |

Adjunct Associate Professors

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|------------------------|--|--|
| PHILIP W. ALBRO | | Environmental Chemistry |
| MAHMOUD A. AYOUB | | Occupational Safety |
| EDWARD CHANEY | | Radiation Therapy |
| JOHN M. DEMENT | | Industrial Hygiene |
| J. RONALD HASS | | Environmental Chemistry |
| LINDA W. LITTLE | | Bioassay Procedures |
| MIRDZA L. PETERSON | | Environmental Management and
Protection |
| WARREN T. PIVER | | Environmental Management |
| MADHAV B. RANADA | | Air and Industrial Hygiene |
| HUGO H. ROGERS | | Air Pollution Biology |
| HERSCHEL SLATER | | Air Pollution Meterology |
| WILLIAM E. WILSON, JR. | | Aerosols, Photochemistry, Smog
Chambers |

Adjunct Assistant Professors

LINDA S. BIRNBAUM
DAVID B. WASHBURN

Physiology
Diagnostic Radiation Physics

Emeritus Professors

EMIL THEODORE CHANLETT
DAVID H. HOWELLS
MAYNARD M. HUESCHMIDT
ARTHUR C. STERN
STANLEY J. WEIDENKOPF

- 100 READING IN ENVIRONMENTAL SCIENCES AND ENGINEERING (1-6). Prerequisite, permission required for students outside the Department. Extensive library study of a specific subject in environmental sciences and engineering. The subject and requirements of the project are arranged with the faculty in each instance. *Fall, spring and summer*. Staff.
- 101 SURVEY OF ENVIRONMENTAL PROBLEMS (3). A survey of basic environmental issues for the non-technologist, including physical dynamics of the natural environment, specific environmental problems and quality control techniques. *Spring*. Christman, Turner, Piver.
- 110 PRINCIPLES OF CHEMICAL CARCINOGENESIS (2). Prerequisite, permission of the instructor. Review of DNA structure, replication, repair and the control of these processes. Bioactivation of carcinogens and the interaction of activated metabolites with DNA will also be covered. *Two lecture hours per week, spring*. Gold.
- 111 ENVIRONMENTAL POLICY ANALYSIS (3). Current issues in environmental protection. Analysis of environmental problems and decisions from the viewpoints of the various disciplines concerned with the assessment of risk, policy development and environmental management. *Fall*. Shiffman.
- 115 APPLIED ELECTRON MICROSCOPY (3). Prerequisites, college physics and permission of instructor. The use of the electron microscope as a research tool. *Two lecture and two laboratory hours a week, spring*. Fraser.
- 118 QUANTITATIVE STUDIES FOR ENVIRONMENTAL SCIENCES (5). Prerequisite, Mathematics 15 or equivalent. Applied mathematics from the viewpoint of the needs of those studying environmental sciences. *Ten lecture and eight laboratory hours a week, summer*. Reist.
- 122 WATER CHEMISTRY (4). Prerequisites, CHEM 11 and CHEM 21, or equivalents. Principles and applications of water chemistry. Thermodynamic background for equilibrium calculations is presented. Proton transfer, solubility, complex formation and redox reactions in natural waters are discussed. *Three lecture and two laboratory hours a week, fall*. Johnson, Singer.
- 123 ORGANIC MATERIALS IN NATURAL WATERS (3). Prerequisites, organic chemistry, instrumental analysis, or permission of the instructor. *Spring, alternate years*. Christman.
- 124 ENVIRONMENTAL KINETICS OF CHEMISTRY AND BIOLOGY (2). Prerequisite, ENVR 122. Rates of chemical and biological processes of environmental systems. Theory and models of gas and solution kinetics. Applications are primarily to the chemical kinetics of complex reactions in aqueous solutions. *Spring*. Johnson.
- 127 OCEANOGRAPHY (ZOOL 126, MASC 101) (3). Prerequisite, ZOOL 11 or BOTN 11. *Fall*. Kuenzler, Neumann.
- 128 CHEMICAL OCEANOGRAPHY (MASC 105) (3). Prerequisites, one semester of physical chemistry or ENVR 122, CHEM 180 or equivalent. Variation and abundance

of sea water constituents, the chemical, physical and biological processes contributing to their distribution as well as problems of dispersion of conservative and nonconservative substances are considered. *Spring*. Martens, Johnson.

- 128L CHEMICAL OCEANOGRAPHY LAB (MASC 105L) (1). *Two laboratory hours a week, spring*. Martens, Johnson.
- 131 BIOLOGY IN ENVIRONMENTAL SCIENCE (3). Prerequisite, general chemistry. An introduction to biology, including principles of biochemistry, cell structure, classification, and ecology. Laboratory emphasizes techniques utilized in measurement and control of environmental pollution. *Two lecture and two laboratory hours a week, spring*. Francisco.
- 132 LIMNOLOGY AND WATER POLLUTION (3). Prerequisite, two semesters of chemistry or ENVR 122. The basic determinants of water quality and limnological principles are used to define the ecology of clean and polluted aquatic environments, including lakes, reservoirs and rivers. *Two lecture and two laboratory hours a week, fall*. Weiss.
- 133 ENVIRONMENTAL HEALTH AND THE AQUATIC ENVIRONMENT (3). Prerequisite, ENVR 135 or equivalent. Environmental biology as it relates to health of man and the environment. Includes risk assessment process for aquatic pollution, wastewater treatment, aquatic toxicology, infectious agents, indicator organisms and bioassays. *Two lecture and three laboratory hours a week, fall*. Pfaender.
- 134 ENVIRONMENTAL MICROBIOLOGY (3). Prerequisites, organic chemistry, ENVR 131 or ENVR 133, general biology, or permission of instructor. *Two lecture and three laboratory hours a week, spring*. Pfaender.
- 135 ECOLOGY (Biology, Zoology, Botany 102) (3). Prerequisites, BOTN 11 or ZOOL 11 or BIOL 21-21L. A study of the principles governing the environmental interrelationships of organisms, populations, communities, and ecosystems. *Fall and spring*. Stiven, Reice, Peet, White, Vitousek.
- 135L ECOLOGY LABORATORY (Biology, Zoology, Botany 102L) (1). Corequisite, ENVR 135. *Three laboratory hours a week, fall and spring*. Stiven, Reice, Peet, White.
- 136 BIOLOGICAL OCEANOGRAPHY (Marine Science 104, Zoology 140) (4). Prerequisites, ZOOL 105 and 102, or permission. *Spring*. Lopez.
- 137 ECOLOGY OF WETLANDS (Marine Science 137) (4). Prerequisites, 1 year of biology, 1 year of chemistry, 1 semester of ecology, and permission of instructor. An introduction to the functioning of freshwater and estuarine marsh and swamp ecosystems, with emphasis on systems of south-eastern U.S. *Fall*. Kuenzler.
- 138 ENVIRONMENTAL VIROLOGY (4). Prerequisite, introductory course in microbiology, or ENVR 131 or 133; or permission. Ecological, environmental health and fundamental aspects of virology, with special emphasis on viruses in water, food, and air. *Three lecture and three laboratory hours a week, spring*. Not offered Spring 1981. Sobsey.
- 142 SURVEY OF AIR AND INDUSTRIAL HYGIENE (3). A survey of current problems in air pollution, air pollution control and industrial hygiene including potential for exposure to disease-causing agents, standards and standards setting and methods of control. *Summer I*. Staff.
- 143 APPLIED PHYSIOLOGY AND TOXICOLOGY (3). Prerequisite, admission to graduate standing or permission of instructor. *Fall*. Gold.
- 144 AIR POLLUTION MEASURING, MONITORING AND SURVEY (3). Prerequisites, graduate standing and permission of the instructor. Theory and application of the analysis of samples; manual methods; sensor calibration; site selection; monitoring, gas and aerosol sampling. *Two lecture and four laboratory hours a week, spring*. Fox, Jeffries.
- 145 INSTRUMENTATION AND DATA ACQUISITION (3). Prerequisite, graduate standing and permission of the instructor. Concepts and principles employed in

- electronic-aided measurements of air quality including acquisition of measurements, principles of input transduction, and on-line minicomputers. *Fall*. Jeffries.
- 146 INDUSTRIAL HYGIENE ENGINEERING CONTROL DESIGN (3). Prerequisite, engineering degree or permission of the instructor. Design of industrial exhaust systems and control of heat exposures in occupied spaces. *Fall*. Harris.
- 146L INDUSTRIAL VENTILATION LABORATORY (1). Corequisite, ENVR 146. Laboratory exercises in fluid mechanics specifically related to industrial ventilation. *Fall*. Hickey.
- 147 OCCUPATIONAL SAFETY (2). Prerequisite, permission of instructor. Fundamentals of occupational safety emphasizing legislation and organization of industrial programs. *Spring*. Ayoub.
- 161 ELEMENTS OF RADIOLOGICAL HYGIENE (2). Prerequisite, calculus. The physics of ionizing radiations, their interactions with matter, biological effects, and principles of radiation protection are presented. *Spring, second summer session*. Stansbury, Watson, Willhoit.
- 162 MODERN PHYSICS FOR ENVIRONMENTAL SCIENCE (3). Prerequisite, ENVR 118. Modern physics with the emphasis on radioactivity and ionizing radiations. *Fall*. Watson.
- 163 RADIATION INSTRUMENTATION (3). Corequisite, ENVR 162. A laboratory study of measurements of radioactivity with emphasis on the principles of operation of the instruments. *One lecture and four laboratory hours a week, fall*. Stansbury.
- 164 FIELD OBSERVATIONS IN RADIOLOGICAL HYGIENE (2). Prerequisite, permission of instructor. Field observation of health physics practices at nuclear fuel cycle facilities and government nuclear facilities. Field fee \$175.00. *Spring, alternate years beginning 1980*. Watson.
- 165 ADVANCED RADIOLOGICAL LABORATORY (2). Intensive radiological laboratory training at Oak Ridge Associated Universities. Tour of research facilities at Oak Ridge National Laboratory. Field fee \$200.00. *Spring, alternate years beginning 1983*. Stansbury.
- 167 INTRODUCTION TO MEDICAL PHYSICS (2). Permission of the instructor required. The physics of radiation therapy, diagnostic radiology, and nuclear medicine are introduced by practicing clinical physicists. *Fall*. Stansbury, Chaney, Johnston, Washburn.
- 171 WATER QUALITY EVALUATION AND CONTROL (3). Characteristics of water as a resource. Water uses, trends, water quality concepts, measurements, criteria, problems, pollutants. Regulation of water quality. *Fall*. Lamb.
- 174 WATER AND WASTES TREATMENT PROCESSES (3). Prerequisite, ENVR 122, corequisite, ENVR 131 or permission of instructor. Unit processes for water and wastewater treatment. *Spring*. Staff.
- 174L WATER AND WASTES TREATMENT PROCESSES LABORATORY (1). Corequisite, ENVR 174. Laboratory exercises to illustrate the process principles discussed in ENVR 174. *Two laboratory hours a week, spring*. Staff.
- 176 ENGINEERING HYDRAULICS AND HYDROLOGY (3). Prerequisites, MATH 31 and 32, BIOS 105. Applied hydraulic computations including: hydrostatics, pipeline flows, networks, open channels, metering and pumping systems. Analytical techniques of surface and ground water hydrology. *Spring*. Lamb.
- 183 SPECIAL TOPICS IN WATER RESOURCES (2). Prerequisite, permission of instructor, interdisciplinary exploration of issues in water resources. *Spring*. Okun.
- 200 PROBLEMS IN ENVIRONMENTAL SCIENCES AND ENGINEERING (1 or more). For students outside the Department. Permission required. Requirements of the project are arranged with the faculty in each individual instance. *Two or more hours a week, fall spring, and summer*. Staff.

- 211 ENVIRONMENTAL MANAGEMENT (3). Prerequisite, permission of instructor. An analysis of decision-making for environmental protection programs including policy development, program implementation, management approaches. Case studies emphasize public policy, organizational structure, institutional arrangements. *First summer session*. Shiffman.
- 212 PLANNING AND DEVELOPMENT OF ENVIRONMENTAL HYGIENE PROGRAMS (3). Prerequisite, permission of the instructor. *Two lecture and two seminar hours a week, fall*. Shiffman.
- 215 ENVIRONMENTAL ASSESSMENT (2). Prerequisite, ENVR 111 or permission of the instructor. Concepts and methodologies for assessing the environmental, ecological and social consequences of technological development. The preparation of environmental impact statements will be considered as well as case studies of specific projects. *One lecture, two seminar hours per week, spring*. Shiffman, Weiss.
- 217 SYSTEMS ANALYSIS IN ENVIRONMENTAL PLANNING (3). Prerequisite, calculus. Applications of systems techniques to the management of environmental quality. *Fall*. Staff.
- 218 ENVIRONMENTAL SYSTEMS ANALYSIS I: DETERMINISTIC MODELS (3). Prerequisite, calculus. Concepts of systems analysis. Modeling of environmental and urban systems. Elements of linear algebra. Classical optimization techniques. Marginal analysis models in economics. Mathematical programming models. Selected topics in linear, nonlinear, and dynamic programming. *Spring*. Staff.
- 219 ENVIRONMENTAL SYSTEMS ANALYSIS (City and Regional Planning 219) (3). Prerequisite, permission of the instructor. Principles of model construction for complex urban and environmental resource systems. Includes a review of selected models for urban and regional growth, water quality and quantity, air quality, and other environmental impacts. *Fall*. Moreau.
- 221 INSTRUMENTAL METHODS OF ANALYSIS (3). Prerequisites, inorganic and analytical chemistry. Principles and techniques of instrumental chemical analysis, including optical, electrical and separation methods. Laboratory sessions include adsorption spectrophotometry, potentiometry, amperometry, gas chromatography, GC-mass spectrometry. *Two lecture and four laboratory hours, fall*. Shuman.
- 222 SPECIAL TOPICS IN AQUATIC CHEMISTRY (2). Prerequisite, ENVR 122. Modern topics in aquatic chemistry, application of chemical concepts to understanding and controlling man's aquatic environment. May be taken for credit more than once, as special topics change. *Fall, spring*. Johnson.
- 223 TRACE ELEMENTS IN THE ENVIRONMENT (3). Prerequisite, ENVR 122 or equivalent. Transport and transformations of selected trace elements in the environment. Global cycles, societal flow, models and experimental approaches to chemical speciation. Health effects, societal targets, drinking water standards. *Fall*. Shuman.
- 224 CHEMICAL MODELING OF AQUATIC SYSTEMS (3). Prerequisite, ENVR 122. The application of aquatic chemistry to modeling water supplies, wastewaters, rivers, lakes, estuaries, and the oceans. Stoichiometric, thermodynamic, and kinetic models are developed for these aquatic systems. *Spring*. Staff.
- 231A LIMNOLOGICAL METHODS (2). Prerequisite, basic limnology and statistics; must register for 231B in the second session. Professional preparation for field study of freshwater aquatic systems. *Two lecture and ten laboratory hours a week, first summer session*. Francisco.
- 231B LIMNOLOGICAL METHODS (2). Prerequisite, ENVR 231A. *Second summer session*. Francisco.
- 232 SPECIAL TOPICS IN AQUATIC BIOLOGY (2). Prerequisite, ENVR 132 or permission of instructor. Topics of contemporary concern to the management of the aquatic environment will be discussed in depth. Course may be taken more than once, as new topics are offered. *Spring*. Weiss, Kuenzler.

- 233 MICROBIAL ECOLOGY (4). Prerequisite, ENVR 134 or permission of instructor. A consideration of the factors which influence the distribution and interrelationships of microorganisms and their natural habitats. *Two lecture and four laboratory hours per week. Fall. Pfaender.*
- 234 BIOASSAY FOR ENVIRONMENTAL EFFECTS (2). Permission of instructor required. Bioassay techniques for environmental effects are evaluated with reference to health hazardous substances. Extrapolations for regulatory mandates as well as total ecosystem effects are examined. *Fall. Weiss.*
- 235 ECOLOGY OF PHYTOPLANKTON (Botany 245) (4). Prerequisite, general ecology or biology. Relationships of planktonic algae to the environment, emphasizing nutrition and primary productivity. *Three lecture and two laboratory hours a week, spring. Kuenzler.*
- 236 LIMNOLOGICAL STUDIES (2). Prerequisites, ENVR 132, or equivalent; permission of instructor. *Spring. Weiss; staff.*
- 241 INTRODUCTION TO AEROSOL SCIENCE (3). Prerequisite, admission to the Department of Environmental Sciences and Engineering or permission of the instructor. *Fall. Reist.*
- 241L AEROSOL SCIENCE LABORATORY (1). Corequisite, ENVR 241. *Fall. Reist.*
- 242 INDUSTRIAL HYGIENE PRACTICE (3). Prerequisites, ENVR 241, 143. *Two lecture and two laboratory hours a week, spring. Fraser.*
- 243 AIR AND ITS CONTAMINANTS (3). Corequisite, ENVR 241. *Fall. Fox.*
- 244 INDUSTRIAL HYGIENE LABORATORY (3). Prerequisite, ENVR 241, corequisite, ENVR 242. *One lecture and four laboratory hours a week, spring. Reist.*
- 245 AIR POLLUTION CONTROL (3). Prerequisite, ENVR 243. *Three lecture hours a week, spring. Harris.*
- 246 BIOLOGICAL EFFECTS OF AIR POLLUTION (3). Prerequisites, ENVR 143, 243, or graduate standing in the biological sciences. *Three lecture hours a week, spring. Staff.*
- 247 CHEMISTRY OF THE TROPOSPHERE (3). Prerequisites, physical chemistry and permission of the instructor. *Spring. Fox.*
- 248 INDUSTRIAL MEDICINE—PRACTICE AND MANAGEMENT (3). Prerequisite, ENVR 143 or equivalent. The roles and responsibilities of the industrial physician nurse and industrial hygienists and the etiology, diagnosis, treatment and prevention of diseases and stresses found in modern industry. *Spring. Fraser.*
- 249 AIR POLLUTION METEOROLOGY (3). Prerequisite, GEOG 110 or equivalent. Theory of transport and diffusion of air pollutants and application to practical problems and computations involving both single sources and multiple sources. *Spring. Slater.*
- 252 ENVIRONMENTAL PROTECTION II (3). Environmental assessment and management of pesticide chemicals, hazardous wastes and community noise. Methodologies and rationale of human exposure and risk evaluation are presented. *Two lecture and two seminar hours per week. Fall. Turner.*
- 253 ENVIRONMENTAL POLICY ANALYSIS II (3). Structure and dynamics of U.S. environmental policy making as it affects environmental management. Legislation, regulation and administration and the roles of science and analysis in political decisions are presented. *Two lecture and two seminar hours per week. Spring. Andrews.*
- 255 MANAGEMENT OF HAZARDOUS WASTE (3). Prerequisite, CHEM 61 or equivalent. The classification, chemistry and toxicology of hazardous wastes will be presented. Control technologies, regulatory policies and management strategies are examined. *Fall. Turner.*
- 261 RADIATION BIOPHYSICS (3). Prerequisite ENVR 162 or equivalent. Biophysical factors of radiation quality and the response of cell populations, models of the

- mechanisms of radiation action on biological systems, microdosimetry and dosimetry at interfaces. *Spring*. Stansbury.
- 262 HEALTH PHYSICS (3). Prerequisites, ENVR 163, 261, 263. The principles of applied radiation protection. *Fall*. (1980 and alternate years.) Staff.
- 263 RADIATION HAZARDS EVALUATION I (3). Prerequisite, ENVR 162. The principles and techniques of external and internal radiation hazard evaluation are studied. The interaction of radiation with matter and fundamentals of radiation dosimetry are presented. *Spring*. Watson.
- 264 RADIATION HAZARDS EVALUATION II (3). Prerequisites, ENVR 261 and 263. Internal and external hazards of ionizing radiation are evaluated. Problems in hazards evaluation and radiation protection of the types included in certification exams of the American Board of Health Physics are studied. *Three lecture hours a week, fall*. Watson.
- 271 ENGINEERING MODELING OF AQUATIC SYSTEMS (3). Prerequisite, permission of the instructor. Examination of selected physical, chemical and biological phenomena in natural aquatic systems. Use of mathematical models for water quality control. *Spring*. Lauria.
- 272 ENGINEERED WATER SYSTEMS (3). Prerequisite, permission of instructor. An examination of technology and planning techniques for water and wastewater systems including pumping stations, reservoirs, water distribution and wastewater collection networks. *Three lecture hours a week, fall*. Lauria.
- 273 WATER AND WASTEWATER TREATMENT PLANT DESIGN (3). Prerequisite, ENVR 174. Design of municipal treatment facilities. *Summer*. Okun.
- 274 ADVANCED WATER AND WASTES TREATMENT PROCESSES I (3). Prerequisite, ENVR 122 or permission of instructor. Applications of chemical and physical principles to water and wastewater treatment processes. *Fall*. Singer.
- 275 ADVANCED WATER AND WASTES TREATMENT PROCESSES II (3). Prerequisites, ENVR 274, ENVR 131 or permission of the instructor. Application of biological principles to wastewater treatment processes and consideration of advanced treatment processes. Singer.
- 276 INDUSTRIAL WATER QUALITY MANAGEMENT (3). Prerequisites, ENVR 171 and 174 or equivalents. Water supply and wastes disposal problems of industries. *Fall*. Lamb.
- 277 ENGINEERING PROJECT DESIGN (3). Prerequisites, ENVR 217 and BIOS 135. Decision-model approach to project design. *Six lecture hours a week, first summer session*. Staff.
- 278 DEVELOPMENT OF A WATER PROJECT (3). Prerequisite, permission of instructor. Analysis of a real water project, including data collection, preliminary design, evaluation of engineering alternatives, and assessment of feasibility, culminating in the preparation of an engineering report. *Two lecture and two seminar hours a week, fall*. Okun.
- 281 TOPICS IN ADVANCED HYDROLOGY (3). Prerequisites, ENVR 272, and BIOS 135, or equivalent. *Spring*. Staff.
- 282 PUBLIC INVESTMENT THEORY AND TECHNIQUES (City and Regional Planning 232) (3). Prerequisites, Economics 131 and permission of the instructor. *Spring*. Whittington.
- 283 NATURAL RESOURCE LAW AND POLICY (City and Regional Planning 233) (3). Prerequisite, permission of instructor. *Fall, spring*. Heath, Campbell.
- 284 PLANNING OF NATURAL RESOURCES AND ENVIRONMENTAL SYSTEMS (City and Regional Planning 234) (3). Prerequisite, permission of instructor. *Fall*. Hill.

- 285 SPECIAL PROJECT IN WATER QUALITY PLANNING (3). Prerequisites, a master's degree or two semesters residence in the Department of Environmental Sciences and Engineering. A specific real project integrating the many elements that affect water quality and the decisions that must be made in water management. *Second summer session.* Staff.
- 300 RESEARCH IN ENVIRONMENTAL SCIENCES AND ENGINEERING (2 or more). Prerequisites, consultation with the faculty and approval of subject and proposed program. For students outside the Department. *Four or more hours a week, fall, spring and summer.* Staff.
- 301 SEMINAR IN ENVIRONMENTAL SCIENCES AND ENGINEERING (1 or more). No prerequisites. Readings and discussions to provide opportunity to develop new concepts and topics in various aspects of Environmental Sciences and Engineering. *Fall, spring and summer.* Staff.
- 311 SEMINAR IN ENVIRONMENTAL HEALTH (1). Open by special arrangement to students doing advanced graduate work. *Two seminar hours a week, fall and spring.* Staff.
- 313 ENVIRONMENTAL HEALTH PROBLEMS IN DEVELOPING COUNTRIES (1). *Two seminar hours a week, fall.* Shiffman.
- 314 SEMINAR ON CURRENT INDUSTRIAL HYGIENE ISSUES (1). ENVR 242, corequisite; permission of instructor required. Discussion on current topics affecting the field of industrial hygiene. *Two seminar hours per week. Spring.* Reist.
- 320 RESEARCH IN ENVIRONMENTAL CHEMISTRY (1-9). Prerequisite, consultation with the faculty and approval of subject and proposed program. *Fall, spring, summer.* Christman, Johnson, Millington, Shuman, Singer.
- 330 RESEARCH IN ENVIRONMENTAL BIOLOGY (1-9). Prerequisite, consultation with the faculty and approval of subject and proposed program. *Fall, spring, summer.* Kuenzler, Weiss, Pfaender, Sobsey.
- 340 RESEARCH IN AIR AND INDUSTRIAL HYGIENE (1-9). Prerequisite, consultation with the faculty and approval of subject and proposed program. *Fall, spring, summer.* Battigelli, Fox, Fraser, Harris, Jeffries, Reist, Hickey.
- 341 ENGINEERING RESEARCH IN AIR AND INDUSTRIAL HYGIENE (1-9). Prerequisite, consultation with the faculty and approval of the subject and proposed program. Engineering research problems relating to air and industrial hygiene topics such as control equipment design, industrial ventilation parameters. *Fall, spring, summer.* Fox, Fraser, Harris, Jeffries, Reist, Hickey.
- 350 RESEARCH IN ENVIRONMENTAL MANAGEMENT AND PROTECTION (1-9). Prerequisite, consultation with the faculty and approval of subject and proposed program. *Fall, spring, summer.* Andrews, Christman, Shiffman, Turner, Gold.
- 360 RESEARCH IN RADIOLOGICAL HYGIENE (1-9). Prerequisite, consultation with the faculty and approval of subject and proposed program. *Fall, spring, summer.* Watson, Stansbury.
- 370 INVESTIGATIONS IN WATER RESOURCES ENGINEERING (1-9). Prerequisite, consultation with the faculty and approval of subject and proposed program. *Fall, spring, summer.* Briscoe, DiGiano, Lamb, Lauria, Okun, Singer.
- 392 MASTER'S TECHNICAL REPORT (0-9). The technical report requirement for MSPH, MPH, and MSEE candidates is satisfied by the extensive study of a problem in environmental sciences and engineering. *Fall, spring and summer.* Staff.
- 393 MASTER'S THESIS (0-9). *Fall, spring and summer.* Staff.
- 394 DOCTORAL DISSERTATION (0-9). *Fall, spring and summer.* Staff.
- 400 GENERAL REGISTRATION (0).

Department of Epidemiology (EPID)

MICHEL A. IBRAHIM, *Chairman*

Professors

BARBARA S. HULKA	(5)	Health Services Research, Cancer Epidemiology
MICHEL A. IBRAHIM	(6)	Health Services Research Cardiovascular Epidemiology, Cancer Epidemiology
BERTON H. KAPLAN	(8)	Social Epidemiology
ABDEL R. OMRAN	(10)	Population Epidemiology
CARL M. SHY	(14)	Environmental, Occupational Epidemiology, Cancer Epidemiology
HERMAN A. TYROLER	(13)	Environmental Epidemiology, Cardiovascular Epidemiology

Associate Professors

M. CAROLINE BECKER	(3)	Hypertension Intervention Programs
SHERMAN A. JAMES	(7)	Psychosocial Epidemiology
RALPH C. PATRICK	(11)	International Health Programs
EDWARD H. WAGNER	(15)	Clinical Epidemiology
CAROLYN A. WILLIAMS	(16)	Health Services Research

Research Associate Professors

GERARDO HEISS	(41)	Cardiovascular Epidemiology
G. J. LOVE	(23)	Environmental Epidemiology

Research Assistant Professors

HARVEY CHECKOWAY	(52)	Occupational Epidemiology
SUZANNE G. HAYNES	(62)	Cardiovascular Epidemiology
VICTOR J. SCHOENBACH	(64)	Health Services Research

Clinical Professors

CURTIS G. HAMES	(44)	Clinical Epidemiology
MICHAEL R. SWIFT	(60)	Clinical Epidemiology

Clinical Associate Professors

LAWRENCE M. CUTCHIN	(53)	Clinical Epidemiology
GORDON H. DEFRIESE	(54)	Health Services Research
ROBERT H. FLETCHER	(45)	Clinical Epidemiology
SUZANNE W. FLETCHER	(46)	Clinical Epidemiology

Clinical Assistant Professor

DAVID S. SISCOVICK	(68)	Clinical Epidemiology, Cardiovascular Epidemiology
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Adjunct Professors

H. HUGH FUDENBERG	(40)	Immunogenetics
SIEGFRIED H. HEYDEN	(56)	Cancer Epidemiology, Cardiovascular Epidemiology
CLARENCE C. LUSHBAUGH	(63)	Occupational Epidemiology

Adjunct Associate Professors

DRAGANA A. ANDJELKOVICH	(66)	Occupational Epidemiology
JOAN CORNONI-HUNTLEY	(4)	Alcohol, Behavior and Health
CARL G. HAYES	(2)	Environmental Epidemiology
EUGENE S. MAYER	(37)	Health Services Research
J. NEWTON MACCORMACK	(57)	Infectious Disease Epidemiology
MELINDA S. MEADE	(58)	Medical Geography
ALLEN H. SMITH	(65)	Occupational Epidemiology

Adjunct Assistant Professors

STEPHEN B. BLUM	(51)	Environmental Epidemiology
STEPHEN H. GEHLBACH	(19)	Clinical Epidemiology
KATHRYN M. HABIB	(55)	Health Services Research
MICHAEL D. HOGAN	(35)	Environmental Epidemiology
MICHAEL J. MOSER	(67)	Occupational Epidemiology
GEORGE R. PARKERSON	(49)	Clinical Epidemiology
SAMUEL M. PUTNAM	(38)	Health Services Research
WALTER J. ROGAN	(39)	Environmental Epidemiology
SETH A. RUDNICK	(59)	Clinical Epidemiology
ALLEN J. WILCOX	(61)	Environmental Epidemiology

Emeritus Professor

JOHN T. FULTON	(28)	Dental Epidemiology
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- 140 PROBLEMS IN EPIDEMIOLOGY (1 or more). A course for students who wish to make an intensive study of some special problems in epidemiology. *Two or more hours a week, fall, spring, summer.* Staff.
- 160 PRINCIPLES OF EPIDEMIOLOGY (3). Pre- or co-requisite, BIOS 101 or BIOS 105 or permission of instructor. An introductory course that considers the meaning and scope of epidemiology and the uses of morbidity, mortality and other vital statistics data in the scientific appraisal of community health. *Two lecture and two laboratory hours a week, fall.* Omran, faculty.
- 161 EPIDEMIOLOGY IN POPULATION DYNAMICS AND FAMILY PLANNING PROGRAMS (2). Pre- or co-requisites, BIOS 101 and EPID 160, or their equivalents. Health and population dynamics: epidemiologic transition, health and family formation, fertility regulation methods, infertility. Assessment of family planning programs. Emphasizes methodologic and content issues in international context. *Two lecture hours a week, fall.* Omran.
- 162 EPIDEMIOLOGY OF ENVIRONMENTAL AND OCCUPATIONAL HEALTH (3). Pre- or co-requisites, BIOS 105 and one year of calculus; or permission of instructor. Alternative to EPID 160 satisfying core requirements. Introductory course

- in history, principles and uses of epidemiology for understanding and control of health and disease in relation to man's environment. *Three lecture hours a week, spring.* Shy.
- 165 ANALYSIS OF CATEGORICAL DATA (Biostatistics 165) (3). Prerequisites, BIOS 105 and EPID 160 or equivalents. Analysis of categorized data, with special emphasis on the methods of use in epidemiology; contingency tables, rates and relative risk, survivorship and life table methods, linear models for categorical data. *Three hours a week, spring.* Symons.
- 168 FUNDAMENTALS OF EPIDEMIOLOGY (3). Pre- or co-requisite, BIOS 105 or higher level BIOS course, and biomedical background. Permission of instructor required for non-majors. Epidemiologic principles and methods with emphasis on topical issues and advanced research design and analysis. An alternate to EPID 160 for satisfying the SPH core requirements. *Two lecture and two laboratory hours a week, fall.* Ibrahim, Schoenbach, faculty.
- 170 EPIDEMIOLOGY OR PROGRAM ACCEPTANCE (3). Prerequisite, EPID 160 or equivalent. Use of epidemiological method to consider problems of social, cultural and psychological determinants of health programs. Concepts and methods useful in predicting patterns of acceptance or rejection. *Three lecture hours a week, spring.* Patrick.
- 200 EPIDEMIOLOGY FOR CLINICIANS (2-4). Prerequisite, clinical experience in medicine or consent of instructors. When taken for three or more hours, acts as alternative to EPID 160 satisfying core requirements. Introduction to epidemiologic principles and methods as applied to clinical practice. *Two lecture hours and two possible seminar or laboratory hours a week, spring.* Gehlbach.
- 211 DETERMINANTS OF COMMUNICABLE DISEASE (2). Biological determinants, changing patterns of communicable diseases, definition of high-risk sub-populations, methods of control. *Two lecture hours a week, fall.* Becker.
- 231 EPIDEMIOLOGIC RESEARCH IN PERSONAL HEALTH SERVICES (3). Permission of instructor required for non-majors. Exploration of research methodology and measurement techniques in areas of quality of care and services utilization. Formation of research proposals by students. *Three lecture hours a week, fall.* Hulka.
- 233 CANCER EPIDEMIOLOGY AND PATHOGENESIS (3). Prerequisites, EPID 160 or alternative, background in pathology. Permission of instructor required for non-majors. Focuses on integrative approach to cancer epidemiologic investigation, choice of research strategies and comparison groups, hypothesis generation, data analysis and interpretation. *Three lecture hours a week, spring.* Hulka and Rudnick.
- 234 RESEARCH DESIGN IN EPIDEMIOLOGY (2). Pre- or co-requisite, EPID 160 or alternative. Systematic stepwise approach to research design. Epidemiologic methods and strategies in planning and interpreting etiologic studies; clinical and intervention trials; evaluation. Appraising validity of different designs. Grantsmanship and research proposals. *Two lecture hours a week, fall.* Omran.
- 240 EPIDEMIOLOGY OF ALCOHOL USE AND ABUSE (Health Administration 240) (3). Prerequisite, EPID 160 or equivalent. Course will examine patterns of alcohol use and abuse nationally, internationally, and ethnically. Problems of definition, measurement and methodology will also be considered; as will implications for health. *Two lecture and two seminar hours a week, spring.* Magruder-Habib.
- 249 GENETICS OF COMMON DISEASES (Genetics 249) (3). Prerequisites, BIOS 150, GNET 122, or EPID 160; or permission of instructor. Critical analysis of genetic issues in human disease. The genetics of cancer, heart disease, diabetes, mental illness, mental retardation, hypertension and arthritis will be covered. The application of genetic and epidemiological techniques will be examined. *Three lecture hours a week, spring, 1980 and alternate years.* Swift.

- 250 HEALTH PROBLEMS OF BLACK AMERICANS: A SOCIAL EPIDEMIOLOGIC PERSPECTIVE (3). Prerequisites, EPID 160; BIOS 105. Examines major underlying socioeconomic, cultural and psychological factors contributing to the observed Black excess in deaths from hypertension-related disorders, cancer, alcoholism and homicide in early and middle adulthood. *Two lecture and two seminar hours a week, spring.* James.
- 251 EPIDEMIOLOGIC METHODS IN POPULATION (3). Prerequisites, EPID 161 and/or permission of instructor. Uses, limitations of traditional epidemiologic strategies in population research. Advanced epidemiologic methodologies in the study of fertility and mortality correlates, abortion, sterilization, contraception, and sterility. Epidemiology in family planning evaluative research. Epidemiologic case studies in population. *Three lecture hours a week, fall.* Omran.
- 256 CARDIOVASCULAR DISEASE EPIDEMIOLOGY (4). Pre- or co-requisites, EPID 160, and BIOS 105, or their equivalents. Review of major issues in cardiovascular disease epidemiology, summarization of relevant pathology and analogies of population determinants and strategies for prevention. *Three lecture hours a week, fall.* Tyroler, Heiss, Davis.
- 257 TEACHING EXPERIENCE IN EPIDEMIOLOGY (4). Prerequisite, Epid Major, second year or above. Provides Epidemiology majors with supervised experience in teaching and course preparation. Students act as assistants in Departmental courses. *Fall, spring and summer.* Faculty.
- 258 WOMEN'S HEALTH: AN EPIDEMIOLOGICAL ANALYSIS (3). Prerequisite, EPID 160. Permission required for non-majors. Critical exploration and research on factors associated with selected health states in women and health service utilization by women. Emphasizes examination of hypotheses on health correlates of women's role changes. *Three lecture hours a week, spring.* Williams.
- 264 CULTURE AND HEALTH (3). Prerequisite, EPID 160 or equivalent, basic social science background; permission of instructor. This course considers the role of social, cultural and psychological factors in the etiology of various disorders. Emphasis is placed upon the development of useful frameworks and on the methods required to investigate these correlates of health. *Three lecture hours a week, spring.* Kaplan.
- 265 HISTORY OF EPIDEMIOLOGY (3). Prerequisite, EPID 160 or permission of instructor. This course considers the historical development of epidemiological knowledge and method in relation to changing patterns of health and the existing scientific "climate." *Four lecture hours a week, first session, summer.* Patrick.
- 266 EPIDEMIOLOGIC INVESTIGATION (3). Prerequisites, EPID 160, EPID 256, BIOS 105, or their equivalents. Permission required. Designed for the acquisition of skills in epidemiologic research, through the investigation of problems in cardiovascular disease. Available data sets are used for tutored research. *Three lecture hours a week, spring.* Heiss, Davis, Tyroler.
- 267 OCCUPATIONAL EPIDEMIOLOGY (3). Prerequisites, EPID 160, BIOS 105. Review of methods of investigation and epidemiologic evidence of diseases associated with the work environment. *Three lecture hours a week, spring.* Tyroler, Shy, Checkoway, Andjelkovich.
- 268 ADVANCED METHODS IN EPIDEMIOLOGY (4). Prerequisites, BIOS 145, EPID 160 and BIOS 108, or their equivalents. This course develops a systematic overview of the methodologic techniques available for observational and experimental epidemiologic investigation at the stages of planning, information and analysis. *Three lecture and two laboratory hours a week, fall.* Kleinbaum, Kupper.
- 276 ADVANCED ENVIRONMENTAL AND OCCUPATIONAL EPIDEMIOLOGY (3). Prerequisite, EPID 160 or 162 or equivalent; permission of instructor. Designed for epidemiology majors, this course investigates various applications of the principles

- of epidemiologic research to the evaluation and identification of environmental and occupational health hazards. *Fall*. Shy.
- 301 EPIDEMIOLOGIC RESEARCH IN FEDERAL AGENCIES (1). Prerequisite, EPID 160. Permission of instructor required. Field visit to D.C. area federal agencies conducting epidemiologic research. Supervised meetings with agency scientists to discuss epidemiologic studies. Oral and written report on research program of one agency required. No field fee. *Spring*. Shy.
- 315 FIELD TRAINING IN EPIDEMIOLOGY (3-6). Prerequisite, advanced standing. Designed to give epidemiology majors a supervised field experience in population health research. Field fee \$650. *Fall, spring, summer*. Faculty.
- 360 RESEARCH IN EPIDEMIOLOGY (2-9). Prerequisite, permission of instructor.
- 361 Independent investigation in consultation with an instructor who must assign or approve the subject of research. Credits will vary according to the effort and rigor of the research. *Fall, Spring, Summer*. Faculty.
- 362 ENVIRONMENTAL EPIDEMIOLOGY SEMINAR (3). Detailed, critical reviews of selected topics in environmental epidemiology. Students work collaboratively with faculty members conducting research in environmental determinants of disease. *Spring*. Tyroler.
- 368 EPIDEMIOLOGIC BASIS OF COMMUNITY HEALTH SERVICES (2). Prerequisites, basic course in epidemiology and biostatistics. Preference to students with practical experience in community health service. Application of epidemiologic principles and methods to community diagnosis, establishing health priorities and planning and evaluating health programs. Indices, classifications, strategies, utilization, screening, intervention and outcome of care practices. *Two lecture hours a week, spring, 1983 and alternate years thereafter*. Ibrahim.
- 392 MAJOR PAPER (1-6). *Fall, spring and summer*. Graduate Faculty.
- 394 DOCTORAL DISSERTATION. *Fall, spring and summer*. Graduate Faculty.
- 400 GENERAL REGISTRATION (0).

Department of Health Policy and Administration (HPAA)¹

SAGAR C. JAIN, *Chairman*

Professors

MOYE W. FREYMAN	(2)	Population Policy, Program Development, Technical Assistance
JOHN T. HUGHES	(6)	Dental Public Health
SAGAR C. JAIN	(1)	Organizational Analysis and Development, Health Policy Analysis
ARNOLD D. KALUZY	(15)	Organizational Behavior, Innovation Diffusion, Medical Care
NANCY MILIO	(51)	Consumer Health-oriented Policy Planning and Evaluation
HARRY T. PHILLIPS	(7)	Health Planning, Health Facilities Management, Community Health Services
LEONARD S. ROSENFELD	(8)	Financing of Health Services, Health Planning and Evaluation, Institutional Management
MORRIS SCHAEFER	(9)	Planning and Evaluation, Administrative Theory, Systems Management
JAMES E. VENEY	(18)	Social Research Methods, Health Policies
CURTIS P. McLAUGHLIN	(61)	Management Science, Financial Management, Health Administration Research

Associate Professors

JAMES E. ALLEN	(11)	U.S. Health Policy, Management Information Systems, Population Policies and Programs
PATRICIA Z. BARRY	(20)	Accident and Injury Control, Emergency Health Services
DAN E. BEAUCHAMP	(21)	Health Policy Analysis, Alcohol and Drug Problems
WILLIAM S. FLASH	(12)	Policy Analysis, Program Evaluation, Re-evaluation Counseling
CHARLES L. HARPER	(13)	Personnel and Finance Administration
WILLIAM T. HERZOG	(23)	Systems Analysis and Planning, Personnel Development
WILLIAM JESSEE	(76)	Medical Care, Quality Assurance
ALBERT L. JOHNSON	(14)	Inter-organizational Behavior, Research Methods
DONALD L. MADISON	(16)	Rural Health

Assistant Professors

LAUREL FILES	(28)	Policy Analysis, Human Services Administration, Mental Health
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¹Effective July 1, 1982, the name of the Department of Health Administration changes to the Department of Health Policy and Administration. The change is noted here for the benefit of the reader.

DEBORAH A. FREUND	(75)	Labor and Health Economics, Public Finance, Economic Theory
GEORGE M. NEELY	(56)	Organizational Behavior
BARNETT R. PARKER	(60)	Operations Research
KENNETH R. WING	(58)	Health Law
WILLIAM N. ZELMAN	(62)	Health Finance

Lecturers

KENNETH MILLS	(85)	Health Administration, Alcohol
J. WILBERT EDGERTON	(50)	Mental Health, Group Dynamics
DANIEL C. JONES	(49)	Health Law and Policy
WILLIAM G. HOLLISTER	(5)	Mental Health, Leadership Development, Group Dynamics
WILLIAM BAXTER	(79)	Mental Health
ROBERT BURNS MOORHEAD	(33)	Financial Management
GEORGE M. STOCKBRIDGE	(64)	Health Planning
ROBERT HOLLISTER	(88)	Public Health, Primary Health Care
HAROLD HOLDER	(87)	Systems Analysis, Alcohol
BASIL DELTA	(86)	Public Health, Health Services Administration

Clinical Professors

JAMES P. DIXON	(74)	Health Administration, Higher Education, Health Systems Agencies
JACOB KOOMEN	(35)	Health Policy, Program Development, Community Health Services

Clinical Associate Professor

ROBERT A. LODDENGAARD	(32)	Program Evaluation
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Clinical Assistant Professors

JAMES W. LUCKEY	(77)	Mental Health, Alcoholism
MOSES CAREY	(84)	Health Administration, Public Health Law

Clinical Instructor

CHARLES T. GRUBB	(68)	Management and Development of Human Service Resources
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Adjunct Professors

ABRAHAM S. DAVID	(38)	Health Economics, Population
JAMES W. OSBERG	(36)	Mental Health
HUGH H. TILSON	(81)	Health and Human Services, Preventive Medicine
DAVID G. WARREN	(10)	Health Law and Policy
KANDIAH KANAGARATNAM	(89)	Public Health, Medical Services Administration

Adjunct Associate Professors

K. V. RANGANATHAN	(91)	Public Health, Population Planning
MARVIN J. BLOCK	(73)	Dental Public Health
B. J. CAMPBELL	(37)	Highway Safety
DAVID W. DUNLOP	(71)	Health Economics
MARTIN P. HINES	(39)	Communicable Disease Control, Occupational Health, Veterinary Public Health
W. BURNS JONES	(40)	Program Planning & Evaluation, Community Health Administration
FLORENCE KAVALER	(41)	Long Term Care, Health Finance, Health Facilities
RONALD H. LEVINE	(90)	Pediatrics, Health Services

Adjunct Assistant Professors

GEORGE G. DUDNEY	(44)	Dental Public Health
THOMAS R. KONRAD	(69)	Research Methodology
DEBORAH BENDER	(55)	Non-traditional Education, Family Planning

Adjunct Lecturer

DANIEL B. REIMER	(80)	Personal Health Service Administration, Fiscal Personnel Management, Inter-organization Relations
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Research Professor

PATRICIA F. WALLER	(19)	Accident and Injury Control, Highway Safety
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Research Assistant Professors

THOMAS J. BACON	(67)	Health Manpower
RICHARD GARY ROZIER	(29)	Dental Public Health

Visiting Professor

JAMES D. SUVER	(82)	Management Control, Managerial Finance
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Emeritus Professors

WILLIAM FRED MAYES
JOHN JOSEPH WRIGHT

Courses for Graduates and Advanced Undergraduates

- 101 AGING AND HUMAN DEVELOPMENT (PHNU/HEED 101) (3). Biological, medical, demographic and social aspects of aging. New methods and concepts of aging processes and their implications. *Three lecture hours per week. Fall.* Staff.

- 102 DETERMINANTS OF HEALTH: BIOLOGICAL, PHYSICAL AND SOCIAL FACTORS (Maternal and Child Health 102) (3). This course will examine the role of various biological, physical and social factors in health and will be taught in three autonomous modules with provisions for exemption. *Spring*. Rozier, Watkins.
- 105 CONCEPTS OF HEALTH ADMINISTRATION (3). Survey of health and human services organization and management including concepts of administrative systems, government, legal and public interest aspects, organizational behavior and relations. *Fall and spring*. Allen, Barry.
- 109 CONCURRENT FIELD TRAINING IN HEALTH ADMINISTRATION (1-3). Supervised observation or service activities in health service organizations. *Fall and spring*. Staff.
- 113 HOSPITALS AND NURSING HOMES (3). Prerequisite, permission of instructor. Hospital care, organization, monitoring, costs, and financing. Exploration of trends and issues such as cost controls, productivity, quality assurance, medical staffing and organization, regional organization, other countries. *Fall*. Staff.
- 119 PLANNING OF COMMUNITY HEALTH SERVICES (3). Prerequisite, permission of instructor. A simulation exercise in developing a community health program supported by lectures and seminars leading to class presentations and critiques. *Fall, spring*. Grubb.
- 126 INTRODUCTION TO POPULATION POLICY (3). Concepts of population policy in the context of social policy, policy implications of population dynamics, policy issues and alternatives, and studies in policy development process. *Fall*. Freymann.
- 131 METHODS OF INTERORGANIZATIONAL COORDINATION (3). An examination of selected methods of interorganizational coordination with special attention given to the interorganizational context of health and human services provider agencies. *Fall*. Files, Jain, Schaefer.
- 133 ISSUES IN HEALTH CARE (1-2). No prerequisite. By means of presentations by national leaders in health care and of class discussions, problems and issues and changes in public policy in health care will be explored. *Spring*. Freund.
- 137 STATE AND LOCAL PUBLIC HEALTH PROGRAMMING (2). Current trends in function and programs of health departments with special reference to responsibility and relationships to citizens, health professionals, public officials and governing boards. *Spring*. Koomen.
- 140 READINGS IN HEALTH ADMINISTRATION (1-6). Staff.
- 147 POPULATION PROGRAM DEVELOPMENT AND ADMINISTRATION (3). Offers basic knowledge, methods and skills required to plan, implement, administer and evaluate fertility control programs. Utilizes discussions, readings, planning exercises, and a computer game. *Spring*. (Alternate years.) Loddengaard.
- 153 HEALTH CARE COSTS AND FINANCING (3). No prerequisites. Analysis of trends in utilization of services, costs, sources and methods of health financing. Extensive review of multiple socioeconomic and geographic factors affecting costs. Examination of the evolution and trends in third party payment (insurance) mechanisms. *Fall, spring*. Rosenfeld.
- 156 STRATEGIES FOR PREVENTION (3). Examines effects of public policies on rates of illness, injury, and premature death. Advantages and disadvantages of various approaches to prevention, especially regulation and health promotion. *Spring*. Barry.
- 158 ETHICAL ISSUES IN MEDICINE AND HEALTH POLICY (3). Nature of ethical thought and reasoning; contributions of religion and science; historical and current issues. Sections on professional practice issues and health policy issues. *Fall, spring*. Rosenfeld.
- 165 WOMEN IN MANAGEMENT (3). Analysis of current status of women in management in corporate, health and governmental settings in the U.S. Contributions of

- social sciences to understanding problems in women achieving full equality with male managers. *Fall and spring*. Allen.
- 167 INTRODUCTION TO DENTAL PUBLIC HEALTH BASIC KNOWLEDGE AND SKILLS (2). Survey of the theory and practice of dental public health, epidemiology and natural history of dental disease, dental indices, methods of prevention and control on population groups. *Fall*. Hughes, Rozier.
- 168 STRUCTURE AND FUNCTIONS OF HUMAN SERVICES SYSTEMS (3). Describes development of human services in U.S. with exploration of functions and practices in categorical service systems. Considers feasibility of integrating functions into more comprehensive service systems. *Fall*. Koomen, Files.
- 175 POLICY INITIATIVES FOR THE AGING (3). Presentation and review of existing and developing policies affecting the aging population. *Spring*. Phillips.
- 176 LONG TERM CARE ADMINISTRATION (3). Current status and characteristics of long-term care institutions and alternatives to institutional care. *Fall, spring*. Rosenfeld.
- 181 INTERPERSONAL AND GROUP RELATIONSHIPS IN ADMINISTRATION (3). Didactic and experiential learnings of personal understandings and skills the administrator needs in order to create effective interpersonal work relationships and group functioning in a service organization. *Fall*. Edgerton.
- 182 MANAGERIAL ASPECTS OF FINANCIAL MANAGEMENT OF HEALTH ORGANIZATIONS (3). Finance and accounting concepts and techniques applicable to managing resources in health organizations, with emphasis on budgeting and control. *Spring*. Zelman, Suver.
- 183 MANAGEMENT OF HUMAN RESOURCES IN HEALTH ORGANIZATIONS (3). Basic knowledge and skills in managing people in health organizations; philosophy, productivity assessment, managerial skills, and support systems. *Spring*. Herzog.
- 185 FINANCIAL ADMINISTRATION OF HEALTH CARE INSTITUTIONS (3). Working capital management, budget process and short/long term financing in managing health care organizations. *Spring and fall*. Zelman, Suver.
- 187 SURVEY OF MENTAL HEALTH PROGRAMS (3). A survey of the development and organization of mental health services available to the public. Selected reading and field observation. *Fall*. Luckey.
- 188 HEALTH LAW (3). Familiarization with nature, perspective and objects of the legal process. Provides skills in understanding legal terminology, legal reasoning and the tools of law, particularly for application to health care management and in making health policy decisions. *Fall and spring*. Wing, Jones.
- 189 DEVELOPMENT OF PERSONAL EFFECTIVENESS (3). Prerequisite, permission of instructor. To increase, (a) awareness of how personal feelings and those of others affect the ability to behave rationally and (b) ability to deal with those feelings. Approach used is a peer, self-help method. Emphasis is on capacity to respond awarely to others and deal effectively with the environment. *Fall and spring*. Flash.
- 190 LEGAL PROBLEMS IN HEALTH FACILITIES ADMINISTRATION (3). Prerequisite, HPA 188 or permission of instructor. Study of legal problems in the administration of hospitals, nursing homes, and other health facilities, and their relation to health policy. *Spring*. Wing.
- 195 IMPLEMENTING AND MANAGING CHANGE IN HEALTH ORGANIZATIONS (3). Prerequisite, permission of instructor. Alternative strategies of implementing and managing change within health organizations. Analytical models from systems approach, interpersonal dynamics, politics. Case discussions, exercises, student participation. *Fall and spring*. Herzog, Allen.

Courses for Graduates Only

- 200 QUANTITATIVE AND ANALYTICAL METHODS FOR HEALTH ADMINISTRATION (3). Prerequisite, permission of instructor. Introduction to process of decision modeling, emphasizing formulation, application and computation of basic management science models in health administration. Includes decision theory, economic analysis and linear programming. *Spring*. Parker.
- 201 RESEARCH METHODS IN HEALTH AND HEALTH SERVICES (3). Prerequisites, BIOS 105 and passing the math qualifying examination in Health Administration. Examination of available methodology in terms of its application to researchable problems in health administration. Provides directed supervision of students carrying out empirical research. *Fall*. Veney.
- 202 ISSUES IN HEALTH ADMINISTRATION (1-6). *Fall and spring*. Staff.
- 204 POLICY FOR ALCOHOL AND OTHER DRUGS (3). Examination of issues in formulating and implementing policy for drug problems, including alcohol. Conceptual frameworks for understanding of the etiology of drug problems and intervention strategies. *Fall*. Beauchamp.
- 206 FIELD WORK IN HEALTH ADMINISTRATION (1-2). This course provides an opportunity for supervised field observation and experience in approved health agencies. Field fee, \$450. *Spring, summer*. Staff.
- 207 EVOLUTION, ORGANIZATION AND FINANCING OF HEALTH SYSTEMS (3). Societal, technological and professional forces in the evolution of health systems, current organizational and financing pattern, and various emerging issues. *Fall, spring*. Rosenfeld, Allen, Jessee.
- 208 HEALTH POLICY AND LAW (3). Topics include historical perspective on health, definition of community health needs, public policy process and health policy structure, legal bases of policy and policy analyses. *Fall, spring*. Beauchamp, Flash, Wing.
- 209 FUNDAMENTALS OF HEALTH ADMINISTRATION (3). General introduction to health management concepts and methods in relation to managerial role, program planning, implementation and evaluation. *Fall*. Jain.
- 210 HEALTH MANAGEMENT METHODS I (3). Conceptual and methodology learnings in management of health sciences programs and agencies; includes examination of administrative processes and methods of program planning, program implementation and program control. *Fall*. Schaefer, staff.
- 211 HEALTH MANAGEMENT METHODS II (3). Prerequisites, HPAA 210 and permission of instructor. Continuation of HPAA 210; includes methods of personnel and financial management, communication and coordination. *Fall and spring*. Herzog, staff.
- 212 FUNDAMENTALS OF HEALTH ADMINISTRATION II (2). A continuation of HPAA 209, course will focus on treatment and correction of organizational pathologies. *Spring*. Jain, staff.
- 217 THEORY AND METHODS OF HEALTH PLANNING AND EVALUATION (3). Prerequisite, HPAA 210 or 147. Theory of planning and evaluation methods, developed through experiential learning in the planning of health programs and design of program evaluations. *Fall and spring*. Schaefer.
- 218 PROGRAM PLANNING IN FAMILY HEALTH (3). (Maternal and Child Health 218). Basic models and methods of program planning. Emphasis will be on application of methods through the development of program plans for significant family health problems. *Spring*. Peoples.
- 220 AREAWIDE HEALTH PLANNING (3). Prerequisite, permission of instructor. A perspective on the legal background, processes and products of areawide health planning, with special reference to current issues. *Fall*. Phillips.

- 221 HEALTH MANPOWER PLANNING: METHODS AND ISSUES (3). Prerequisite, permission of instructor. Topics include: Manpower study design, planning methods, new careers distribution, productivity, training and manpower utilization. Case examples and practical exercises in planning. *Spring*. Bacon.
- 223 THE POLITICS OF HEALTH ORGANIZATIONS (3). Prerequisite, HPA 208 or permission of instructor. A view of health agencies from the perspective of the competitive struggle for public support. Topics covered include: the concept of public support; the constituencies of health organizations; leadership, expertise, values and public policies as generators of public support. *Fall*. Beauchamp, Flash.
- 224 SOME QUANTITATIVE METHODS OF PLANNING AND EVALUATION (Biostatistics 224) (3). Prerequisite, BIOS 101 or permission of instructor. Planning cycle, methods overview, data sources, PERT, budgeting, health indices, measurement of goal fulfilment, achievement, effectiveness, efficiency, research designs, benefit cost analysis, decision analysis, probability analysis, and decision trees. *Two lecture and two laboratory hours a week*. *Spring*. Gillings, Coulter.
- 226 HEALTH CARE QUALITY AND UTILIZATION CONTROL (3). Evolution and current status of health care quality assurance systems and program for utilization control. Includes discussion of alternative quality assurance methods; PSROs; hospital accreditation; hospital and ambulatory care utilization studies. *Spring*. Jessee.
- 227 AMBULATORY CARE AND RELATED SERVICES (3). Prerequisite, HPA 207 or permission of instructor. Review of experience, current status, trends, and public policy relating to ambulatory health care and such related services as home care, day care, screening, and mental health screening. *Spring*. Rosenfeld.
- 228 ADMINISTRATIVE EPIDEMIOLOGY (3). Review and analysis of cases dealing with the process of how community problems and technological data are used in the development of program strategies, evaluations and plans. Sections may be organized around minority group needs, mental health, family planning, animal-related health problems, similar interest area. *Spring*. Hines, staff.
- 230 PLANNING CONSUMER-ORIENTED HEALTH PROGRAMS (3). Study of options in health policy and programs, in response to changing illness patterns and to developments in health improvement strategies. *Spring*. Milio.
- 234 INJURY CONTROL POLICY AND PROGRAM ADMINISTRATION (3). Social, economic and political issues in injury control. Course material drawn from federal, state and local intervention programs including occupational safety, highway safety, product safety, and poison control. *Spring*. Barry, Waller.
- 240 EPIDEMIOLOGY OF ALCOHOL USE AND ABUSE (Epidemiology 240) (3). Course will examine patterns of alcohol use and abuse nationally, internationally, and ethnically. Problems of definition, measurement and methodology will also be considered, as well as implications for health. *Spring*. Magruder-Habib.
- 253 OPERATIONS RESEARCH AND THE HEALTH SYSTEM (3). Prerequisite, permission of instructor. Analysis of deterministic and stochastic models and their applicability to health services research. Formulation of decision models for health care problems, involving mathematical programming, simulation and heuristics. *Fall*. Parker.
- 255 PUBLIC POLICY ANALYSIS FOR HEALTH (3). Prerequisites, HPA 208 and permission of instructor. This course reviews issues in the analysis and design of public policy for health. Topics will include: policy and ideology; public vs. private, majority vs. minority, individual vs. collective issues, the uses and assumptions of formal techniques, such as cost benefit analysis, systems analysis and social policy analysis. *Fall*. Beauchamp.
- 256 POLITICS OF HUMAN SERVICES (3). An introduction and exploration of major political issues ("who gets what, when, how") in the development of organizations for

the delivery of human services: reorganization, decentralization, coordination, services integration. *Fall*. Files.

- 263 DENTAL PUBLIC HEALTH PRACTICE (3). Dental care in the comprehensive health services setting, financing and payment, social and behavioral science applications, emerging role of auxiliary personnel, prevention and health education, organization and care delivery, professional regulation and accountability, role of health department and community dentistry in the academic setting. *Spring*. Hughes, Rozier.
- 266 UNITED STATES HEALTH POLICY (Maternal and Child Health 266) (2-3). Examination of policy issues pertaining to delivery of health services in the U.S. Evolution and current development are examined in an effort to evaluate the administrative implications of current and proposed systems of health delivery in the U.S. *Fall and spring*. Miller, Allen.
- 282 INTERNATIONAL AND COMPARATIVE HEALTH ADMINISTRATION (3). Prerequisite, HPA 105, 209 or 210. Analytical descriptions of (1) national health systems of selected countries, developed and developing and (2) U.S. and international efforts in promoting health development in the less developed countries. *Spring*. Schaefer, Freymann.
- 287 HEALTH PROGRAM LEADERSHIP (3). Explores the personnel skills and approaches required of the administrator in developing and operating health programs, using community mental health center leadership as the major example. *Fall*. Hollister.
- 293 HEALTH POLICY AND THE GOVERNING PROCESS: EXECUTIVE, LEGISLATIVE, AND JUDICIAL (3). Prerequisite HPA 208 or permission of instructor. This course examines the political ideology, structures, and processes through which health policy issues are generated, legislated, adjudicated and administered at local, state, national, and international levels of governance. *Spring*. Flash.
- 295 MANAGEMENT OF ORGANIZATIONAL DYSFUNCTIONS (3). Prerequisite, HPA 287. Focus on administrator's role in remediation or prevention of behavioral and relationship problems with clients, staff, and other agencies. Includes problem solving and skill practice laboratories. *Spring*. Hollister.
- 296 ORGANIZATIONAL BEHAVIOR OF HEALTH INSTITUTIONS (3). Review of theory and empirical findings providing approach to management and organizational behavior. Topics include effect of technology and size on organizational structure, performance, roles of professionals. *Fall and/or spring*. Kaluzny, Herzog, Files, Neely.
- 300 DOCTORAL SEMINAR IN HEALTH MANAGEMENT I (3). Prerequisite, doctoral standing. Readings and discussion of various aspects of health services. Special emphasis is given to the inter-relationships of administrative and organizational theory to selected health service topics. *Fall*. Kaluzny, Schaefer.
- 301 DOCTORAL SEMINAR IN HEALTH MANAGEMENT II (3). Prerequisite, HPA 300. Continuation of HPA 300. *Spring*. Kaluzny, staff.
- 304 SEMINAR IN TEACHING HEALTH ADMINISTRATION (3). Problems and processes of teaching health administration including supervised practicum experience. *Fall, spring*. Staff, Kaluzny.
- 305 CURRICULUM DEVELOPMENT IN HEALTH ADMINISTRATION (3). Prerequisite, Doctoral standing or permission of instructor. Seminar in technologies of needs assessment, content analysis, objective setting and evaluation as applied to conventional and non-traditional educational programs in health administration education; historical and comparative approaches. *Fall, spring*. Schaefer, Herzog, staff.
- 311 SELECTED TOPICS IN HEALTH FINANCIAL MANAGEMENT (3). Selected issues in health financial management such as Uniform Accounting and Reporting

- reimbursement; advanced budgeting techniques; Internal Control, etc. Students apply concepts to specific areas of interest. *Fall*. Zelman.
- 317 MANAGEMENT AND ORGANIZATIONAL ISSUES IN MENTAL HEALTH (3). Prerequisites, HPAA 187, 210, 237 or permission of instructor. Deals with selected issues like integration of mental health in human services departments, federal-state-local funding mix, changing professional roles and similar other issues. *Spring*. Luckey.
- 333 ADVANCED METHODOLOGY IN HEALTH ADMINISTRATION RESEARCH (1). Prerequisites, BIOS 145 and HPAA 201, or permission of instructor. Research methodology as applied to understanding problems in health care delivery. Consideration is given to experimental design, data collection, and application of appropriate modes of analysis of data. *Spring*. Veney.
- 334 SELECTED TOPICS IN HEALTH ADMINISTRATION: ADVANCED SEMINAR (3). Prerequisite, permission of instructor. Integrative study of selected theory and research as it relates to the organization and delivery of health services. Separate seminars are developed to correspond to the doctoral student's specific interests and needs. *Spring*. Staff.
- 373 SEMINAR IN HEALTH ADMINISTRATION (1 or more). *Fall, spring, summer*. Jain.
- 384 ADVANCED STUDIES IN POPULATION POLICY (3). Prerequisite, permission of instructor. Individualized studies on special problems in population policy analysis and development to provide skills in aspects of goal identification, analyzing relevant organizational processes. *Spring*. Freymann.
- 392 MASTER'S PAPER (1-3). Staff.
- 393 MASTER'S THESIS (1-6). Staff.
- 394 DOCTORAL DISSERTATION (3-9). Staff.
- 400 GENERAL REGISTRATION (0). Staff.

Department of Health Education (HEED)

GUY W. STEUART, *Chairman*

Professors

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|-----------------------|-----|--|
| RALPH H. BOATMAN, JR. | (5) | Organization of Higher Education, Community Organization, Health Education |
| GODFREY M. HOCHBAUM | (2) | Communications, Health Behavior, Health Education |
| GUY W. STEUART | (3) | Health-related Social and Behavioral Change Strategies |

Associate Professors

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|----------------|------|--|
| JOHN W. HATCH | (6) | Community Organization and Development |
| ALLAN STECKLER | (12) | Citizen Participation, Health Promotion |
| FRANK STRITTER | (9) | Instructional Development and Evaluation |

Assistant Professors

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| JO ANNE EARP | (10) | Medical Sociology, Health Education Research |
| JOYCE KRAMER | (15) | Cross-Cultural Demography, Health Education Research, Health-Related Social Change Strategies |
| BRENDA M. DEVELLIS | (13) | Health Education Research, Health Behavior, Patient Education |
| TONY L. WHITEHEAD | (11) | Family, Conjugal Relationships, Cultural Continuity |
| PRESTON L. SCHILLER | (14) | Rural Health, Evaluation Research, Medical Sociology |

Instructor

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| EUGENIA ENG | (17) | Cross-Cultural Health Education, Program Strategies and Design |
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Clinical Associate Professor

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| HOWARD BARNHILL | (7) | Community Organization and Development |
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Clinical Assistant Professors

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| HARRIET H. BARR | (4) | Community Organization and Development, Health Education Practice |
| LEONARD H. DAWSON | (1) | Community Organization Training, Field Practice |
| ROSALIND THOMAS | (16) | Consultation, Training, Health Education Practice and Mental Health |

- 101 AGING AND HUMAN DEVELOPMENT (Public Health Nursing, Nutrition, Health Policy and Administration 101) (3). Biological, medical, demographic, and social aspects of aging. New methods and concepts of aging processes and their implications. *Three lecture hours per week, fall.* Staff.
- 102 COMMUNITY ORGANIZATION FOR HEALTH EDUCATION (3). Introduction of community organization in community health education and implications for the function of the community health educator. (Permission required for non-majors.) *Two lecture and two laboratory hours per week, fall.* Barnhill, staff.
- 103 METHODS AND MATERIALS IN HEALTH EDUCATION (3). Methods and materials in school and community health education practice. Required for all undergraduate majors. *Two lecture and two laboratory hours per week, fall.* Barr, staff.
- 104 SCHOOL ORGANIZATION FOR HEALTH EDUCATION (3). Introduction to school health education and administration including components and organization of a comprehensive school health program curriculum design and evaluation. (Permission required for non-majors.) *Two lecture and two laboratory hours a week, spring.* Barr, staff.
- 108 MINORITY HEALTH AND HEALTH SERVICES DELIVERY (2). The life experiences of ethnic minorities in the United States with special reference to the implications for their participation in health programs. *Two lecture hours a week, spring.* Hatch.
- 109 RURAL HEALTH AND COMMUNITY ACTION (3). Prerequisite, permission of instructor. Community education and action as modes of intervention in rural communities. Cross-cultural perspectives of rural health development. *Three seminar hours per week, fall.* Hatch.
- 120 PROMOTING HEALTH IN A COLLEGE SETTING (3). Prerequisite, permission of instructor. Lectures and seminars on planning, implementing and evaluating health education programs in a college setting with an emphasis on health promotion and wellness. *Two lecture and two seminar hours per week. Fall.* Minuto.
- 121 HEALTH PROMOTION PRACTICUM (3). Prerequisites, HEED 120 and permission of instructor. This field placement in the Student Health Service will provide the student with an opportunity to implement skills learned in HEED 120. *Nine laboratory hours a week. Fall.* Minuto.
- 130 PRINCIPLES OF HEALTH EDUCATION (2). For majors only. The relationship between human behavior and health; natural and planned change in health-related behavior in the individual, small group and community; principles of program design and evaluation; the role of the client. *One lecture and two seminar hours per week, fall.* Dawson.
- 131 HEALTH EDUCATION IN PUBLIC HEALTH (2). Determinants of health-related consumer and provider behaviors and means to promote behavioral change by working with individuals and communities, with focus on problems encountered by various health professionals. For non-majors. *Two lecture hours a week, spring.* Hochbaum.
- 133 INTERPERSONAL AND GROUP RELATIONS (3). Prerequisite, permission of instructor. An experimental study of human relations with emphasis on analysis of interpersonal and group interaction, the effective use of intervention in group problem solving, leadership styles and team building, intergroup cooperation and conflict. *Two lecture and two laboratory hours. Fall and spring.* Staff.
- 140 PROBLEMS IN HEALTH EDUCATION (1 or more). Prerequisites to be arranged
141 with the faculty in each individual case, depending upon the problem that is to be
142 studied. A course for students of public health who wish to make an intensive study of some special problem in public health education. *Fall, spring, and summer.* Staff.
- 150 GROUP DYNAMICS AND DISCUSSION GROUP LEADERSHIP: HUMAN SEXUALITY (4). Prerequisites, HEED 33 or graduate status; permission of instruc-

- tor. Interpersonal and group interaction, theory and practice. Design and application of training exercises. Focus on leadership in groups dealing with human sexuality. Students lead discussions of small groups of students in HEED 33. *Two lecture hours, four seminar hours per week, fall and spring.* DeVellis.
- 160 INTRODUCTION TO WOMEN'S HEALTH AND HEALTH EDUCATION (3). Using a lecture-discussion format, this course provides an overview of women's health-specific interests as family and community members, as patients and as health professionals. Implications for health education practice as well as opportunities for future research will be emphasized. *Two lecture and two seminar hours per week, fall.* Earp.
- 171 SOCIAL PSYCHOLOGICAL THEORY APPLIED TO ISSUES IN PATIENT EDUCATION (3). Selected social psychological theories will be studied in depth and related to understanding and modifying the attitudes and behavior of patients and health professionals *Two lecture and two seminar hours per week, fall.* DeVellis.
- 172 PRINCIPLES AND PRACTICE OF PATIENT EDUCATION (2-3). Principles and practice of implementing, coordinating and evaluating patient education programs. *Two lecture hours per week (three hours credit will be granted on the basis of a relevant research activity approved by instructor), spring.* Hochbaum and DeVellis.
- 180 MENTAL HEALTH PROMOTION: SOCIAL AND BEHAVIORAL CHANGE APPROACHES (3). Critical review and evaluation of programs targeted at individuals, families, interpersonal networks, communities and larger social units which have the promotion of mental health as a goal. Thomas.
- 190 PSYCHOLOGICAL ASPECTS OF AGING (3). Psychosocial aspects of the aging process and of old age. Needs of the elderly and their reactions to agencies and programs for the aged. *Two lecture and two seminar hours per week, spring.* Hochbaum.
- 200 SPECIAL STUDIES IN BEHAVIOR CHANGE (1 or more). Prerequisite, permission of instructor. HEED 200—natural change process in health-related behavior; 201 HEED 201—planned change; personal and non-personal methods; HEED 202—program design and evaluation; HEED 203—personal development and community action; HEED 204—social class and culture variations in planned change. *Fall, spring and summer.* Staff.
- 206 EDUCATION AND SOCIAL CHANGE IN POPULATION PLANNING (2). Permission of instructor. The study of social and behavioral factors in the adoption of new practices; cross-cultural analysis and planning for the educational aspects of population control programs including implementation, evaluation, and training of personnel. *Two laboratory hours per week, spring.* Whitehead.
- 208 UNITS OF PRACTICE I: FAMILY AND KINSHIP SYSTEMS (3). Prerequisite, permission of instructor. The relationship of family and kinship patterns to health behavior; implications for planned change. *One to three lecture hours per week, fall and spring.* Whitehead; staff.
- 209 UNITS OF PRACTICE II: INDIVIDUAL, SMALL GROUP AND NETWORK (1-3). Corequisite, enrollment in HEED 241, or permission of instructor. Behavior systems in the individual and small group with reference to planned change in personal health-related behavior. *Three lecture hours a week, fall and spring.* Staff.
- 210 UNITS OF PRACTICE III: THE COMMUNITY (1-3). Corequisite, enrollment in social systems; theories, principles and practices relevant to health-related community development processes; the identification of formal and informal leadership and power structures, etc. *Two lecture and seminar hours per week, fall, and summer.* Dawson.
- 211 UNITS OF PRACTICE IV: SOCIAL POLICY AND LARGE POPULATIONS (1-3). Health education social policy roles and strategies. The nature and delineation

- of policy and large populations as units of health education practice; includes field practicum. *One-three seminar, one-three laboratory hours per week, spring.* Steckler, Dawson.
- 212 CITIZEN PARTICIPATION IN COMMUNITY HEALTH DECISION MAKING (1-4). Permission of instructor. Theories and concepts of citizen participation in community health settings; an historical review of mandated citizen participation; and strategies for enhancing citizens' ability to influence the social policy process. *One to three lecture hours; zero to two seminar hours per week, fall.* Steckler.
- 222 PROFESSIONAL PRACTICE (1 or 2). Corequisite, enrollment in HEED 242 or permission of instructor. Studies in the professional role of the change agent and consultant with special reference to cross-cultural settings; the development of the professional and sources of innovation in practice. *One or two hours a week, spring.* Steuart; staff.
- 230 CROSS-CULTURAL CONSULTATION (1-3). Permission of instructor. Enrollment required in total series. The process and content of cross-cultural and international consultation in technical assistance to developing country health programs with special reference to planned social and behavioral change. *Two or more lecture hours per week, fall, spring, and summer.* Steuart.
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- 234 TEAM PROBLEM SOLVING (1 or more). Prerequisite, HEED 133 or permission of instructor. An experimental study of interpersonal relations in professional team settings; intra- and inter-team relationship processes to large social systems with emphasis on intervention techniques. *Two or more hours a week, spring.* Staff.
- 235 INSTRUCTIONAL MATERIALS AND DEVELOPMENT (1-3). Permission of instructor. Independent projects in the design production, validation and utilization of self-instructional training materials for use in college courses, in-service training programs, patient education, etc. Students may arrange for credit proportionate to the complexity of the individual projects. *Two or more lecture hours per week, fall and spring.* Staff.
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- 240 FIELD WORK: INTRODUCTION TO COMMUNITY ACTION (2 or more). Corequisites, HEED 130, HEED 133 or permission of instructor. Establishing client-professional relations; community group development and participation in planning; preliminary analysis of selected demographic, social, cultural and epidemiological features of the community needs. Field fee, \$450.00. *Fall.* Dawson; staff.
- 241 FIELD WORK: PROGRAM PLANNING AND DESIGN (2 or more). Prerequisite, HEED 240 or permission of instructor. Data-collection and analysis relevant to program objectives, methods and evaluative research with associated community group participation in planning and implementation. *Spring.* Dawson, staff.
- 242 FIELD WORK: PROGRAM DEVELOPMENT AND COMMUNITY ACTION (2 or more). Prerequisite, HEED 241 or permission of instructor. Client-professional partnership in community action in selection and design of techniques for health related behavior change and in program evaluation. *Summer.* Dawson; staff.
- 243 FIELD WORK: ADVANCED COMMUNITY HEALTH DEVELOPMENT (2 or more). Prerequisite, HEED 242 or permission of instructor. Client and professional consultation in community health development, in personal development and supervision of non-professional and professional community health workers. *Fall.* Dawson; staff.
- 244 FIELD WORK: EVALUATION (2 or more). Prerequisite, HEED 243 or permission of instructor. Studies of change processes in the community setting and evaluation of the effectiveness of the role of the change agent. *Spring.* Dawson; staff.
- 250 RESEARCH METHODS IN HEALTH EDUCATION (1-3). Corequisites, enrollment in HEED 241, 242, 243 or permission of instructor. Introduction to research and evaluation methods of particular relevance to planned change in health-related behavior. *Fall, spring and summer.* Earp; staff.
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- 253 NATURAL CHANGE DETERMINANTS IN HEALTH-RELATED BEHAVIOR (3). Permission of instructor. An integrated behavioral science approach to unplanned determinants to change in the health-related behavior systems of the individual, small group and community. *Fall*. Stuart.
- 254 PERSONNEL DEVELOPMENT (1-3). Corequisite, enrollment in HEED 234, or
255 permission of instructor. The study of training and supervision processes for personnel development in programs of planned change; training system strategies, design, teaching styles, methods and evaluation; the personnel development role in supervision, effects of organizational climate, etc. *Fall and summer*. Staff.
- 310 DOCTORAL SEMINARS IN HEALTH EDUCATION (1-3). Prerequisites, master's
311 degree and permission of instructor for non-majors. A series of seminars designed
312 to explore the scientific foundations of health education and their implications for
313 health education practice. *Two to six seminar hours per week, fall, spring and
314 summer*. Staff.
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- 340 ADVANCED FIELD TRAINING IN HEALTH EDUCATION (8). Under the
guidance of faculty and field counselors, students in this course may assume major
responsibility in field centers for a special phase of public health education—program
planning and development, intensive studies and surveys of problem situations,
evaluations, in-service training, etc.—for a community wide program on a temporary
basis. Open only to advanced graduate students who have been engaged in public
health education at least two years beyond completion of the master's program. Field
fee \$450.00. *Fall and spring*. Staff.
- 350 ADVANCED RESEARCH IN HEALTH EDUCATION (2-9). Permission of in-
351 structor. Available only to students capable of pursuing independent research projects
352 under supervision. *Four laboratory hours a week, fall, spring, and summer*. Staff.
- 392 MASTER'S PAPER (1-6). *Fall, spring, and summer*. Staff.
- 393 MASTER'S THESIS (3-6). *Fall, spring and summer*. Staff.
- 394 DOCTORAL DISSERTATION (3-9). *Fall, spring and summer*. Staff.
- 400 GENERAL REGISTRATION (0).

Department of Maternal and Child Health (MHCH)

C. ARDEN MILLER, *Chairman*

Professors

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|-----------------------|------|---|
| KARL E. BAUMAN | (1) | Health Program and Policy Evaluation |
| JAROSLAV FABIAN HULKA | (6) | Methods of Fertility Management and Development of Delivery Systems |
| C. ARDEN MILLER | (9) | Health Policy and Priorities, Public Accountability, Child Health |
| EARL S. SCHAEFER | (11) | Family Relationships, Child Care and Education, Parent-Professional Interaction |
| EARL SIEGEL | (12) | Perinatal Health and Family Planning, Early Child Care |
| J. RICHARD UDRY | (14) | Population, Family, Program Evaluation |
| ELIZABETH L. WATKINS | (16) | Maternal Health, Child Health and Consultation |

Assistant Professors

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| DOROTHY HOWZE | (30) | Advocacy; Child Abuse and Neglect |
| JONATHAN KOTCH | (17) | Social Influences on Child Health; Child Health Services, Health Policy |
| MARY PEOPLES | (31) | Maternal and Infant Health, Health Care Program Planning and Evaluation |
| INGRID SWENSON | (22) | Family Planning, Contraception; Population Programs, Policy; Fetal and Infant Mortality |

Lecturers

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| MICHAEL DURFEE | (24) | Health Care in the Juvenile Justice System, Adolescent Health Care, Handicapping Conditions and Chronic Diseases |
| CATHEE HUBER | (26) | Program Development and Prevention of Developmental Disorders |
| FRANK LODA | (27) | General Pediatrics, Child Abuse and Neglect, Health Care Delivery |
| MARVA PRICE | (28) | Child Development, Prevention and Care of Developmental Disorders, Maternal and Child Health Services |

Clinical Professor

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|-----------------|------|--|
| HOWARD JACOBSON | (20) | Maternal and Child Health Services, Public Health Nutrition and Program Evaluation |
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Clinical Assistant Professor

- JOAN LIPSITZ (23) Early Adolescent Development, Secondary Schools and Youth Policy

Adjunct Associate Professor

- GARY BERGER (29) OB/GYN; Epidemiology

Professor Emeritus

SIDNEY S. CHIPMAN

Associate Professors Emeriti

GERALDINE GOURLEY
E. BARBARA STOCKING

- 103 REPRODUCTIVE PHYSIOLOGY AND CONCEPTION CONTROL (Women's Studies 103) (2). Human sexuality, reproductive physiology, methods of regulation; pregnancy, fetal wastage, infertility, sterilization, abortion and community responsibilities discussed. *Two lecture hours a week, fall.* Hulka.
- 105 DEVELOPMENTALLY HANDICAPPED CHILDREN AND THEIR FAMILIES: AN INTERDISCIPLINARY APPROACH (Physical Therapy 105) (Social Work 105) (3). Permission of instructor. Provides content on the range and complexities of developmental disabilities; presents a model of interdisciplinary diagnosis and management of mental disabilities; presents a model of interdisciplinary diagnosis and management of developmentally disabled children and their families. Lecture and discussion. Individual and group projects. *Three lecture hours a week. Fall, spring, summer.* C. Knobeloch and DDDL staff.
- 110 ISSUES IN WOMEN'S HEALTH (3). Examination of changing roles of women, women health providers, health policy and legislation affecting women and their unique reproductive needs. *Spring.* Staff.
- 140 PROBLEMS IN MATERNAL AND CHILD HEALTH (1-3). Prerequisites to be arranged with the faculty in each individual case. *Two to six hours a week, fall, spring and summer.* Staff.
- 200 ISSUES IN MATERNAL AND CHILD HEALTH TODAY (3). Prerequisite, permission of instructor. For students outside the department of MCH who desire an overview of content and programs in maternal and child health including family planning. Emphasis will be directed to contemporary approaches to promoting health and providing services for families. *Two lecture and two seminar hours per week. Spring.* Kotch, Swenson.
- 208 CONCURRENT FIELD TRAINING IN MATERNAL AND CHILD HEALTH (1-4). Prerequisite, MHCH major. An elective faculty supervised field experience in community maternal and child health services in relation to background of experiences, special interests, and future professional plans. *Variable number of laboratory hours per week, fall, spring and summer.* Staff.
- 209 PROCESSES OF HEALTH SERVICE PROGRAM DEVELOPMENT (Health Policy and Administration 209) (2). Non-majors require permission of instructor. Through review of health service program characteristics, and analysis of the processes by which they came about, students will acquire understandings for preparation

- of a proposal for an MCH program, or some aspect of one, for a specific community. *One lecture and two seminar hours per week, fall.* Miller.
- 210 MATERNAL AND INFANT HEALTH AND FAMILY PLANNING (2). Non-majors require permission of instructor. Health needs, problems, and programmatic issues in maternal-infant health and family planning. Includes biologic, sociocultural and physiological factors. *One lecture, two seminar hours, fall.* Siegel, staff.
- 211 FAMILY AND CHILD HEALTH II (2). Prerequisite, permission of instructor for non-majors. Addresses major issues in child and adolescent health in developmental sequence and interactions among children, their families and environment in relation to delivery of health services. *Spring.* Watkins and Kotch.
- 212 SEMINAR ON FAMILY FUNCTION (Public Health Nursing 212) (1). Permission required. Family theory, research and assessment; family relationships and environments that influence adult and child health and development; professions and institutions that influence family functioning. *Spring and summer.* Schaefer.
- 213 RESEARCH UTILIZATION IN MATERNAL AND CHILD HEALTH (2). This course is designed to provide each student with major interest in maternal and child health the ability to utilize research conducted by others. Emphasis is upon evaluating the research methodology used by others and applying that research to the assessment, planning and implementation of policies and programs in maternal and child health. *Two hours per week, spring.* Bauman.
- 214 FIELD TRAINING IN MATERNAL AND CHILD HEALTH (2-8). Required of selected students in terms of their background of experience, special interests and future professional plans. An additional field fee of \$450.00 will be assessed. *Summer, 6-10 weeks.* Staff.
- 215 CHILD HEALTH ASSESSMENT AND CARE (Public Health Nursing 215) (2). Prerequisite, permission of instructor. Seminar series which emphasizes theoretical, conceptual and practice bases fundamental to assessment of infants and young children in community settings. Focus is upon wellness care and management of common and long-term childhood conditions. *Spring.* Adams.
- 217 CHILD HEALTH: NURSING INTERVENTION (Public Health Nursing 217) (1-6). Prerequisite, permission of instructor. For nurses with appropriate theoretical and experiential backgrounds in child health and development. Emphasis is upon nursing practice with infants, young children and their families in a variety of community settings throughout North Carolina. *Spring.* Stocking.
- 218 PROGRAM PLANNING IN FAMILY HEALTH (Health Policy and Administration 218) (3). Permission required for non-majors. Basic models and methods of program planning. Emphasis will be on application of methods through the development of program plans for significant family health problems. *Three lecture hours, spring.* Peoples.
- 220 ANTEPARTAL THEORY: ASSESSMENT AND CARE OF PREGNANT WOMEN (Public Health Nursing 220) (2). Theoretical basis of antepartal care emphasizing the concept of risk and assessment of maternal and fetal well-being. *Spring.* Staff.
- 221 ANTEPARTAL ASSESSMENT AND CARE OF PREGNANT WOMEN: CLINICAL PRACTICE (Public Health Nursing 221) (3). Prerequisite, permission of instructor. Corequisite, Maternal and Child Health 220. Initial and ongoing assessment of pregnant women including physical and pelvic examinations. Designed for nurses. *Spring.* Staff.
- 222 FAMILY PLANNING THEORY: ASSESSMENT AND CARE OF WOMEN IN THE REPRODUCTIVE YEARS (Public Health Nursing 222) (1). For health professionals doing family planning counseling. Includes mode of action, effectiveness, contraindications, side effects, complications, advantages, disadvantages of temporary and permanent methods of birth control. *First summer session.* Staff.

- 223 FAMILY PLANNING ASSESSMENT AND CARE: CLINICAL PRACTICE (Public Health Nursing 223) (2 or 3). Prerequisite, permission of instructor. Corequisite, Maternal and Child Health 222. Initial and on-going assessment of women requesting or utilizing temporary birth control method. Nurse students competent in performing physical and pelvic exams, 2 credits; other nurses, 3 credits. *Second summer session.* Staff.
- 224 CHILDREN OF SCHOOL AGE: HEALTH PROBLEMS AND PROGRAMS (Public Health Nursing 224) (3). Permission of instructor required. Health needs of school age children; analysis of policies and programs that are responsive to those needs with emphasis on school based initiatives, and school-community interactions. *Two lecture and two seminar hours per week. Spring.* Asay.
- 225 PRACTICUM: LEADERSHIP IN SCHOOL HEALTH PROGRAMS (Public Health Nursing 225) (1-4). Prerequisites, MHCH 224 or equivalent and permission of instructor. An elective, individually planned and supervised school-community based field experience. Designed to provide leadership experiences in delivery of school health services. *Spring.* Stocking.
- 254 SOCIAL WORK IN PUBLIC HEALTH (2). Permission of instructor or MSW permission. Analyzes role and functions of social workers in Public Health with emphasis on multidisciplinary practice. Focus is on planning social work component of health program. Observational visits to selected sites. *Fall.* Watkins.
- 255 CONSULTATION: A PUBLIC HEALTH METHOD (Public Health Nursing 255) (2). Delineates skills, problems, and potentialities of consultation. Role, functions, process and relationships in consultation are analyzed with attention to utilization of this knowledge in special fields of interest. *Spring and summer.* Watkins.
- 266 UNITED STATES HEALTH POLICY (Health Administration 296) (2-3). An examination of policy issues pertaining to delivery of health services in the United States. Evolution and current developments are examined in an effort to evaluate the administrative implications of current and proposed systems of health delivery in the U.S. *Two-three hours a week, spring.* Allen, Miller.
- 300 RESEARCH IN MATERNAL AND CHILD HEALTH (2-6). Open by special arrangement to students desiring to initiate and pursue an original investigation of a selected program. *Four or more hours a week, fall, spring or summer.* Staff.
- 307 SEMINAR IN DISORDERS OF DEVELOPMENT AND LEARNING IN CHILDHOOD (Physical Therapy 307) (2). Permission of the instructor. Seminar for students with prior background in child development or related areas on interdisciplinary diagnosis and management of developmental problems in childhood. Focus on staff and student prepared case material. *Two seminar hours a week, spring.* C. Knobloch and DDDL Staff.
- 309 ISSUES OF ADVOCACY IN MATERNAL AND CHILD HEALTH (3). Prerequisite, permission of instructor. Current efforts to extend entitlements to health services are examined in the context of professional consultation and technical assistance. Concurrent related field training possible. *Three lecture hours, spring.* House.
- 315 SEMINAR IN MATERNAL AND CHILD HEALTH (1). Non majors require permission of instructor. This seminar provides an opportunity for students and faculty to explore in greater depth selected subjects within the field of maternal and child health. *Two seminar hours a week, summer.* Staff.
- 320 SEMINAR IN PROGRAMS TO AFFECT HUMAN REPRODUCTION (2). Application of health services research and behavioral, biological, epidemiological, and clinical studies in human reproduction to the design of programs to affect patterns of reproduction and reproductive outcomes. *Four hours a week, fall.* Udry.
- 321 SEMINAR IN PROGRAMS TO AFFECT CHILD CARE AND DEVELOPMENT (2). Analysis of programmatic research and behavioral and biological studies

in child care and development; its contribution to the design and to the research and evaluation of programs affecting child care and development. *Four hours a week, spring.* Schaefer, Siegel.

- 322 HUMAN SEXUAL BEHAVIOR (3). Permission of instructor required. Scientific foundation for understanding human sexual behavior, including biological, psychological and sociological perspectives. Research emphasis. *Three lecture hours per week, spring.* Udry.
- 393 MASTER'S THESIS (3-6). *Fall, spring, and summer.*
- 394 DOCTORAL DISSERTATION (3 or more). *Fall, spring and summer.*
- 400 GENERAL REGISTRATION (0).

Department of Nutrition (NUTR)

JOSEPH C. EDOZIEN, *Chairman*

Professors

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|---------------------|-----|---|
| JOSEPH C. EDOZIEN | (1) | Malnutrition, Abnormal Intake of Nutrients and the Endocrines, Clinical Nutrition |
| JOHN J. B. ANDERSON | (2) | Calcium and Phosphorus Metabolism, Endocrines and Food Nutrients, Physiology |

Associate Professors

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|-----------------|------|--|
| MILDRED KAUFMAN | (20) | Nutrition Policy and Planning, Maternal, Child and Community Nutrition and Aging |
| BARRY M. POPKIN | (17) | Socio-economic Determinants of Malnutrition, International Nutrition, Evaluation and Cost-Analysis |
| BOYD R. SWITZER | (5) | Nutritional Biochemistry, Research Methods, Hormones |

Assistant Professors

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|--------------------------|------|--|
| JEAN C. BURGE | (24) | Vitamin and Trace Minerals, Calcium and Vitamin D, Taste in Relation to Renal Disease |
| MARIE T. FANELLI | (25) | Ultrasonic Assessment of Body Composition, Nutritional Status and Education of Elderly Persons |
| WILLIAM A. FORSYTHE, III | (26) | Cholesterol and Lipoprotein Metabolism as Affected by Diet |

Adjunct Professor

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|----------------------|------|--|
| FREDERIC W. NORDSIEK | (13) | Nutritional Goiter, Obesity, Food Technology |
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Adjunct Associate Professors

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|----------------------|------|---|
| BARBARA A. HUGHES | (22) | Nutrition and Dietary Services Administration |
| STEPHEN R. SCHROEDER | (27) | Behavioral Aspects of Nutrition |

Adjunct Assistant Professors

- | | | |
|--------------------|------|---------------------------------|
| CAROLYN J. BARRETT | (28) | Pediatric Nutrition |
| THOMAS J. CHEGASH | (29) | Food Service Systems Management |
| NANCY L. JOHNSON | (23) | Nutrition Services Consultation |

Clinical Associate Professor

MARY ANN C. FARTHING

(21) Nutrition Education, Community Nutrition, Therapeutic Nutrition

Associate Professor Emerita

REBECCA B. BRYAN

- 100 NUTRITION AND HUMAN HEALTH (3). Prerequisite, EPID 160. A review of the physiological and environmental determinants of human nutritional requirements and the relation of diet to human health and disease. *Three lecture hours per week, spring.* Edozien.
- 101 AGING AND HUMAN DEVELOPMENT (Public Health Nursing, Health Education and Health Administration 101)(3). Biological, medical, demographic, and social aspects of aging. New methods and concepts of the aging processes and their implications. *Three lecture hours per week, fall.* Staff.
- 110 APPLIED NUTRITION FOR HEALTH PROFESSIONS (3). Prerequisites, previous or concurrent courses in chemistry, biochemistry, and physiology/anatomy at undergraduate or graduate level. Knowledge and understanding of nutrition and application to the preventative and therapeutic care of man in a health-team approach. Clinical and community experiences. *Three lecture hours per week, spring.* Anderson, staff.
- 140 READINGS IN NUTRITION (1-6). Prerequisite, permission of instructor. Reading and tutorial guidance in special areas of nutrition such as international nutrition and nutrition and population. *Fall, spring and summer.* Staff.
- 150 CELL BIOLOGY (4). Prerequisites, a course each in biochemistry and physiology or permission of instructor. A review of the general structure and function of the cell. Chemistry and metabolism of carbohydrates, proteins, lipids, vitamins and minerals. Endocrine and nervous integration of cellular mechanisms. *Four lecture hours per week, fall.* Anderson, Switzer.
- 151 CELL BIOLOGY LABORATORY (3). Prerequisites, two chemistry laboratory courses and concurrent registration in NUTR 150. A laboratory course designed to acquaint students with the equipment and theory of modern biochemical and biophysical methods used in nutrition research. *Six laboratory hours per week, fall.* Switzer, Anderson.
- 152 MEAL PLANNING, FOOD SELECTION AND PREPARATION (3). Prerequisite, NUTR 50 or equivalent. Introduction to foods important in the American diet; composition and properties; factors affecting the selection, handling and preparation of foods; menu planning and meal preparation. *Three lecture hours per week, fall.* Fanelli.
- 153 FOOD PRODUCTION, PROCESSING AND PACKAGING (3). Prerequisite, NUTR 50 or equivalent. Impact of all parts of food industry on availability and nutritive value of foods, and food safety. *Three lecture hours per week, spring.* Staff.
- 154 HUMAN NUTRITION (4). Prerequisites, undergraduate BIOC 100 and ZOO 45. A second level course in human nutrition which deals with nutrient requirements in relation to specific cellular needs and mechanisms. Structural and metabolic aspects of carbohydrates, lipids, proteins, vitamins and minerals. *Three lecture hours per week, spring.* Fanelli.
- 155 INTRODUCTION TO PUBLIC HEALTH NUTRITION (3). Prerequisite, NUTR 50 or equivalent. The functions of the nutritionist in the community, including an assessment of nutritional needs and an examination of existing food and nutrition

- programs and services and their relationship to other health and social programs. Occasional field trips to agencies. *Three lecture hours per week, spring.* Farthing, Kaufman.
- 156 FOOD SERVICE SYSTEMS MANAGEMENT (3). Basic concepts of food service system management applied to small and medium-sized group and health care facilities in the community. *Two lecture hours and two laboratory hours per week. Fall and spring.* Staff.
- 157 THERAPEUTIC NUTRITION (3). Prerequisites, Zoology 45, Biochemistry 100, Nutrition 152; corequisites, Nutrition 154 and permission of instructor. A study of the relationship of diet to diseases of man and of dietary intervention in the prevention and/or treatment of these conditions. *Three lecture hours per week, spring.* Burge.
- 159 FOOD HABITS (3). Social, cultural, and psychological influences on food consumption patterns of individuals. Includes a study of selected research methodologies and alternate U.S. food consumption patterns. *Three lecture hours per week, spring.* Burge.
- 160 ECONOMICS OF NUTRITION AND PUBLIC HEALTH (3). Prerequisite, two social science courses. Concepts and methodologies used by economists in examining health and nutritional issues at the microeconomic level. Emphasis will be on examining how economics can be used to understand the determinants and consequences of health/nutritional status and a few key aspects of health and nutrition behavior. *Three lecture hours per week, spring.* Popkin.
- 200 MATERNAL, INFANT AND CHILD NUTRITION (3). Prerequisite, NUTR 154 or permission of instructor. This course covers the nutritional needs of women during the childbearing years, infants and children; the community, ethnic and socioeconomic influences on food intake of these target populations, and community food and nutrition programs designed to meet their unique nutritional needs. *Two lecture and two seminar hours per week, spring.* Farthing.
- 201 NUTRITION OF ADULTS AND THE ELDERLY (3). Prerequisite, NUTR 154 or equivalent or permission of instructor. A review of the effects of the aging process on human nutrition. Physiological, psychological and sociological factors which affect dietary habits and nutrient intake will be examined. *Three lecture hours per week, spring.* Edozien, Fanelli.
- 202 NUTRITIONAL PATHOLOGY (3). Prerequisite, NUTR 154. A review of the epidemiology, pathology and prevention of disorders related to diet and nutrition. *Three lecture hours per week, spring.* Edozien.
- 205 PRINCIPLES OF PUBLIC HEALTH NUTRITION (3). Prerequisite, NUTR 154 or equivalent. This course is designed to acquaint students with the roles and functions of the nutritionist in community health and to assist them, through classroom work and practical experience in the community, to acquire the basic knowledge and skills required to perform these functions. *Two lecture hours and concurrent experience per week, fall.* Kaufman.
- 207 NUTRITION EDUCATION (3). Prerequisite, NUTR 50 or equivalent or permission of instructor. Principles and practice of nutrition education with emphasis on the community setting for small groups and individuals. Use of modern techniques, including written and audiovisual instruments, geared to modification of dietary behavior and to prevention of disease. *Three lecture hours per week, fall.* Farthing.
- 208 NUTRITION PROGRAMS AND SERVICES (3). Prerequisite, NUTR 205. An overview of major components of local, state and federal public health nutrition programs covering their legislation and administrative structures and responsibilities of the nutritionist in planning, administration and management. *Four hours of seminar and concurrent field experience per week, spring.* Kaufman.

- 212 NUTRITIONAL ASSESSMENT (3). Prerequisites, NUTR 154 and laboratory experience in chemistry or nutrition science. This course develops the theory and rationale of nutritional assessment of individuals and communities with various techniques including clinical, anthropometric, dietary and laboratory methods. Emphasis is given to experimental design. *One lecture hour and four laboratory hours per week, spring.* Edozien, Switzer, Fanelli.
- 215 INTERNATIONAL NUTRITION (3). Critical review of the dimensions of world problems in nutrition, with emphasis on the micro and macro determinants of malnutrition, the consequences of malnutrition, and the programs and policies for eliminating malnutrition. *Three lecture hours per week, fall.* Popkin.
- 240 PROBLEM IN NUTRITION (1-6). Prerequisite, permission of the instructor. A course for students who wish to make a study of some special problem in nutrition. Lectures, seminars and/or laboratory work according to the special area under study. *Fall, spring and summer.* Staff.
- 250 CLINICAL NUTRITION PRACTICE (1-6). Prerequisite, NUTR 157 or equivalent. Students are assigned to a medical facility where, under supervision of registered dietitians, they participate in nutritional care of patients. Field fee \$350. *Forty hours per week for twelve weeks, summer.* Staff.
- 251 FIELD EXPERIENCE II (1-3). Students are assigned to a state, local or district health agency or other appropriate agency for supervised field experience. Field fee required. A brief written report of activities is required. *Fall, spring and summer.* Staff and field preceptors.
- 300 NUTRITIONAL ASPECTS OF PROTEIN, LIPID AND CARBOHYDRATE METABOLISM (3). Prerequisites, NUTR 150 and 154; 201 or 202 or 212. Recent advances in the nutritional aspects of protein, lipid and carbohydrate metabolism will be reviewed. *Six seminar hours per week, fall.* Forsythe.
- 301 NUTRITIONAL ASPECTS OF MINERAL METABOLISM (3). Prerequisites, NUTR 150 and 154; 201 or 202 or 212. Recent advances in the nutritional aspects of mineral metabolism will be reviewed. *Six seminar hours per week, spring.* Anderson.
- 302 NUTRITIONAL BIOCHEMISTRY (3). Prerequisites, NUTR 151 and 212. Experimental and laboratory procedures in nutritional biochemistry and physiology, including the identification and measurement of nutrients and their metabolites in foods in the human and animal tissues and body fluids. *Six laboratory hours per week, fall.* Forsythe.
- 303 ADVANCED SEMINAR IN PUBLIC HEALTH NUTRITION (3). Prerequisites, NUTR 205; NUTR 208 or 215. The broad aspects of public health issues, such as U.S. and international nutrition problems and issues, intervention options, and policy decisions—basis and rationale—will be discussed. *Six seminar hours per week, spring.* Edozien, staff.
- 304 ADVANCED SEMINAR IN NUTRITION BEHAVIOR (3). Prerequisites, NUTR 159 and 207. Analysis of the ways anthropology, economics and psychology have been used and can be used to affect nutrition change. *Six seminar hours per week, fall.* Popkin, staff.
- 340 SEMINAR IN NUTRITION (1-6). Prerequisites, a minimum of one year of graduate work in nutrition and permission of the instructor. Seminars and/or laboratory work, according to the special area under study. *Two or more hours per week, fall, spring and summer.* Staff.
- 355 ADVANCED COMMUNITY NUTRITION PRACTICE (3). Prerequisites, NUTR 205 and 208, or permission of instructor. Development of skills, techniques and competencies, through practical experience, in the assessment of the nutritional needs of a community, or in the planning and delivery of community nutrition services in a health or other appropriate agency or the evaluation of an ongoing nutrition program. *Six laboratory hours per week, fall, spring and summer.* Staff.

- 389 PREPARATION OF RESEARCH PROSPECTUS (1). Theoretical and practical aspects of selecting a research topic with subsequent preparation of the research prospectus. *Fall*. Forsythe.
- 390 NUTRITION RESEARCH (1-9). Individual arrangements may be made by the student to spend part or all of his time in supervised investigation of selected problems in nutrition. *Two or more laboratory or field hours per week, fall, spring and summer*. Staff.
- 391 NUTRITION RESEARCH SEMINAR (1). Students registered for NUTR 390 shall present at least one formal seminar each term on some aspect of their research project (community or laboratory). *Two or more hours per week. Fall and spring*. Popkin.
- 392 MASTER'S REPORT (1-6). *Fall, spring and summer*. Staff.
- 393 MASTER'S THESIS (0-6). *Fall, spring and summer*. Staff.
- 394 DOCTORAL DISSERTATION (3-9). *Fall, spring and summer*. Staff.
- 400 GENERAL REGISTRATION (0).

Department of Parasitology and Laboratory Practice (PALP)

JOHN R. SEED, *Chairman*

Professors

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|---------------------|------|---|
| HILTON T. GOULSON | (2) | Immunity to Helminths, Host-parasite Relations, Diagnostic Parasitology |
| JOHN R. SEED | (12) | Biochemistry of the Host-parasite Relationship |
| NORMAN F. WEATHERLY | (3) | Immunoparasitology, Immunity to Helminths, Host-parasite Relations |

Associate Professors

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|----------------------|------|---|
| JAMES C. COFFEY, JR. | (10) | Steroid Biochemistry, Reproductive Physiology |
| JAMES R. HENDRICKS | (4) | Diagnostic parasitology, Survey Methods, Helminth Life Cycles |
| JOHN K. READ | (5) | Public Health Microbiology, Bacterial Pathogenesis |

Clinical Professor

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|----------------|------|--|
| JERRY J. TULIS | (11) | Biological Safety, Biohazards, Infectious Diseases |
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Clinical Associate Professor

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| CHARLES H. OKEY | (9) | Diagnostic Microbiology, Laboratory Management |
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Clinical Assistant Professor

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|-------------------|------|---------------------|
| ERNEST SCHOENFELD | (13) | Laboratory Practice |
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Adjunct Professors

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|----------------------|--|-------------------------------------|
| W. EMMETT BARKLEY | | Biohazard Science Research |
| JOSEPH H. BOUTWELL | | Public Health Microbiology Research |
| MARION M. BROOKE | | Public Health Microbiology Research |
| VULUS R. DOWELL, JR. | | Public Health Microbiology Research |
| WILLIAM KAPLAN | | Public Health Microbiology Research |
| LEO KAUFMAN | | Public Health Microbiology Research |
| ATHOS OTTOLENGHI | | Public Health Microbiology Research |
| G. BRIGGS PHILLIPS | | Public Health Microbiology Research |

Adjunct Associate Professors

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|----------------|--|-------------------------------------|
| LIBERO AJELLO | | Public Health Microbiology Research |
| DON J. BRENNER | | Public Health Microbiology Research |
| JOHN B. BROOKS | | Public Health Microbiology Research |

EDWARD L. CAVENAUGH	Public Health Microbiology Research
HARRY DAUGHARTY	Public Health Microbiology Research
ROBERT E. DESJARDINS	Public Health Microbiology Research
WALTER R. DOWDLE	Public Health Microbiology Research
BRUCE L. EVATT	Public Health Microbiology Research
JOHN J. FARMER III	Public Health Microbiology Research
JOHN C. FEELEY	Public Health Microbiology Research
JOHN E. FORNEY	Public Health Microbiology Research
JOHN W. FOSTER	Public Health Microbiology Research
WILLIAM H. HANNON	Public Health Microbiology Research
CHARLES L. HATHEWAY	Public Health Microbiology Research
WALLIS L. JONES	Public Health Microbiology Research
ALAN P. KENDALL	Public Health Microbiology Research
MALCOLM A. MARTIN	Biohazard Science Research
JOSEPH B. MCCORMICK	Public Health Microbiology Research
MAX D. MOODY	Public Health Microbiology Research
C. WAYNE MOSS	Public Health Microbiology Research
JOHN F. OBJESKI	Public Health Microbiology Research
ERSKINE L. PALMER	Public Health Microbiology Research
LEO PINE	Public Health Microbiology Research
CHARLES B. REIMER	Public Health Microbiology Research
ERROL REISS	Public Health Microbiology Research
ERIC B. SANSONE	Biohazard Science Research
CHARLES C. SHEPARD	Public Health Microbiology Research
STEVEN L. SHORE	Public Health Microbiology Research
PETER B. SMITH	Public Health Microbiology Research
FRANCIS W. SPIERTO	Public Health Microbiology Research
JOHN A. STEWART	Public Health Microbiology Research
W. DANIEL SUDIA	Public Health Microbiology Research
ALEXANDER J. SULZER	Public Health Microbiology Research
CLYDE THORNSBERRY	Public Health Microbiology Research
H. MAC VANDIVIERE	Public Health Microbiology Research
I. KAYE WACHSMUTH	Public Health Microbiology Research
KENNETH W. WALLS	Public Health Microbiology Research
HAZEL W. WILKINSON	Public Health Microbiology Research
DONALD W. ZIEGLER	Public Health Microbiology Research

Adjunct Assistant Professor

JAMES P. O'CONNELL	Public Health Microbiology Research
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Emeritus Professors

ELMER F. CHAFFEE	(6) Public Health Diagnostic Bacteriology and Mycology, Serological Reactions in Parasitic Infections
JOHN E. LARSH	(1) Immunoparasitology, Immunity to Helminths, Host-parasite Relations

- 131 PARASITISM AND HUMAN DISEASE (2). A course consisting of lectures, demonstration, and laboratory work given as an introduction to the principles of infectious diseases. *One lecture and two laboratory hours a week, fall.* Goulson, Okey.
- 134 HUMAN PARASITOLOGY (4). Prerequisite, permission of instructor. Lectures, demonstrations, and laboratory work on the most common animal parasites of man with special emphasis on their life cycles, host response, and laboratory diagnosis. *Two lecture and four laboratory hours a week, fall.* Weatherly.
- 140 PROBLEMS IN PARASITOLOGY (1 or more). A course for students who wish to make an intensive study of some special problem in human parasitology. *Two or more hours a week, fall and spring.* Staff.
- 142 PROBLEMS IN PUBLIC HEALTH LABORATORY PRACTICE (1 or more). A course for students who wish to make an intensive study of some special problem in the laboratory field. *Two or more hours a week, fall and spring.* Staff.
- 143
- 150 PUBLIC HEALTH BACTERIOLOGY (4). Prerequisite, permission of instructor. Lectures and laboratory studies of the human pathogenic bacteria and fungi with particular emphasis on those submitted to public health laboratories for complete identification. *Two lecture and four laboratory hours a week, fall.* Read.
- 151 PUBLIC HEALTH VIROLOGY (3). Prerequisites, PALP 150 and permission of instructor. Lectures and laboratory studies on isolation and identification techniques. *Two lecture and two laboratory hours a week, spring.* Read.
- 192 MEDICAL MYCOLOGY (Bacteriology 192) (4). Prerequisites, general microbiology or botany and permission of the instructor. Isolation, identification, epidemiology, mycology, and clinical importance of medically significant fungi. Identification of hyphomycetes and yeasts will be stressed. *Two lecture and four laboratory hours a week, fall.* McGinnis.
- 230 THE NATURE OF PARASITISM (3). Prerequisite, permission of instructor. Lectures and discussions on the immunobiology of parasitic protozoa and helminths. Host and parasite factors thought to be important in pathogenesis are presented. Medically important protozoa and helminths are stressed. *Three lecture hours a week, spring.* Seed.
- 232 PARASITOLOGICAL METHODS (4). Prerequisite, PALP 134. An introduction to research methods employed in the laboratory studies of various protozoan and helminth parasites. *Two lecture and four laboratory hours a week, spring.* Goulson.
- 233 MALARIOLOGY (3). Prerequisite, permission of instructor. Lectures, demonstrations, and laboratory devoted to the study of malaria in man and mosquito. The biology and classification of mosquitoes are also considered. *Two lecture and two laboratory hours a week, fall.* Hendricks.
- 234 MEDICAL ENTOMOLOGY (3). Prerequisites, Zoology 11 and PALP 134, or equivalents. Lecture, demonstrations, and laboratory studies on the insects, ticks, mites, and other arthropods that transmit and/or cause diseases of man. Methods of identifying these forms are emphasized in the laboratory. *Two lecture and two laboratory hours a week, spring.* Hendricks.
- 235 PROBLEMS IN PUBLIC HEALTH LABORATORY METHODOLOGY (1 or more). Prerequisites PALP 142 or 143, and permission of instructor. *Two or more hours a week, fall and spring.* Goulson.
- 236
- 250 PUBLIC HEALTH LABORATORY METHODS I (2). Prerequisite, permission of instructor. Lectures and seminars pertaining to current diagnostic techniques in Public Health Bacteriology and Mycology. *One lecture and two seminar hours a week, fall.* Okey.
- 251 PUBLIC HEALTH LABORATORY METHODS II (5). Prerequisite, permission of instructor. Lectures, demonstrations, and laboratory work on the most important microbiological diagnostic procedures, e.g., immunoserology, used in the modern public health laboratory. *Two lecture and six laboratory hours a week, spring.* Okey.

- 260 PUBLIC HEALTH LABORATORY MANAGEMENT I (2). Prerequisite, permission of instructor. A study of the broad responsibilities and activities of the public health laboratory, its relations to other divisions of the Health Department and its role in comprehensive health planning. *One lecture and two seminar hours a week, fall.* Okey.
- 261 PUBLIC HEALTH LABORATORY MANAGEMENT II (3). Prerequisite, permission of instructor. A continuing study in depth of the responsibilities and activities of the public health laboratory. *Two lecture and two seminar hours a week, spring.* Okey.
- 270 BIOHAZARD SCIENCE I (3). Prerequisite, permission of instructor. Philosophy of safety, laboratory-acquired and nosocomial infections, other biohazards, fundamentals of laboratory safety, and principles of disinfection and sterilization. *Three lecture hours per week, fall.* Tulis.
- 271 BIOHAZARD SCIENCE II (3). Prerequisite, PALP 270. Lectures and demonstrations on biohazard containment systems, aerosol and surface sampling, filtration technology, hazards of animal experimentation, carcinogen research, oncogenic virus studies, recombinant DNA, and aspects of biohazard control. *Three lecture hours per week, spring.* Tulis.
- 275 LABORATORY METHODS IN BIOHAZARD SCIENCE (3). Prerequisites, PALP 270 and 271. Fundamentals of disinfection and sterilization processes including official methodology, packaging, dosimetry, inactivation kinetics, process control, sterility testing, and use of containment facilities and aerosol and surface sampling equipment. *Three lecture and ten laboratory hours per week, summer.* Tulis.
- 276 ADVANCED STUDIES IN BIOHAZARD SCIENCE (3). Prerequisites, PALP 270, 271, and permission of instructor. Lectures and seminars concerned with biohazard risk assessment, medical surveillance, impact of state and federal regulations, environmental issues, principles of quality assurance, laboratory design, and safety management. *Two lecture and two seminar hours per week, fall.* Tulis.
- 277 SPECIAL TOPICS IN BIOHAZARD SCIENCE (2). Prerequisites, PALP 270, 271, and permission of instructor. Current problems and trends in biohazard science, impact of emerging legislation, development of standards, and other topics. *One lecture and two seminar hours per week, spring.* Tulis.
- 331 SEMINAR IN PARASITOLOGY (1). Prerequisite, permission of staff. Discussion of selected topics in Parasitology. *One seminar hour a week, spring.* Staff.
- 333 SEMINAR IN PUBLIC HEALTH LABORATORY PRACTICE (1). Prerequisite, permission of staff. Discussion of selected topics in the public health laboratory field. *One seminar hour a week, spring.* Staff.
- 334 RESEARCH IN PARASITOLOGY (2 or more). Open to advanced students only.
- 335 *Four or more laboratory hours a week, to be arranged, fall and spring.* Goulson, Hendricks, Seed, Weatherly.
- 336 RESEARCH IN PUBLIC HEALTH LABORATORY METHODOLOGY (2 or more). Open to advanced students only. *Four or more laboratory hours a week, to be arranged, fall and spring.* Weatherly, Read, Goulson, Okey, Tulis.
- 394 DOCTORAL DISSERTATION (3-9). *Fall and spring.* Staff.
- 400 GENERAL REGISTRATION (0).

Department of Public Health Nursing (PHNU)

DOROTHY M. TALBOT, *Chairman*

Professor

DOROTHY M. TALBOT (1) Public Health Nursing; Research,
Administration and Education

Associate Professor

MARION E. HIGHRITER (4) Public Health Nursing and Program
Evaluation

Assistant Professor

JUDITH L. ADAMS (12) Community Health Nursing Research

Lecturer

NANCY L. TIGAR (14) Public Health Nursing Administration

Clinical Assistant Professors

MARILYN K. ASAY (15) Public Health Nursing Practice and
Education

CHARLENE C. OSSLER (16) Occupational/Public Health Nursing
Education, Research, and
Administration

Associate Professors Emeriti

NORA F. CLINE
ELIZABETH M. EDMANDS
ANN C. HANSEN
MARIE J. MCINTYRE
BEATRICE B. MONGEAU
JULIA D. WATKINS

Assistant Professor Emerita

ROSE G. GEORGE

- 101 AGING AND HUMAN DEVELOPMENT (Health Policy and Administration,
Health Education, Nutrition 101) (3). Biological, medical, demographic and social
aspects of aging. New methods and concepts of aging processes and their implications.
Three lecture hours per week. Talbot.
- 140 READING IN PUBLIC HEALTH NURSING (1-3). Prerequisites to be arranged
141 with the faculty. Reading and tutorial guidance in a selected area of public health
142 nursing. *Fall, spring and summer.* Staff.

- 160 DELIVERY OF COMMUNITY NURSING SERVICES (3). Permission of instructor required. Analysis of patterns of organization of community nursing services and relationships to the health care delivery system. Special emphasis on basic management skills and their application. *Three lecture hours per week.* Tigar.
- 171 EDUCATIONAL ROLES OF COMMUNITY HEALTH PROFESSIONALS (3). Application of teaching-learning concepts, principles of adult education, and individual and group teaching strategies in schools, worksites and other settings. Includes designing, implementing, evaluating continuing education. *Three lecture hours per week.* Asay, Ossler.
- 182 HEALTH CARE SERVICES IN OCCUPATIONAL SETTINGS (3). Introduction to population-based health care for workers. Includes major causes of work-related morbidity and mortality, strategies for the team approach and components of occupational health programs. *Three lecture hours per week.* Ossler.
- 193 INNOVATION AND CHANGE IN PUBLIC HEALTH NURSING PRACTICE I (3). Permission of instructor required. Analysis of factors and approaches considered in innovation and change in public health nursing. This includes the development of the theoretical base of public health nursing practice. *Two lecture and two seminar hours per week.* Staff.
- 196 ADVANCED PRACTICE IN PUBLIC HEALTH NURSING (3). Permission of instructor required. Prerequisite: licensure as registered nurse in North Carolina. Concepts of health promotion/illness prevention applied to families/groups/community. Methods of assessment and intervention. Selected practice experiences. Analysis of case materials. *Two seminar and two laboratory hours per week.* Staff.
- 201 SPECIAL STUDIES (1-3). Permission of instructor required. Sections will focus on specific topics of current interest to health workers. Flyers describing the section offering will be distributed prior to registration each semester. *Lecture hours dependent upon credit.* Staff.
- 212 SEMINAR ON THE FAMILY (Maternal and Child Health 212) (1). Permission of instructor required. Family theory, research and assessment; family relationships and environments that influence adult and child health and development; professionals and institutions that influence family functioning. *Two seminar hours per week.* Schaefer.
- 215 CHILD HEALTH ASSESSMENT AND CARE (Maternal and Child Health 215) (2). Permission of instructor. Seminar series which emphasizes theoretical, conceptual and practice bases fundamental to assessment of infants and young children in community settings. Focus is upon wellness care and management of common and long-term childhood conditions. *Four seminar hours per week, spring.* Stocking.
- 217 CHILD HEALTH: NURSING INTERVENTION (Maternal and Child Health 217) (1-6). Permission of instructor. For nurses with appropriate theoretical and experimental backgrounds in child health and development. Emphasis is on nursing practice with infants, young children and their families in a variety of community settings throughout North Carolina. *Four to twenty-four supervised clinical hours per week, spring, summer, fall.* Staff.
- 220 ANTEPARTAL THEORY: ASSESSMENT AND CARE OF PREGNANT WOMEN (Maternal and Child Health 220) (2). Theoretical basis of antepartal care emphasizing the concept of risk and assessment of maternal and fetal well-being. *Two lecture hours per week, spring.* Staff.
- 221 ANTEPARTAL THEORY: ASSESSMENT AND CARE OF PREGNANT WOMEN: CLINICAL PRACTICE (Maternal and Child Health 221) (3). Prerequisite, permission of instructor. Co-requisite, Maternal and Child Health 220. Initial and on-going assessment of pregnant women including physical and pelvic examinations. Designed for nurses. *Six laboratory hours per week, spring.* Staff.

- 222 FAMILY PLANNING THEORY: ASSESSMENT AND CARE OF WOMEN IN THE REPRODUCTIVE YEARS (Maternal and Child Health 222) (1). For health professionals doing family planning counseling. Includes mode of action, effectiveness, contraindications, side effects, complications, advantages, disadvantages of temporary and permanent methods of birth control. *One lecture hour per week. First summer session.* Staff.
- 223 FAMILY PLANNING ASSESSMENT AND CARE: CLINICAL PRACTICE (Maternal and Child Health 223) (2 or 3). Prerequisite, permission of instructor. Co-requisite, Maternal and Child Health 222. Initial and on-going assessment of women requesting or utilizing temporary birth control methods. Nurse students competent in performing physical and pelvic exams, 2 credits; other nurses, 3 credits. *Four or six laboratory hours per week, second summer session.* Staff.
- 224 SCHOOL AGE POPULATION: HEALTH PROBLEMS AND PROGRAMS (Maternal and Child Health 224) (3). Permission of instructor required. Health needs and problems of school aged population. Development and evaluation of programs to meet those needs, including examination of legislative mandates, administrative structures and manpower utilization. *Three lecture hours per week.* Asay.
- 225 PRACTICUM: LEADERSHIP IN SCHOOL HEALTH PROGRAMS (Maternal and Child Health 225) (1-4). Permission of instructor required. Prerequisites, MHCH 224 or equivalent. An elective, individually planned and supervised school-community based field experience. Designed to provide leadership experiences in delivery of school health services. *Three to twelve laboratory hours per week.* Asay.
- 240 PROBLEMS IN PUBLIC HEALTH NURSING (1-4). A course for students in public
241 health nursing. Students will make an intensive study of some special problem in public
242 health relevant to public health nursing. The study will demonstrate the application of
research principles. *Hours to be arranged. Fall, spring, and summer.* Staff.
- 255 CASE AND PROGRAM CONSULTATION IN PUBLIC HEALTH (Maternal and Child Health 255) (2-3). Examination of the practice of case and program consultation in public health settings. Analysis of consultation as a mutual problem-solving process including evaluation. Roles and relationships of consultant and consultee are considered with provision for experiential learning opportunities. Emphasis is on multidisciplinary practice. *One and one-half lecture hours per week. Field experience and written report accepted for additional credit hours. Fall and spring.* Watkins.
- 261 COMMUNITY NURSING SERVICE ADMINISTRATION I (3). Permission of instructor required. Concepts and methods of administering community nursing services. Functions of the nurse administrator in areas of organizing, staffing, program planning, priority setting and evaluation of services. *Three lecture hours per week.* Tigar.
- 262 COMMUNITY NURSING SERVICE ADMINISTRATION II (3). PHNU 261 and permission of instructor required. Continuation of PHNU 261. Aspects of fiscal management, personnel management, legal considerations, records and reporting relating to delivery of community nursing services. Leadership styles, motivation and application of administrative processes. *Two lecture and two seminar hours per week.* Tigar.
- 271 INSTRUCTIONAL APPROACHES IN PUBLIC HEALTH NURSING (3). Permission of instructor. Educational issues involved in preparation for public health nursing practice and education. Study and evaluation of public health-community nursing content in nursing curricula. Strategies of instructional approaches involving innovation and change. *Three lecture hours per week, fall, spring.* Ossler.
- 272 PRACTICUM IN TEACHING COMMUNITY HEALTH NURSING (3-6). Permission of instructor. Supervised experience involved in teaching community health nursing to students at the undergraduate level. Problems related to curriculum,

organization, and faculty roles will be explored under faculty direction. Field fee: \$300.00. *One seminar hour biweekly and eighteen laboratory hours weekly, fall, spring.* Asay.

- 280 OCCUPATIONAL HEALTH NURSING I (3). Permission of instructor required. Concerns factors influencing the development and operation of occupational health nursing programs. General and special health services contingent on work environment and inherent health problems in the employed populations are considered. *Three lecture hours per week, fall.* Ossler.
- 281 OCCUPATIONAL HEALTH NURSING II (3). PHNU 280 and permission of instructor required. Continuation of PHNU 280. Role components of Occupational Health Nursing with emphasis on designing, implementing, evaluating occupational health programs. Application of principles of toxicology, epidemiology in Occupational Health Nursing role. *Three lecture hours per week.* Ossler.
- 293 INNOVATION AND CHANGE IN PUBLIC HEALTH NURSING PRACTICE II (3-6). Permission of instructor required. Integration of selected factors of innovation and change into the practice of public health nursing. Evaluation of the adequacy of the change in practice. Practice credit variable. *Two lecture, two seminar, and zero to nine laboratory hours per week.* Staff.
- 297 SUPERVISION IN PUBLIC HEALTH NURSING (3). Permission of instructor required. For public health nursing and other selected students. Philosophy, principles and methods of supervision with emphasis on the supervisor's role in staff development and first-level management. *One lecture and four seminar hours per week.* Watkins.
- 299 RESEARCH METHODS IN PUBLIC HEALTH NURSING (2-4). Permission of instructor required. Prerequisite: BIOS 101. Analysis of nursing research emphasizing methodology and implications for community health nursing practice. For over two credits, students develop a research design or participate in the research process. *Two lecture and two seminar hours for ten weeks for two credits.* Highriter, Adams.
- 200 SEMINAR IN PUBLIC HEALTH NURSING (3). Permission required for non-majors only. Analysis of current factors influencing public health nursing practice. Emphasis is on issues in health planning and policy, quality assurance and standards of professional practice. *One lecture, four seminar hours per week.* Staff.
- 300
- 301 FIELD OBSERVATION OF NATIONAL COMMUNITY HEALTH NURSING SERVICE (1). Permission of instructor. Orientation to national agencies in the Washington, D.C. area concerned with community health nursing practice. Supervised visits made to agencies e.g., The Division of Nursing, HHS and Walter Reed Army Institute. Field fee \$150.00. *Field observations and seminars, spring.* Talbot.
- 340 RESEARCH IN PUBLIC HEALTH NURSING (1-4). PHNU 299 or the equivalent and permission of instructor. Independent research in public health nursing under supervision. *Two to eight laboratory hours per week, fall, spring, summer.* Staff.
- 341
- 342
- 392 MAJOR PAPER (1-6). Permission of instructor required. A major paper on a problem relevant to public health nursing. This study may extend over more than one semester. Credit is assigned accordingly. *Fall, spring, summer.* Staff.
- 393 MASTER'S THESIS (3-9). *Fall, spring, summer.* Staff.
- 396 FIELD PRACTICE IN COMMUNITY HEALTH NURSING (3-9). Permission of instructor. Field experience in community health nursing practice. Study and observation of selected areas related to students' program of study. For example, occupational health nursing, or public health nursing. Field fee, \$450.00. *Twenty-four hours laboratory per week, fall, spring, summer.* Staff.
- 400 GENERAL REGISTRATION (0).

DEPARTMENT OF RADIO, TELEVISION AND MOTION PICTURES

A. RICHARD ELAM, *Chairman*

Professors

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|------------------|------|---|
| A. RICHARD ELAM | (11) | Mass Media Management, Communications Measurement, Broadcast Journalism |
| JOHN R. BITTNER | (14) | Social Implications of Mass Communication, Broadcast Policy, Broadcast Journalism |
| WILLIAM M. HARDY | (2) | Writing, Directing, Performance |

Associate Professors

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|--------------------|------|---|
| ROBERT J. GWYN | (1) | Instructional Broadcasting, Educational Technology, Political Communication |
| RICHARD H. SIMPSON | (15) | TV and Film Production |
| ELIZABETH S. CZECH | (9) | Minorities and Women in the Media, Mass Media, Media Effects |

Assistant Professors

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|------------------|------|--|
| ROBERT C. ALLEN | (13) | Motion Picture History, Media Aesthetics, Popular Culture |
| GORHAM A. KINDEM | (10) | Motion Picture Production, Popular Semiotic Theory |
| LOY A. SINGLETON | (12) | Broadcast Regulation, Policy and History; Broadcast Journalism |

Professors Emeriti

J. PAUL NICKELL
WESLEY H. WALLACE

The Department offers a graduate program leading to the degree of Master of Arts in Communication. The master's program offers exposure in radio, television, and film to develop an understanding of media processes, to create a critical framework for viewing media and society, and to offer opportunity to develop different media skills. The master's program serves both the student going on to a higher degree program and the student pursuing professional aspects of the media. Emphasis is on building deeper understanding of the creative processes.

Facilities for graduate work in the Department are good. Library resources at The University of North Carolina at Chapel Hill are excellent. The Department's facilities include radio production and recording stu-

dios, a motion picture sound stage, a television studio, film editing and projection rooms. Also housed in Swain Hall are the University's 100,000 watt NPR affiliated public radio station, WUNC (FM), and the production studios of The University of North Carolina Center for Public Television, the statewide Public TV network where many students gain additional experience. The Department produces both dramatic and nonfiction programs and films with students active in the roles of writing, production, and performance. Both video and audio recording facilities permit self-criticism by the student.

Requirements for the Master of Arts in Communication Degree

The Thesis: This requirement may be satisfied by completing an approved research thesis, creative writing thesis, documented production thesis, or critical thesis. The type of thesis allowed for a particular student depends upon satisfactory completion of course work appropriate to that type of thesis; i.e., research, writing, production, criticism. In the instance of the production thesis, availability of facilities also will be a determining factor. The specific thesis topic must receive prior approval by a committee of the departmental graduate faculty.

Undergraduate courses required: Students whose undergraduate majors have not been in broadcasting or film or who have not had a significant amount of undergraduate course work or experience in these fields may be accepted in the graduate program but will be required to complete twelve semester hours of undergraduate courses or satisfy the requirement by examination or by offering equivalent academic work and experience; RTVM 20, Introduction to Mass Communication; RTVM 30, Basic Writing for Broadcasting and Film; RTVM 50, Production Fundamentals; and one other chosen to fit the student's needs. Applicants who are accepted for graduate work in our department and whose undergraduate majors are in areas or subject matter fields other than broadcasting, film, mass communication, or equivalent will be required to enter in the first summer session. Accepted applicants who are receiving their baccalaureate degrees at the end of the spring term (the terminus of which conflicts with UNC-CH's opening dates for the first summer session) may be permitted to enter at the beginning of the second summer session. This requirement permits the entering student to complete all (or some) of the undergraduate prerequisites during the summer.

Graduate courses required in the major: 290, Social Aspects of Mass Communication (3); 300, Seminar in Communication (3); and 393. Thesis (3). The student will elect from the graduate curriculum four other courses to complete the twenty-one semester hours of the major.

The Minor: The minor, a significant element of the graduate program, must be taken in another department approved by the major department.

This portion of the graduate program should be worked out by the student upon consultation with and approval by the Director of Graduate Studies of the minor department. Normally, the student will choose a minor in a department in which there has been significant undergraduate preparation. In the minor, at least three courses at the graduate level, nine semester hours, are required. The minor department may require additional undergraduate prerequisites.

Language requirement: A reading knowledge of one modern foreign language. With departmental approval, course work leading to the development of other research tools such as computer science or statistics may be substituted for the language requirement.

Residence requirement: One academic year.

Courses for Graduates and Advanced Undergraduates

- 113 INTRODUCTION TO INSTRUCTIONAL MATERIALS PRODUCTION (Education 113) (3). Prerequisite, permission of the instructor. The planning and production of two and three dimensional instructional materials, such as: television graphics, slides, overhead transparencies, manipulative tactile materials and animated pictures. Open to RTVMP majors (seniors and graduate students only). *One lecture and six laboratory hours per week, fall and spring.* Wileman.
- 125 SOUNDS AND IMAGES IN THE CREATIVE PROCESS (3). Examines the expressive resources of motion pictures and television through consideration of the relationship of the physical world, ideas, and sound and image representation. *Fall and spring.* Allen.
- 130 MASS MEDIA AND AMERICAN POPULAR CULTURE (3). Prerequisites, RTVM 125 and permission of the Department. An examination of the processes of communication and an assessment of the cultural significance of popular films and television programs. The theoretical discussion of popular culture will focus on the problematic distinction between high art and low art, elite culture and popular culture. Popular works of art will be considered in the light of their authors, genre, and social, cultural and historical contexts. *Spring.* Kindem.
- 140 EDUCATIONAL TELEVISION PRODUCTION AND INSTRUCTION (3). Permission of the Department. To prepare the educational television participant, including the producer-director, the classroom and studio of instructional materials. Current uses of television; content considerations; cooperative program planning; techniques of television teaching; classroom considerations; production techniques; sources of material; special visual considerations; potentials of various instructional forms; evaluation methodology. *Two lecture and two laboratory hours per week, fall.* Gwyn.
- 141 CONCEPTS OF PUBLIC BROADCASTING (3). Provides students with the understanding of the rationales, modes, and processes of public broadcasting; permits students to examine the underlying assumption of commercial broadcasting. *Spring.* Gwyn.
- 143 BROADCAST CRITICISM (3). Prerequisites, RTVM 125 and permission of the Department. Study of contemporary radio and television, aimed at developing sound critical criteria for media. Current criticism will be examined, relationship of criticism to broadcasting content in recent years will be considered. *Two lecture and two laboratory hours per week, spring.* Hardy.

- 144 THE DOCUMENTARY IDEA (3). Prerequisites, RTVM 125 and permission of the Department. Historical and theoretical examination of expressions of the documentary idea in different eras and various modes including film, television, and radio. *Three lecture and two laboratory hours per week, spring.* Allen.
- 145 HISTORY OF FILM (3). Prerequisites, RTVM 125 and permission of the Department. Study of the development of the art and craft of the film through examination of individual films and topics stressing the interaction of aesthetic considerations with socio-cultural and institutional settings. *Fall.* Allen.
- 146 INTERNATIONAL COMMUNICATION AND COMPARATIVE JOURNALISM (Journalism 146) (Political Science 146) (3). Development of international communication; the flow of news and international propaganda; the role of communication in international relations; communication in the developing nations; comparison of press systems. *Fall.* Cole.
- 147 BROADCASTING IN DEVELOPING COUNTRIES (3). The cultural and educational uses of radio and television are studied in the developing countries of Africa, Latin America and India. Emphasis will be placed on the new electronic media and its effectiveness in serving developing countries. *Fall.*
- 150 MINORITIES AND THE MEDIA (3). The course traces the development of minorities in film, radio and television, and the press, looking at trends and treatments of minorities by the media, and how and if they have changed. *Spring.*
- 151 INTRODUCTION TO MASS COMMUNICATION RESEARCH (Journalism 151) (Speech 151) (3). Fundamentals of communication research techniques (content analysis, historiography, survey research, experimental design) including an overview of computer application, statistics, theory development, and trends in published literature. *Fall and spring.*
- 157 BROADCASTING AND THE LAW (3). Prerequisites, RTVM 20 and permission of the Department. A study of the various laws affecting broadcasting; the actions of the courts in interpreting the laws; the actions of federal regulatory agencies relating to broadcasting. Topics include: political broadcasting; the "fairness doctrine"; regulation of programming; freedom of speech in broadcasting; public access; regulation of news media; and others. *Fall.* Singleton.
- 158 SOCIAL RESPONSIBILITIES OF BROADCASTING (3). Prerequisite, RTVM 20. A study of the changing dimensions of broadcasting's "public interest" responsibilities within the framework of American social, political, and economic attitudes and behavior. *Spring.*
- 159 BROADCAST STATION MANAGEMENT (3). Prerequisites, RTVM 20 and permission of the Department. A study of audiences, station organization and operation, and economic, cultural and political factors which influence broadcasting. Emphasis is placed upon factors affecting management, sales and program policies and decisions. *Spring.* Elam, Bittner.
- 160 COMMUNITY AND MEDIA (3). A study of the electronic media as feedback mechanisms for community organization and social change. A variety of broadcast and non-broadcast uses of the media are studied. *Fall.* Gwyn.
- 161 INFORMATIONAL BROADCASTING (3). Study of the structure, preparation and production of informational radio and television programs including the investigative documentary and radio and television "talk" programs. Instruction in data collection, analysis and preparation of informational programs. *Spring.* Gwyn.
- 171 IDEA, FORM, AND MEDIUM (3). Prerequisites, RTVM 125 and permission of the Department. An investigation of the relationship between the idea to be expressed, the form of expression, and the medium chosen. Examples of this relationship will be studied in the works chosen from four media: the stage the motion picture, radio, and television, and will include examples from Greek, Tudor, and modern drama as well as

selected examples of naturalism, expressionism, and related forms in radio, television and motion pictures. *Fall and spring*. Allen.

- 174 ADVANCED BROADCAST NEWS REPORTING (3). Prerequisite, RTVM 73. Examination and application of in-depth broadcast news reporting techniques, especially investigative reporting, special events coverage, and the documentary. Students film and produce radio and television programs of actual news events. *Two lecture and two laboratory hours per week, spring*. Singleton, Elam.
- 175 RESEARCH PROJECTS IN THE MASS MEDIA (3). A proseminar for the study of research methods in the mass media and the completion of special research projects. *Spring*. Gwyn.
- 176 RADIO PRODUCTION ARTS (3). Prerequisites, RTVM 50 and permission of the Department. Analysis and application of the principles and methods of radio production and direction. Standard and experimental forms will be studied. *Two lecture and two laboratory hours a week, fall and spring*. Czech, Gwyn.
- 177 TELEVISION DIRECTING (3). Prerequisites, RTVM 50 and RTVM 77. The aesthetics of television directing: script analysis, direction of performance, set and lighting design, creative visual and audio communications. Students direct several television projects. *One lecture, one seminar, and four laboratory hours per week, fall and spring*. Simpson.
- 179 ADVANCED SCRIPTWRITING FOR BROADCASTING, FILM AND STAGE (Dramatic Art 179) (3). Prerequisites, permission of instructor or RTVM 78 or 81. A major writing project will be completed by each student, either dramatic or nonfiction for radio, television, film or stage. *Three lecture hours per week, fall and spring*. Hardy.
- 182 MEDIA ACTING AND PERFORMANCE (Dramatic Art 182) (3). Prerequisite, permission of the Department. Study and practice in acting and performance for radio, television and motion pictures. Limited to majors in fine arts and speech. *Two lecture and two laboratory hours per week, fall and spring*.
- 187 MOTION PICTURE PRODUCTION ARTS (3). Prerequisites, RTVM 50 and RTVM 87 and permission of the Department. The theory and techniques of film form are studied in lecture, demonstration, and individual student films. *Two courses for graduate lecture and two laboratory hours a week, fall and spring*. Kindem.

Courses for Graduates

- 225 VISUAL COMMUNICATION: REALITY, PERCEPTION AND ART (3). Prerequisites, RTVM 125 and permission of the Department. Examination of the evidence, theories, and relationship of psychology and aesthetics as they affect communication through film and television. *Fall*.
- 251 MEDIA RESEARCH METHODS (Journalism 251) (3). Prerequisite, Journalism 151 or equivalent. A high degree of sophistication in research methodology is also necessary. Advanced work in experimental design in communication research, audience surveys, and content analysis. *Fall*.
- 290 SOCIAL ASPECTS OF MASS COMMUNICATION (3). Required. A survey of current research in communication media as related to propaganda and public opinion and cultural and social patterns, with particular emphasis upon those backgrounds essential to an understanding of the impact of communication media on society. *Spring*.
- 300 SEMINAR IN COMMUNICATION (3). Required of all graduate majors. Examination of and practice with major forms of research methodologies in the mass media; individual research and reports. Presentation of trial thesis proposals. *Fall*.

- 301 SEMINAR IN FILM (3). Permission of the Department required; may be repeated for credit. Selected problems in aspects of film including the nature of the critical enterprise in film; the relationship between society and specific groups of film; economics of the film industry; consequences of economic and institutional structure on films produced; the nature of film history; documentary film in various periods. Exact topic to be covered each semester will be announced before preregistration.
- 302 SEMINAR IN MASS COMMUNICATIONS EFFECTS (3). A critical examination of assertions regarding effects of the mass media through published research in mass communications and related areas.
- 303 SEMINAR IN THE HISTORY OF MASS MEDIA (3). Prerequisite, permission of the instructor. Application of historical research techniques to problems in the mass media.
- 305 PRODUCTION PROJECTS (3). Prerequisite, RTVM 176, 177 or 187, and permission of the Department. Individual students carry through to completion projects they initiate, which may include documentary films, a series of dramatic or documentary radio programs, or a television drama. *Fall*.
- 310 EXPERIMENTAL AND CREATIVE WRITING (3). Prerequisite, RTVM 179. Individual projects in writing accomplished with appropriate research, conferences, and criticism. *Fall and spring*. Hardy.
- 392 READING AND RESEARCH (3). Prerequisite, graduate standing in RTVM or Journalism. Advanced reading or research in a selected field; reports to and conferences with the responsible member of the graduate staff. Graduate staff.
- 393 MASTER'S THESIS (3 or more). *Fall and spring*. Staff.
- 400 GENERAL REGISTRATION (0).

CURRICULUM IN RECREATION ADMINISTRATION

H. DOUGLAS SESSOMS, *Chairman*

Professors

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|--------------------|-----|---|
| H. DOUGLAS SESSOMS | (1) | Theory, Recreation Education, Group Dynamics |
| THOMAS A. STEIN | (2) | Recreation Administration, Community Recreation Services, Special Populations |

Associate Professor

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| LEE E. MEYER | (3) | Therapeutic Recreation Services, Program Development |
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Assistant Professors

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|---------------------|-----|--|
| RICHARD J. GITELSON | (6) | Recreation Administration, Public Policy, Systems Planning |
| CYNTHIA J. HAMPTON | (4) | Group Dynamics, Services to the Aging |

Lecturer

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|--------------------|-----|---|
| CHARLES C. BULLOCK | (5) | Therapeutic Recreation Services, Sociology of Leisure |
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Visiting Lecturers

- | | |
|--------------------|---------------------------------|
| JOSEPH C. DAVIDSON | Recreation Planning |
| ALEX J. GILLESKIE | Recreation Administration |
| JAMES H. HERSTINE | Recreation Administration |
| RONALD SECRIST | Recreation Administration |
| RAYMOND WEST | Therapeutic Recreation Services |

The Curriculum in Recreation Administration provides an interdisciplinary approach to the study of leisure and the preparation of specialists to work in the field of parks and recreation services. It is a major area of study within the College of Arts and Sciences and offers the Master of Science in Recreation Administration degree at the graduate level. Optional areas of concentration include the study of therapeutic recreation services and general recreation and park administration.

This professional degree program brings into play both academic and practical experience. It is highly individualistic, the specific requirements depending somewhat upon the student's undergraduate major, work experience and professional objectives. A minimum of eighteen hours of course work in Recreation Administration is required; the remaining hours of the thirty-three to thirty-six semester hour program may be taken in related areas of study.

All students admitted to this program must fulfill the requirements for admission to the Graduate School. To be admitted unconditionally, applicants will be required to have prerequisite training equivalent to an undergraduate major in one of the following: Dramatic Art, Physical Education, Education, Political Science, Recreation, or Sociology. The Master of Science in Recreation Administration normally requires twelve months for completion.

Three options are available for the fulfillment of the degree requirements. They are the ten courses and 1) a thesis (3 credits), or 2) a three month internship (6 credits), or 3) 6 hours of independent field study. The choice of option is based upon the student's interest and past experiences. Normally, those wishing to do further graduate work or those seeking an academic career in Recreation Administration elect the thesis option. For those experienced in recreation services or currently employed as recreation specialists while pursuing their graduate degree, the 6 hours of independent field study is recommended. For students with limited practical experience who seek a practitioner's role upon graduation, the internship option is suggested.

All candidates for the M.S. in Recreation Administration are expected to have a concurrent work experience with their course work. No academic credit is given for this experience, but it is a Curriculum expectation. A variety of opportunities exists through the cooperative efforts of the various recreation services and agencies within the university environs.

Limited numbers of graduate traineeships and fellowships are available, particularly for those interested in recreational services for special populations; e.g., the Bureau of Education for the Handicapped, Office of Education, has awarded to the Curriculum a grant to prepare recreation specialists to work with handicapped children. Also, the Tri Sigma National Society provides fellowship support for the development of play therapists. A special program designed for those interested in working with the physically disabled is available. It requires a longer period of study, and a minor in allied health sciences.

Minor Courses

Depending upon individual interests, a student may elect a minor. If so designated, at least three to four courses (nine to twelve semester hours) must be chosen with the advice of the department(s) in which the minor is being selected. It is possible for a student to split the minor (two courses or six semester hours in each area). The minor is not required; students may choose to elect a variety of experiences from various departments rather than concentrate on one subject area. If one does elect a minor, it must be declared and a minor representative designated as a member of his or her advisory committee.

Courses for Graduates and Advanced Undergraduates

- 120 PROGRAM PLANNING FOR RECREATION SERVICES (3). A study of the principles of planning recreation programs and the factors which affect its implementation and functioning. *Fall and spring*. Hampton, Meyer.
- 130 INTRODUCTION TO GROUP DYNAMICS AND COMMUNITY LEADERSHIP (3). An analysis of the techniques, methods, and motives of group and community leaders. Special attention is focused upon the roles of organizational structure, personnel policies, and in-service training programs. *Fall and spring*. Hampton, Sessoms.
- 140 RECREATION SPACES: THEIR DESIGN AND USE (3). Principles of planning recreation areas and facilities and the relationship of human needs to environmental resources. *Spring*. Davidson.
- 150 EVALUATION OF RECREATION SERVICES (3). Techniques and application of various methods for evaluating organized recreation services and programs. *Fall*. Meyer.
- 160 ADMINISTRATION OF RECREATION SERVICES (3). Analysis of recreation from the standpoint of organization, administration, finances, training, legislation, public relations, and coordination of community resources. *Fall and spring*. Gilleskie, Gitelson, Secrist.
- 161 MANAGEMENT CONCEPT APPLIED TO RECREATION SERVICES (3). The application of management theory to personnel, financial, and programming issues related to the provision of leisure services. *Spring*. Gitelson.
- 171 LEISURE AND THE AGING (3). Survey in gerontology and geriatrics as fields of study and professional services as they relate to the freetime behaviors of the aging. Visits to local service facilities and recreation agencies. *Spring*. Hampton.
- 175 INTRODUCTION TO THERAPEUTIC RECREATION SERVICES (3). History and philosophy of therapeutic recreation. A survey of basic counseling/interactional styles, clinical and administrative skills, and inter/intra disciplinary approaches in a variety of clinical settings. A five hour practicum is required. *Fall and spring*. Bullock; staff.
- 180 SUPERVISED FIELD TRAINING IN RECREATION (3,3). Prerequisite, three or
181 more courses in recreation. Students will have opportunity to receive varied practical on-the-job experience in one of many agency types. Staff.

Courses for Graduates

- 210 WORK, LEISURE AND ORGANIZED RECREATION IN THE UNITED STATES (3). A description and analysis of the scope of organized recreation systems, the evolution of work and leisure attitudes, and the trends of individual recreation behavior. *Fall*. Sessoms.
- 230 PROBLEMS OF ORGANIZED RECREATION (3). To promote insight into some problems confronting organized recreation in community life; to interpret and analyze the problems; to determine the specific needs; to plan for adjusting the problems. *Fall and spring*. Sessoms, Stein.
- 275 PRINCIPLES AND PROCEDURES IN THERAPEUTIC RECREATION (3). A study of the existing practices and principles utilized in therapeutic recreation. An in-depth treatment of assessment/evaluation, goal setting, and individualized planning, documentation, leisure counseling and clinical skills. *Spring*. Bullock, Meyer.

- 276 ISSUES AND PROBLEMS IN THERAPEUTIC RECREATION (3). An in-depth treatment of various issues, problems and concerns such as professionalism, credentialing, accessibility, mainstreaming, recent legislation, and others as they relate to the provision of therapeutic recreation services. *Summer*. Bullock, Meyer.
- 280 INTERNSHIP IN RECREATION ADMINISTRATION (3,3). *Fall and spring*.
281 Staff.
- 290 INDEPENDENT FIELD STUDY (3). Permission of faculty. May be repeated for credit.
- 310 SEMINAR IN LEISURE STUDIES (3). A survey of contemporary views of society, its structures and functions, as they relate to concepts of leisure and recreation behaviors. *Fall and spring*. Meyer, Stein.
- 350 RESEARCH SEMINAR (3). An appraisal of current recreation research efforts including a survey of descriptive statistics methods and research methodologies. *Fall*. Gitelson.
- 393 THESIS (3). Staff.
- 400 GENERAL REGISTRATION (0). Staff.

DIVISION OF REHABILITATION COUNSELING

ROBERT SAKATA, *Acting Director*

Professor

ROBERT SAKATA (1) Administration, Research and Curriculum,
Graduate Education

Assistant Professor

CYNTHIA L. WILHELM (5) Pediatric Rehabilitation, Rehabilitation
Nurse Education, Clinical Education

Instructors

DAVID K. HOLLINGSWORTH (7) Vocational Rehabilitation, Research
Design, Program Evaluation

STEVEN P. KAPLAN (11) Clinical Education, Obesity Research, Psy-
chosocial Adjustment and Disabilities

Clinical Instructor

STELLA WAUGH (10) Arthritis Rehabilitation, Rehabilitation
Medicine

Adjunct Assistant Professor

FRANK STALFA (6) Community Mental Health

The Division of Rehabilitation Counseling of the Department of Medical Allied Health Professions offers a graduate program leading to the Master of Science degree in Medical Allied Health Professions with a major in rehabilitation counseling.

The graduate courses offered in Rehabilitation Counseling are designed to present and discuss theoretical constructs and their application to clinical practice; to stimulate critical, analytical and creative thought; and to prepare students for professional positions in private, state and federal rehabilitation agencies.

Students enrolled in this two-year master's program are expected to complete thirty hours of core academic course requirements, plus two semesters of practicum and a one-semester internship. Students are encouraged to take courses in areas which allow for specialization within the field of Rehabilitation Counseling.

Requirements for Admission

1. A bachelor's degree with a major in Psychology, Sociology, Special Education or Business Administration from an accredited college or university.
2. A grade point average of *B* or better in the area of the major.
3. Submission of Graduate Record Examination scores.
4. Three letters of recommendation.
5. A structured admission interview with the Rehabilitation Counseling faculty.

Courses for Graduates

- 200 INTRODUCTION TO REHABILITATION COUNSELING (3). The introduction of principles and practices basic to understanding the interaction of disability or disease and human behaviors. *Three lecture hours a week, fall.*
- 202 THEORIES OF COUNSELING APPLIED TO REHABILITATION (3). The introduction to theories of counseling and behavior change as they apply to rehabilitation settings. Emphasis will be the generation of effective treatment models. *Three lecture hours a week, fall.* Wilhelm.
- 204 MEDICAL ASPECTS OF REHABILITATION (3). Orientation to the disease or disability process and treatment using principles and practices of medicine and rehabilitation. *Three lecture hours a week, spring.* Sakata.
- 206 MEASUREMENT AND EVALUATION IN REHABILITATION (3). Orientation and information on assessment and evaluation techniques used in rehabilitation settings will include performance measures, work samples and job simulation. *Three lecture hours a week, fall.* Hollingsworth, Wilhelm.
- 208 CAREER DEVELOPMENT AND SELECTIVE PLACEMENT IN REHABILITATION (3). Orientation to career development theory and vocational information applicable to rehabilitations settings. Also presented are selective placement consideration for the severely disabled. *Three lecture hours a week, spring.* Hollingsworth.
- 210 REHABILITATION COUNSELING PRACTICUM 5). Prerequisites, REHAB 200, 202, 206. A supervised clinical experience in techniques of interviewing, case planning, and case management. *Five lab hours a week, fall, spring.* Wilhelm, Kaplan.
- 212 REHABILITATION OF PSYCHOSOCIAL DISABILITIES (3). Prerequisites, REHAB 200, 202. Introduction to rehabilitation treatment information and strategies for counseling interventions when working with emotional, psychological and social disabilities. *Three lecture hours a week, spring.* Hollingsworth, Wilhelm.
- 214 PRINCIPLES OF GROUP COUNSELING IN REHABILITATION (3). Prerequisite, REHAB 200. Introduction to theories, principles and research in small group counseling techniques useful in the treatment of the severely disabled. *Three lecture hours a week, fall, summer.* Wilhelm.
- 216 REHABILITATION COMMUNITY ORGANIZATION (3). Introduction to community based treatment facilities and programs, the identification of rehabilitation community organization, structural, political and economic. *Fall.* Staff.
- 218 LAB—REHABILITATION AND SMALL GROUP BEHAVIOR (2). Prerequisite, permission of instructor. The laboratory education model of learning will be used to teach group dynamics from an experimental point of view. Training group theory and practice will be explored through the experiences generated from participation in small group activities. *Fall.* Staff.

- 300 RESEARCH IN REHABILITATION (3). Prerequisites, REHAB 200, 202. An introduction to research methods and models encountered in rehabilitation. Emphasis is on the utilization of research findings in the treatment process. *Three lecture hours a week, spring.* Sakata, Hollingsworth.
- 302 ADVANCED TECHNIQUES IN REHABILITATION COUNSELING (5). Prerequisites, REHAB 200, 202, 210. Emphasizes the refinement of counseling skills and techniques, development of integrated plans and models for rehabilitative intervention. *Five lab hours a week, fall, spring, or summer.* Staff.
- 304 SPECIAL TOPICS IN REHABILITATION (3). Current issues, techniques and research of a topical or short-term nature. May be repeated for credit. *Three seminar hours a week, fall and spring.* Staff.
- 306 PROBLEMS IN REHABILITATION COUNSELING (3). Prerequisites, REHAB 200, 202. Individually guided study or research into a specific area or topic. May be repeated for credit. *Three lab hours a week, fall, spring, or summer.* Staff.
- 308 APPLICATION OF SMALL GROUP THEORY AND INTERVENTION TECHNIQUES IN REHABILITATION (3). Prerequisites, Rehabilitation Counseling 214 or equivalent and permission of instructor. This advanced course is designed to provide the prospective group counselor with a substantial overview of current theory, research and practice in small group intervention. Seminars and experiential learning modules will provide the opportunity for the acquisition of basic leader skills in rehabilitation. *Fall.* Staff.
- 310 INTERNSHIP IN REHABILITATION COUNSELING (9). Prerequisites, REHAB 200, 202, 206, 210, 212. Full-time supervised clinical counseling experience; integrates previous academic and field experiences into working models. *Forty lab hours a week, fall, spring, or summer.* Staff.
- 393 MASTER'S THESIS (3). *Fall, spring, and summer.* Staff.
- 400 GENERAL REGISTRATION (0).

DEPARTMENT OF RELIGION

JOHN VAN SETERS, *Chairman*

Professors

JOHN W. DIXON, JR.	(2)	Religion and Art
GILES B. GUNN	(12)	Religion and Literature, American Cultural and Religious Studies
CHARLES H. LONG	(4)	History of Religion, African Religions, Afro-American Religion
JACK M. SASSON	(9)	Ancient Near Eastern Religions
JOHN H. SCHÜTZ	(10)	Early Christian History and Literature; Religion in the Roman World
JOHN VAN SETERS	(3)	Old Testament Studies

Associate Professors

WILLIAM J. PECK	(6)	Psychology of Religion and History of Western Religious Thought
RUEL W. TYSON, JR.	(13)	Philosophy and Anthropology of Religion; Ethics and Rhetoric

Assistant Professors

DAVID J. HALPERIN	(14)	Judaism in Antiquity
PETER I. KAUFMAN	(16)	History of Christian Traditions; Patristic, Medieval and Reformation Studies
JAMES H. SANFORD	(8)	Far Eastern Religions; Japanese Buddhism
GRANT A. WACKER	(15)	History of Religion in America

Emeritus Professor

ARNOLD SAMUEL NASH

The Department of Religion offers a program of study leading to a Master of Arts degree in Religious Studies. The program provides concentration in the broad areas of comparative and historical studies, biblical studies, and cultural and philosophical studies. The program is designed to acquaint students with a wide range of religious data from religious and cultural traditions that have directly influenced Western culture, as well as those traditions more distant in space and time. Structures of religious communities, history and historiography of religious traditions, texts, monuments, and artifacts are given equal attention as methodological orientation and religious data. For more information write: Director of Graduate Studies, Department of Religion, Saunders Hall, 043A, The University of North Carolina at Chapel Hill, Chapel Hill, N.C. 27514.

The Department also participates with Duke University in a Cooperative Program in Judaic Studies which makes available several courses in Judaica not listed here. Further details are available from the Department office.

Courses for Graduates and Advanced Undergraduates

- 101 ISLAM: AN HISTORICAL INTRODUCTION (History 101) (3). A study of the religion of Islam in the historical context of its growth from the prophecy of Muhammad to an ingredient in a world civilization. *Fall*. Bodman.
- 113 BIBLICAL HEBREW (3 each semester). *Fall and spring*. Staff.
- 114
- 115 INTERMEDIATE CLASSICAL HEBREW (3). Reading in Biblical, *Mishnaic*, and medieval poetry and prose. *Fall*. Sasson, Halperin.
- 116 INTERMEDIATE CLASSICAL HEBREW (3). Continuation of Religion 115. *Spring*. Sasson, Halperin.
- 117 ELEMENTARY AKKADIAN (3 each semester). Prerequisite, permission of the instructor. An introduction to the Cuneiform script and the elements of Akkadian grammar. Selected readings in Old Babylonian (Codex Hammurabi, Atrahasis Epic), and Neo-Assyrian texts (Epic of Creation, Gilgamesh Epic). *On demand. Fall and spring*. Sasson.
- 119 GREEK NEW TESTAMENT (Greek 158) (3). Prerequisite, Greek 22 or equivalent. *On demand*. Schütz, Stadter.
- 121 THE LITERATURE OF THE ANCIENT NEAR EAST (Folklore 141) (3). Prerequisite, permission of the instructor. An examination of Babylonian, Canaanite, Egyptian, Hittite and Sumerian texts from the pre-Biblical era, focusing on representative myths, epics, sagas, songs, proverbs, prophecies and hymns. *Spring*. (Alternate years.) Sasson.
- 123 HEBREW KINGSHIP AND JEWISH MESSIANISM (3). An investigation of Israel's understanding of Kingship will form a background for an inquiry concerning Jewish Messianism, its ideals and manifestations. *Fall or spring*. (Alternate years.) Sasson, Halperin.
- 124 HISTORY-WRITING IN ANCIENT ISRAEL (3). Prerequisite, Religion 21. The course will study the historical tradition in the Old Testament as reflected in the books from Joshua to 2 Kings. *On demand*. Van Seters.
- 125 MOSES, THE MAN AND THE TRADITION (3). Prerequisite, Religion 21. The course will study the formation of the biblical traditions about Moses in Egypt, the exodus and the giving of the law at Sinai. *On demand*. Van Seters.
- 127 PROBLEMS IN EARLY CHRISTIAN LITERATURE AND HISTORY (3). Prerequisite, one of the following: Religion 22, 58, or 59 or permission of the instructor. *Fall*. Schütz.
- 128 PROBLEMS IN THE NEW TESTAMENT AND RABBINIC JUDAISM (3). Uses of the New Testament as a source for the study of Judaism, and the study of Judaism as an aid to understanding the New Testament. *Fall*. (Alternate years.) Halperin and Schütz.
- 129 PROBLEMS IN RABBINIC JUDAISM AND EARLY ISLAM (3). Prerequisite, Religion 24 or 25 or permission of the instructor. Examination of the Jewish element in the background of Islam and of themes developed in the literature of both religions. *Fall*. (Alternate years.) Halperin.
- 132 TOPICS IN MEDIEVAL PHILOSOPHY (Philosophy 152) (3). Consult Philosophy Department. *Spring*. Galligan.

- 133 THE MEDIEVAL CHURCH (History 120) (3). See History 120 for description.
- 134 THE REFORMATION (History 131) (3). See History 131 for description.
- 136 STUDIES IN CHRISTIAN THEOLOGIES AND THEOLOGIANS (3). An investigation of one writer or school in the history of Christian theology as an example of typical methods, positions and problems within that tradition. *Fall or spring*. Kaufman.
- 138 MODERN WESTERN RELIGIOUS THOUGHT (3). Prerequisite, one of the following: Religion 27, 29, 30, 35 or Philosophy 32. Representative themes and approaches in the work of modern Western religious thinkers. *Spring*. Peck, Kaufman.
- 140 STUDIES IN AMERICAN RELIGION (3). Prerequisite, permission of the instructor. A consideration of varying topics from the intellectual, literary, social, and cultural dimensions of American religion. *Fall or spring*. Gunn, Wacker.
- 141 RELIGIOUS ELEMENTS IN THE AMERICAN LITERARY TRADITION (3). Prerequisite, Religion 38 or 68 or permission of the instructor. A study of the tradition of "irregular metaphysics" in American literature from the Puritan period to the present. *Fall*. Gunn.
- 149 RELIGION, IDEOLOGY AND SOCIAL MOVEMENTS IN U.S. HISTORY (History 149) (3). See History 149 for description.
- 150 RELIGIONS OF EAST AFRICA (3). A study of the religions of the East African Sudan. *Spring*. Long.
- 161 SELECTED TOPICS IN THE STUDY OF ASIAN RELIGIONS (3). Prerequisite, permission of the instructor. A close study of selected topics in Buddhist studies. *Fall*. Sanford.
- 163 JUDAISM IN THE SECOND TEMPLE PERIOD (3). Prerequisite, Religion 24 or 25 or permission of the instructor. Exploration of three varieties of Judaism that flourished before the destruction of the Second Temple: Hellenistic Judaism, apocalyptic Judaism, and Judaism of the Dead Sea sect. *Fall*. Halperin.
- 164 JUDAISM IN THE RABBINIC PERIOD (3). Prerequisite, Religion 24 or permission of the instructor. Exploration of Rabbinic Judaism (second through sixth centuries A.D.) and its literature. *Spring*. Halperin.
- 169 MEDIEVAL RELIGIOUS TEXTS (3). Prerequisites, permission of the instructor and reading knowledge of Latin. Readings in one or two major texts in Latin which permit close study of several issues in the development of Christian life and thought during the Middle Ages. *Spring*. Kaufman.
- 176 CHINESE RELIGIOUS AND PHILOSOPHICAL TEXTS: I (3). Prerequisite, permission of the instructor. An introduction to the reading of classical Chinese religio-philosophical texts in the original language. *On demand*. Sanford.
- 177 CHINESE RELIGIOUS AND PHILOSOPHICAL TEXTS: II (3). Prerequisites, Religion 176 and permission of the instructor. An in-depth reading in a single text or tradition of texts. *On demand*. Sanford.
- 180 THE RELIGIOUS IMAGINATION IN THE MEDIEVAL AND MODERN WORLD (3). Prerequisite, Religion 94 or permission of the instructor. A study of the religious imagination as manifested in selected literature from the Middle Ages to the present. *Spring*. Dixon.
- 181 RELIGION AND MODERN ART (Art 155) (3). A study of selected works in modern art, both those that are specifically designated as religious and those that, by reshaping modern sensibility, have created a new religious consciousness. *Fall*. Dixon.
- 182 THE ART OF FLORENCE (Art 156) (3). Prerequisite, Religion (Art) 39 or permission of the instructor. A study of Florentine art from its beginning in the 16th century with primary emphasis on its religious dimensions. *Spring*. Dixon.

- 183 THEORIES OF THE RELIGIOUS IMAGINATION (3). Prerequisite, Religion 94 or permission of the instructor. A consideration of a theory of the constructive imagination and its implication for religion. *Fall or spring*. Dixon.
- 187 PROBLEMS OF METHOD IN THE CULTURAL ANALYSIS OF RELIGIOUS FORMS (3). Prerequisite, permission of the instructor. An examination of selected issues in the theory of interpretation and literary criticism which bear upon the study of religious meaning in cultural materials. *Fall or spring*. Gunn, Tyson.
- 188 OBSERVATION AND INTERPRETATION OF RELIGIOUS ACTION (Anthropology 188, Folklore 188) (3). Prerequisite, permission of the instructor. Exercises (including field work) in learning to read the primary modes of public action in religious traditions: sermons, testimonies, rituals, prayers, etc. Primary focus on construction and interpretation of texts from field observation. *Spring*. Tyson.
- 190 RELIGION AND SOCIETY (Sociology 121) (3). Prerequisite, Sociology 51 or permission of the instructor. Sociological analysis of group beliefs and practices—both traditionally religious and secular—through which fundamental life experiences are given coherence and meaning. *Fall or spring*. Staff.
- 191 RELIGIOUS ETHICS AND ISSUES IN CONTEMPORARY MEDICINE (3). Prerequisite, senior or graduate standing. Examination of religious-ethical dimensions of such issues as the dying patient, organ transplants, abortion, prolongation of life and experimentation on human beings, drawing on theory from the traditional western religions and the social sciences. *Fall or spring*. Churchill.
- 192 INTERPRETATIONS OF AMERICAN RELIGION (3). Prerequisite, permission of the instructor. A study of different ways American and European historians have understood the overall pattern of American Religion. *Fall or spring*. Wacker.
- 193 MYSTICISM (3). Prerequisite, permission of the instructor. Historical and typological study of various mystical traditions. *Fall or spring*. Sanford.
- 195 MYTH, HISTORY AND RELIGION (3). An analysis of these terms in their methodological and descriptive meaning in the study of religion. *Spring*. Long.
- 197 PHILOSOPHICAL PROBLEMS IN THE STUDY OF RELIGIOUS PHENOMENA (3). The problem of intention, or knowledge of other minds, and the study of alien cultures are central issues. *Spring*. Tyson.
- 199 INDEPENDENT STUDY (3). Prerequisites, advanced undergraduate or graduate standing and permission of the instructor. Subject matter will vary with instructor and topic but always be focused on a particular problem or issue. *Fall and spring*. Staff.
- 200 RESEARCH IN RELIGIOUS STUDIES (3). Introduction to history of the study of religion, bibliography, research methodology and problems of interpretation in the study of religious phenomena. *Fall*. Staff.
- 201 RESEARCH IN RELIGIOUS STUDIES (3). Introduction to history of the study of religion, bibliography, research methodology and problems of interpretation in the study of religious phenomena. *Spring*. Staff.
- 220 ADVANCED AKKADIAN (3). Prerequisites, Religion 117-118. Readings in literary, epistolary, and juridical texts. *On demand*. Sasson.
- 222 UGARITIC (3). Prerequisites, Religion 115-116. Readings in the alphabetic texts of Ras Shamra and a study of the elements of Ugaritic grammar. *On demand*. Sasson.
- 224 BIBLICAL ARAMAIC (3). Prerequisites, Religion 115-116. The Aramaic texts of Daniel and Ezra and samples from the Elephantine papyri with a treatment of the elements of Aramaic grammar. *On demand*. Staff.
- 243 THEORIES OF RELIGIOUS EXPERIENCE IN AMERICAN RELIGIOUS THOUGHT (3). Prerequisites, Religion 84 or equivalent and Psychology 28 or equivalent. A study of Jonathan Edwards and William James as pioneers in the psychology of religion, with ancillary attention to Nathaniel Taylor, Charles Finney and H. R. Niebuhr. *Fall or spring*. Peck.

- 300 SEMINAR IN COMPARATIVE AND HISTORICAL STUDIES (3). Topics vary; consult department. *Fall or spring*. Long, Sanford, Kaufman, Peck, Wacker.
- 305 SEMINAR IN BIBLICAL STUDIES (3). Topics vary; consult department. *Fall or spring*. Schütz, Van Seters, Sasson, Halperin.
- 306 HELLENISTIC RELIGIOUS TEXTS IN GREEK (3). Studies in Greek texts drawn from early Christianity, Judaism, and other religions of the Greco-Roman World. *Fall or spring*. (Alternate years.) Schütz.
- 310 SEMINAR IN CULTURAL AND PHILOSOPHICAL STUDIES (3). Topics vary; consult department. *Fall or spring*. Dixon, Gunn, Tyson, Peck.
- 325 READINGS AND RESEARCH (3). Prerequisite, permission of the instructor. *Fall and spring*. Staff.
- 393 MASTER'S THESIS (3 or more). *Fall and spring*. Staff.
- 400 GENERAL REGISTRATION (0).

DEPARTMENT OF ROMANCE LANGUAGES

EDWARD D. MONTGOMERY, *Chairman*

Professors

French

EUGENE H. FALK	(3)	Contemporary French Literature
GEORGE B. DANIEL	(5)	Seventeenth Century French Literature
I. R. STIRLING HAIG II	(6)	Seventeenth and Nineteenth Century French Literature
FREDERICK WRIGHT VOGLER	(7)	Seventeenth Century French Literature
GEORGE MALLARY MASTERS	(8)	French Renaissance
CATHERINE A. MALEY	(11)	Romance Languages

Italian

ALDO D. SCAGLIONE	(12)	Dante and Renaissance Literature
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Portuguese

LAWRENCE A. SHARPE	(28)	Portuguese and Spanish Language and Literature
FRED M. CLARK	(29)	Portuguese Language and Brazilian Literature

Spanish

JUAN B. AVALLE-ARCE	(16)	Medieval and Renaissance Spanish Literature
ALVA V. EBERSOLE	(19)	Spanish Golden Age Literature
LAWRENCE A. SHARPE	(28)	Portuguese and Spanish Language and Literature
MARÍA A. SALGADO	(24)	Contemporary Spanish American and Spanish Literature
PABLO GIL CASADO	(23)	Contemporary Spanish Literature

Arabic

JULIO CORTÉS	(30)	Romance-Arabic Studies
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Associate Professors

French

EDWARD D. MONTGOMERY	(9)	Romance Philology
YVES DE LA QUÉRIÈRE	(10)	French Stylistics and Twentieth Century French Literature
CAROL LYNN SHERMAN	(12)	Eighteenth Century French Literature

Italian

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| ANTONIO ILLIANO | (14) | Modern Italian Literature |
| ENNIO RAO | (15) | Italian Renaissance |

Spanish

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| AUGUSTIN MAISSEN | (22) | Minor Romance Tongues |
| FRANK A. DOMÍNGUEZ | (25) | Medieval Language and Literature |

*Assistant Professors**French*

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| E. JANE BURNS | (33) | Medieval French Literature |
| SIMA N. GODFREY | (35) | Nineteenth Century French Poetry,
Poetics |

Spanish

- | | | |
|-----------------------------|------|--|
| JOSÉ MANUEL POLO DE BERNABÉ | (34) | Nineteenth and Twentieth Century
Spanish Drama and Poetry |
| LARRY D. KING | (36) | Spanish Linguistics |
| ROSA PERELMUTER PEREZ | (37) | Spanish American Literature |

Emeritus Professors

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| STERLING A. STOUDEMIRE | (31) | Sixteenth Century Spanish Drama,
Seventeenth Century Spanish History,
Nineteenth Century Spanish Literature |
| W. L. WILEY | | French Renaissance Literature |
| JACQUES HARDÉ | (1) | Twentieth Century French Literature |
| ALFRED G. ENGSTROM | (2) | Nineteenth-Century French Literature,
Dante |
| WILLIAM A. MCKNIGHT | (18) | Contemporary Spanish Literature |
| EDOUARD MOROT-SIR | (4) | French Thought and Criticism, Seven-
teenth and Twentieth Century French
Literature |
| FRANK M. DUFFEY | (17) | Spanish Phonetics and Civilization |

Requirements for Advanced Degrees

The degree of Master of Arts is offered with concentration in French, Italian, Portuguese (Luso-Brazilian), Spanish, or Spanish-American literature. The program for the M.A. degree is open to students holding the Bachelor of Arts degree or the equivalent, and whose major field of undergraduate study was normally a Romance language and literature. Students are expected to have proficiency in the Romance language and in English upon admission to the program.

The degree of Doctor of Philosophy is offered with concentration in Romance Languages and Literatures; Romance Philology; French, Ital-

ian, Portuguese (Luso-Brazilian), Spanish-American, or Spanish Languages and Literatures.

Teaching experience is an essential part of professional training. Therefore, teaching assistance or lecture instruction equivalent to at least three contact hours a week for two semesters, or until teaching competence is acquired, is required of all doctoral candidates.

Research Facilities

The library is a subscriber to all important periodicals in which space is given either wholly or in part to the Romance languages and literatures. Materials for research are especially rich in Romance linguistics, medieval literature, French literature of the sixteenth, seventeenth, eighteenth, nineteenth, and twentieth centuries; in Spanish literature of the seventeenth and nineteenth centuries and the contemporary period; and in Latin American literature. In Spanish drama a collection of over 30,000 plays offers a wealth of material for research. The reference collection of the general library is unusually good for Romance bibliography and the collections of books in Portuguese and Catalan are also quite important.

CATALAN

Courses for Graduates and Advanced Undergraduates

- 101 INTRODUCTION TO CATALAN (3). Introduction to the Catalan language. Readings. *On demand*. Maissen.

FRENCH

Courses for Graduates and Advanced Undergraduates

- 101X ELEMENTARY FRENCH FOR GRADUATE STUDENTS (3). These courses prepare the student to meet the reading knowledge requirement for graduate degrees. Passing the examination at the end of 102X will certify that this requirement has been satisfied. *Three hours a week, fall and spring*. Staff.
- 102X
- 126 HISTORY OF THE FRENCH LANGUAGE (3). Prerequisites, French 60, 61, 62, or equivalent. *Spring*. (1983 and alternate years.) Montgomery, Burns.
- 145 FRENCH PHONETICS (3). Prerequisite, French 51 or equivalent. The theory and practice of the production of the speech sounds of modern standard French. *Lecture, discussion, and laboratory*. *Fall*. Maley, Daniel.
- 146 STRUCTURE OF FRENCH (3). Prerequisite, proficiency in French language. Designed to acquaint students with the phonology, morphology, syntax, and semantics of modern standard French and with theories of modern grammar. *Fall*. Maley.

Courses for Graduates

- 201 SURVEY OF FRENCH LITERATURE FROM THE MIDDLE AGES THROUGH THE SEVENTEENTH CENTURY (3). A survey course in French literature emphasizing the French graduate reading list. Taught in French. *Fall*. *On demand*. Staff.

- 202 SURVEY OF FRENCH LITERATURE FROM THE EARLY EIGHTEENTH CENTURY TO THE PRESENT (3). A continuation of French 201. Taught in French. *Spring. On demand. Staff.*
- 203 ADVANCED COMPOSITION FOR GRADUATE STUDENTS (3). Review of advanced grammar. Exercises in translation from English into French of literary and critical materials. Free composition and training in the use of stylistic devices. *Fall. de la Quérière, Sherman.*
- 205 FRENCH PROSEMINAR (3). An introduction to scholarly methodology, bibliography, and applied criticism. *Spring. Haig.*
- 211 FRENCH NOVELISTS OF THE TWENTIETH CENTURY (3). A study of the novels of Proust, Gide, Malraux, Bernanos, Sartre, etc. The topics may change from year to year. *Spring. (1981 and alternate years.) Falk, Morot-Sir.*
- 212 FRENCH POETS OF THE TWENTIETH CENTURY (3). A study of the poetry of Claudel, Valéry, Péguy, and the major Surrealists. *Spring. (1984 and alternate years.) de la Quérière.*
- 213 MASTERS OF TWENTIETH CENTURY LITERATURE (3). This course will deal with the works of a single major author of twentieth century French literature. *Fall. (1982 and alternate years.) Falk, Morot-Sir, de la Quérière.*
- 214 FRENCH DRAMA OF THE TWENTIETH CENTURY (3). A study of the theatre of Claudel, Giraudoux, Anouilh, Montherlant, Sartre, and the New Theatre. The topics may change from year to year. *Fall. (1983 and alternate years.) Morot-Sir.*
- 221 OLD FRENCH (3). An introductory course designed to enable students to read medieval texts with rapidity and accuracy. Phonology, morphology, semantics, and syntax. *Fall. Montgomery.*
- 222 OLD FRENCH LITERATURE (3). Exploration of approaches to major genres through examination of representative works: hagiographic, epic, romance, *lai, fabliau, conte.* *Spring. Montgomery, Burns.*
- 233 THE FRENCH MEDIEVAL DRAMA (3). A survey of the medieval religious and comic theatre in France from its origins to 1548. *Spring. (1984 and alternate years.) Montgomery, Burns.*
- 234 THE FRENCH CLASSICAL THEATRE (3). After surveying the Greek and Roman backgrounds, this course covers French classical drama, its Renaissance origins, golden age (Corneille, Racine, Molière, et al.), and decline (Crébillon *père* and Voltaire). *Fall. (1983 and alternate years.) Daniel, Vogler.*
- 235 DEVELOPMENTS IN POST-CLASSICAL FRENCH DRAMA (3). A study of the genre from Marivaux to the end of the nineteenth century. *Spring. (1984 and alternate years.) Sherman.*
- 236 FRENCH STYLISTICS (3). A theoretical and practical approach to the study of style. *Spring. de la Quérière.*
- 237 LITERARY CRITICISM IN FRANCE (3). A study of literary doctrines from the Renaissance to the present. *Fall. (1984 and alternate years.) Falk.*
- 238 STRUCTURES AND EVOLUTION OF FRENCH THOUGHT IN ITS RELATION TO LITERATURE I (3). The Greco-Latin heritage, Descartes and Cartesianism, in relation with the empiricist movement. The Enlightenment and the European scene. Jean-Jacques Rousseau and the ideologies of the French Revolution. *Fall. (1983 and alternate years.) Morot-Sir.*
- 239 FRENCH THOUGHT FROM THE NINETEENTH CENTURY TO THE PRESENT II (3). Idealism and Romanticism; Hegel in France; socialism and utopias; Auguste Comte, Karl Marx; science and European epistemologies; existentialism and phenomenology; Bergson, Teilhard de Chardin; human sciences and structuralism. *Spring. (1984 and alternate years.) Morot-Sir. Fall.*
- 248 FRENCH LITERATURE OF THE FOURTEENTH AND FIFTEENTH CENTURIES (3). A study of literary trends with emphasis on the rise of the prose *nouvelle*

- and lyric poetry from Machaut through Villon. *Spring*. (1983 and alternate years.) Montgomery.
- 265 RABELAIS AND THE "ÉCOLE MAROTIQUE": EARLY RENAISSANCE HUMANISM AND REFORM (3). A critical historical study of the literary works of Rabelais and the poetic movement associated with Clément Marot in the perspective of early Renaissance humanism and Calvinism. *Fall*. (1983 and alternate years.) Masters.
- 267 FRENCH RENAISSANCE POETRY: ÉCOLE LYONNAISE AND PLÉIADE (3). A study of Scève, Pernette du Guillele, and Louisé Labé and the poetry (epic, theatrical, scientific, lyric) and prose of the ten members of the Pléiade. *Spring*. (1984 and alternate years.) Masters.
- 268 MONTAIGNE AND HIS AGE: PROLEGOMENA TO THE BAROQUE (3). Montaigne's *Essais* in the perspective of the political writings of La Boétie; Amyot's translations; the early Baroque as seen in the works of Desportes and D'Aubigné. *Fall*. (1984 and alternate years.) Masters.
- 271 FRENCH PROSE FICTION OF THE SEVENTEENTH CENTURY (3). A study of the development of prose fiction principally through the works of D'Urfé, Cyrano de Bergerac, Sorel, Scarron, Furetière, Perrault, and Mme. de La Fayette. *Fall*. (1984 and alternate years.) Daniel, Vogler.
- 272 FRENCH POETRY OF THE SEVENTEENTH CENTURY (3). French poetry from Desportes through Racan emphasizing *poésie précieuse et galante, religieuse, pastorale, officielle, libertine, and satirique*. In addition to Desportes and Racan, works of Chassignet, Sponde, La Ceppède, Malherbe, Saint-Amant. Théophile de Viau, Maynard, and Régnier will be considered. *Spring*. (1983 and alternate years.) Daniel, Vogler.
- 273 MASTERS OF SEVENTEENTH CENTURY LITERATURE (3). This course deals with the works of a single major author of seventeenth century French literature. *Fall*. (1983 and alternate years.) Vogler, Daniel, Haig, Morot-Sir.
- 274 THE MORALISTS (3). A study of the works of Pascal, La Rochefoucauld, Bossuet, La Bruyère and La Fontaine. *Spring*. (1983 and alternate years.) Vogler, Daniel.
- 281 MASTERS OF EIGHTEENTH-CENTURY PROSE FICTION (3). An array of novelists and *conteurs* such as Prévost, Lesage, Marivaux, Laclous, Crébillon *fils*, Montesquieu, Diderot, Rousseau, and others. *Spring*. (1983 and alternate years.) Sherman.
- 283 MASTERS OF EIGHTEENTH-CENTURY LITERATURE (3). Intensive study of a major eighteenth-century writer. *Fall*. Sherman.
- 284 THE "PHILOSOPHIES" (3). Intellectual currents (religious, scientific, epistemological) and morals as reflected in such writers as Bayle, la Mettrie, Condillac, Helvétius, d'Holbach, the Encyclopedists, and others. *On demand*. Sherman.
- 291 THE FRENCH ROMANTIC NOVEL (3). A study of major novelists of French Romanticism. *Fall*. (1983 and alternate years.) Haig.
- 292 FRENCH ROMANTIC POETS (3). A study of the major poets of French Romanticism (Lamartine, Hugo, Vigny, Musset, and Nerval). *Spring*. (1984 and alternate years.) Haig, Godfrey.
- 293 MASTERS OF NINETEENTH-CENTURY FRENCH LITERATURE (3). Intensive study of a single major author of the Romantic or Post-Romantic period. The subject will change from year to year among writers in the different literary genres. *Fall*. (1984 and alternate years.) Haig, Godfrey.
- 294 FRENCH PARNASSIAN AND NINETEENTH-CENTURY SYMBOLIST POETS (3). A study of leading precursors and poets of the Parnassian and early Symbolist movements (Gautier, Banville, Baudelaire, Leconte de Lisle, Heredia, Laforgue, Lautréamont, Verlaine, Rimbaud, and Mallarmé). *Spring*. (1984 and alternate years.) Godfrey.

- 295 THRE FRENCH REALISTIC AND NATURALISTIC NOVEL (3). A study of major Realistic and Naturalistic novelists (Flaubert, the Goncourts, Daudet, Zola, Maupassant, and Huysmans). *Fall*. (1984 and alternate years.) Haig.
- 296 FRENCH BRIEF FICTION OF THE NINETEENTH CENTURY (3). A study of the nineteenth-century short story and related forms of brief fiction (Nodier, Mérimée, Balzac, Gautier, Barbey d'Aurevilly, Flaubert, Daudet, Maupassant, Villiers de l'Isle-Adam, et al.) *On demand*. Godfrey.
- 330 SEMINAR (3). Staff.
- 331 THE HISTORY OF FRENCH LITERATURE BEFORE 1300 (3). *On demand*. Montgomery, Burns.
- 340 SPECIAL READINGS (3). Members of the graduate faculty. (Doctoral students only.)
- 393 MASTER'S THESIS (3). Members of the graduate faculty.
- 394 DOCTORAL DISSERTATION (3). Research in a special field under the direction of a member of the graduate faculty.
- 400 GENERAL REGISTRATION (0).

ITALIAN

Courses for Graduates and Advanced Undergraduates

- 101X ELEMENTARY ITALIAN FOR GRADUATE STUDENTS (3). These courses prepare the student to meet the reading knowledge requirement for graduate degrees. Passing the examination at the end of 102X will certify that this requirement has been satisfied. *On demand*. Staff.
- 102X
- 126 HISTORY OF THE ITALIAN LANGUAGE (3). Prerequisites, Italian 15 or 21 and consent of instructor. The evolution of the Italian language as documented in literary texts from the origins to the present. *Spring*. (1984 and alternate years.) Rao.
- 133 DANTE IN ENGLISH TRANSLATION (3). (Not open to undergraduate majors in Italian or to graduate majors or minors in Italian). *Fall*.
- 141 ITALIAN LITERATURE OF THE RENAISSANCE I (3). Prerequisites, Italian 15 or 21 or equivalent. *Fall*. Rao.
- 151 ITALIAN LITERATURE OF THE RENAISSANCE II (3). Prerequisites, Italian 15 or 21 or equivalent. *Spring*. Scaglione, Rao.
- 171 THE AGE OF BAROQUE AND OF ENLIGHTENMENT (1600-1800) (3). Prerequisite, Italian 15 or 21. Major trends and figures of the age: Baroque, Galileo, Marino, Chiabrera, Arcadia, Metastasio and the melodrama; the Enlightenment; G. B. Vico; Goldoni, Parini, Alfieri. *Fall*. (1984 and alternate years.) Illiano.
- 181 ITALIAN ROMANTICISM (3). Prerequisite, Italian 15 or 21. Preromanticism; Alfieri; the lyrics and novels of Foscolo, Leopardi, Manzoni; the Romantic drama from Pindemonte to Niccolini. *Spring*. (1984 and alternate years.) Illiano.
- 194 MODERN ITALIAN POETRY (3). Prerequisite, Italian 15 or 21. The major poets and trends of the late nineteenth and twentieth centuries: Decadenti, Crepuscolari, Futuristi, and Ermetici. *Fall*. (1983 and alternate years.) Staff.
- 195 MODERN ITALIAN FICTION (c. 1860 to the present) (3). Prerequisite, Italian 15 or 21. Verga, D'Annunzio, Pirandello, Svevo, Moravia, Pavese, Vittorini, etc. *Fall*. (1984 and alternate years.) Illiano.
- 196 MODERN ITALIAN DRAMA (c. 1860 to the present) (3). Prerequisite, Italian 15 or 21. Neo-Romanticism and Naturalism; I grotteschi; Pirandello; Betti; Italian drama after World War II; Eduardo de Filippo. *Fall*. (1983 and alternate years.) Illiano.

Courses for Graduates

- 201 SURVEY OF ITALIAN LITERATURE I (3). Prerequisite, graduate standing or permission of instructor. *Fall*. Scaglione, Rao.
- 202 SURVEY OF ITALIAN LITERATURE II (3). Prerequisite, graduate standing or permission of instructor. *Spring*. Illiano.
- 205 PROSEMINAR (3). An introduction to methodology and bibliography—modern Italian literary criticism and exercises in applied criticism. *On demand*. Staff.
- 221 OLD ITALIAN (3). An introduction to the historical development of Old Italian, Sardinian, and Dalmatian. Survey of major dialectal areas. *Fall*. (1983 and alternate years.) Montgomery.
- 222 HISTORICAL ITALIAN GRAMMAR (3). The development from Latin of Italian linguistic structures. *On demand*. Staff.
- 231 DANTE I (3). Prerequisite, graduate standing or consent of instructor. *Fall*. Scaglione.
- 232 DANTE II (3). Prerequisite, Italian 231. *Spring*. Scaglione.
- 245 THE ITALIAN TRECENTO: PETRARCH AND BOCCACCIO (3). *Fall*. (1983 and alternate years.) Scaglione.
- 330 SEMINAR (3). Staff.
- 340 SPECIAL READINGS (3). Members of the graduate faculty.
- 393 MASTER'S THESIS (3). Members of the graduate faculty.
- 394 DOCTORAL DISSERTATION (3). Research in a special field under the direction of a member of the graduate faculty.
- 400 GENERAL REGISTRATION (0).

PORTUGUESE

Courses for Graduates and Advanced Undergraduates

- 101 SURVEY OF PORTUGUESE LITERATURE I (3). Prerequisites, Portuguese 4, 15, or equivalent. An introduction to Portuguese literature from its origin through the eighteenth century. *Fall*. (1984 and alternate years.) Sharpe.
- 102 SURVEY OF PORTUGUESE LITERATURE II (3). Prerequisites, Portuguese 4, 15, or equivalent. A survey of Portuguese literature of the nineteenth and twentieth centuries. *Spring*. (1983 and alternate years.) Sharpe.
- 103 SURVEY OF BRAZILIAN LITERATURE I (3). Prerequisites, Portuguese 4, 15, or equivalent. A survey of Brazilian literature of the colonial period and nineteenth century. *Fall*. (1983 and alternate years.) Clark.
- 104 SURVEY OF BRAZILIAN LITERATURE II (3). Prerequisites, Portuguese 4, 15, or equivalent. A study of major writers of twentieth century Brazilian literature. *Spring*. (1984 and alternate years.) Clark.
- 126 HISTORY OF THE PORTUGUESE LANGUAGE (3). Prerequisites, Portuguese 4, 15, or equivalent, or consent of instructor. Survey of the history of Portuguese with special stress on the characteristics of Brazilian Portuguese and the factors underlying them. *On demand*. Sharpe.
- 135 BRAZILIAN DRAMA (3). Prerequisites, Portuguese 4, 15, or equivalent, or consent of instructor. A study of representative Brazilian plays of the twentieth century with a review of the development of the theatre in Brazil. *Fall*. (1984 and alternate years.) Clark.

Courses for Graduates

- 203 ADVANCED COMPOSITION FOR GRADUATE STUDENTS (3). Advanced grammar with exercises in translation from English into Portuguese. Free composition and training in the use of stylistic devices. *Fall*. Sharpe, Clark.

- 205 LUSO-BRAZILIAN BIBLIOGRAPHY AND METHODOLOGY (3). An introduction to bibliography and methodology in Luso-Brazilian literary and linguistic research. *On demand*. Sharpe, Clark.
- 210 THE PORTUGUESE NOVEL (3). A study of prose fiction, particularly from the nineteenth and twentieth centuries, with special emphasis on Camilo Castelo Branco, Eça de Queirós, Aquilino Ribeiro, Ferreira de Castro, and the *neo-realistas*. *Fall*. (1983 and alternate years.) Sharpe.
- 212 THE BRAZILIAN NOVEL (3). Extensive reading of representative Brazilian novels from the second half of the nineteenth century to the present. *Spring*. (1983 and alternate years.) Clark.
- 213 MACHADO DE ASSIS (3). A study of the prose fiction, drama, poetry, and criticism of Machado de Assis, with reference to other major writers of the second half of the nineteenth century. *Spring*. (1984 and every third year.) Clark.
- 214 MODERN BRAZILIAN SHORT FICTION AND ESSAYS (3). A study of Brazilian short stories, *novelas*, and essays of the twentieth century. *Spring*. (1985 and every third year.) Clark.
- 221 OLD PORTUGUESE (3). A study of Portuguese historical phonology and morphology with readings from medieval verse and prose. *Spring*. (1984 and alternate years.) Sharpe.
- 231 CAMÕES (3). The works of Camões (epic, lyric poetry, and drama) are studied with reference to contemporary Iberian historical and literary background. *Fall*. (1984 and every third year.) Sharpe.
- 291 PORTUGUESE OVERSEAS LANGUAGE AND LITERATURE (3). A survey of the use and characteristics of Portuguese as used in Africa and Asia (especially Cape Verde *crioulo*) and readings from contemporary African authors using Portuguese. *Spring*. (1983 and every third year.) Sharpe.
- 330 SEMINAR IN PORTUGUESE LITERATURE (3). Staff.
- 333 SEMINAR IN LUSO-BRAZILIAN LINGUISTICS (3). Staff.
- 335 SEMINAR IN BRAZILIAN LITERATURE (3). Staff.
- 340 SPECIAL READINGS (3). Member of the graduate faculty.
- 393 MASTER'S THESIS (3). Member of the graduate faculty.
- 394 DOCTORAL DISSERTATION (3). Member of the graduate faculty.
- 400 GENERAL REGISTRATION (0).

ROMANCE

Courses for Graduates

- 220 VULGAR LATIN (3). An investigation of the development of the *sermo plebeius* from its earliest manifestations to its fragmentation into the Romance vernaculars. *Spring*. (1984 and alternate years.) Montgomery.
- 225 PROVENÇAL (3). Linguistic analysis of the *langue d'oc* and investigation of medieval Provençal literature. *Fall*. (1983 and alternate years.) Montgomery, Burns.
- 324 ROMANCE PALEOGRAPHY (3). Study of the development of medieval romance book hands and diplomatics from their origins to the advent of printing; with practical exercises. *Spring*. (1983 and alternate years.) Montgomery.
- 370 MINOR ROMANCE TONGUES (3). Introduction to historical development of Catalan, Rhaeto-Romance, and Rumanian. Readings in period texts. *On demand*. Maissen, Montgomery.
- 371 SEMINAR IN MEDIAN AND MINOR ROMANCE LANGUAGES AND LITERATURES (3). Introduction to Rumanian, Catalan, and Rhaeto-Romance: phonetics, lexicology, and grammar. Readings of linguistic and literary texts. Onomastics and folklore (Rumanian Ballad). *On demand*. Maissen.

RUMANIAN

Courses for Graduates and Advanced Undergraduates

- 101 INTRODUCTION TO RUMANIAN (3). Introduction to the Rumanian language. Readings. *On demand*. Maissen.

SPANISH

Courses for Graduates and Advanced Undergraduates

- 101X ELEMENTARY SPANISH FOR GRADUATE STUDENTS (3). These courses
102X prepare the student to meet the reading knowledge requirement for graduate degrees. Passing the examination at the end of 102X will certify that this requirement has been satisfied. *Three hours a week, fall and spring*. Staff.
- 117 CERVANTES (3). Prerequisites, Spanish 71; 72 or 73. The works of Cervantes, stressing the *Quijote* and the *Novelas ejemplares*, with consideration of background of Renaissance prose (the romances of chivalry, pastoral, sentimental novel.) *Spring*. Avalle-Arce.
- 126 HISTORY OF THE SPANISH LANGUAGE (3). Prerequisites, Spanish 71; 72 or 73. The formation of Castilian and other peninsular dialects and languages, beginning with Vulgar Latin and including Visigothic and Arabic influence. Expansion of the New World. *Spring*. Domínguez, Maissen.
- 135 MODERN SPANISH DRAMA (3). Prerequisites, Spanish 71, 72. A study of plays by principal Spanish dramatists of the twentieth century. *Fall*. (1984 and alternate years.) Polo de Bernabé.
- 145 SPANISH PHONETICS & PHONOLOGY (3). Prerequisite, Spanish 51 or equivalent. The study of sounds as system in American and peninsular Spanish. Attention to practical phonetics according to individual needs. *Spring*. King.
- 146 THE STRUCTURE OF MODERN SPANISH (3). Prerequisite, Spanish 50 or equivalent. Introduction to theories of grammar with a detailed analysis of the semantic and syntactic structure of contemporary Spanish. Attention also given to the application of linguistic theory to the teaching of Spanish. *Fall*. King.

Courses for Graduates

- 201 SURVEY OF SPANISH LITERATURE TO 1700 (3). A survey of significant works and movements from the Middle Ages to 1700. *On demand*. Staff.
- 202 SURVEY OF SPANISH LITERATURE SINCE 1700 (3). A survey of significant works and movements from 1700 to present. *On demand*. Staff.
- 203 ADVANCED COMPOSITION FOR GRADUATE STUDENTS (3). Review of advanced grammar. Exercises in translation from English into Spanish of literary and critical materials. Free composition and training in the use of stylistic devices. *Fall*. Staff.
- 205 HISPANIC BIBLIOGRAPHY AND METHODOLOGY (3). Designed to aid students in preparing term papers, theses, dissertations, with attention to bibliographical guides, problems, and methods of research and scholarly procedures. *Fall*. (1984 and alternate years.) Salgado, Domínguez.
- 209 NONFICTION PROSE OF THE SIXTEENTH AND SEVENTEENTH CENTURIES (3). Consideration of the histories, chronicles, didactic works of the Renaissance and the *Siglo de Oro*, with special emphasis on the literature of exploration. *Fall*. (1983 and alternate years.) Avalle-Arce.

- 210 PROSE OF ROMANTICISM, REALISM, AND THE GENERATION OF 1898 (3). *Fall*. (1983 and alternate years.) Casado.
- 211 CONTEMPORARY NOVEL (3). The novel from the Generation of 1914 to present. *Fall*. (1984 and alternate years.) Casado.
- 213 MEDIEVAL POETRY (3). Major poetic works from the *Poema del Cid* through Jorge Manrique. *Fall*. (1984 and alternate years.) Domínguez.
- 214 GOLDEN AGE POETRY (3). Major poetic works from Garcilaso through Quevedo. *Fall*. (1983 and alternate years.) Domínguez, Pérez.
- 215 POETRY OF ROMANTICISM AND THE GENERATION OF 1898 (3). *Spring*. (1983 and alternate years.) Polo de Bernabé.
- 216 CONTEMPORARY LYRIC POETRY (3). Major poets from the Generation of 1927 to the present. *Spring*. (1984 and alternate years.) Pole de Bernabé.
- 221 OLD SPANISH I (3). *Fall*. Sharpe.
- 222 OLD SPANISH II (3). *Spring*. (1983 and alternate years.) Sharpe.
- 224 MEDIEVAL PROSE (3). Major prose works from Alfonso X to López de Ayala. *Spring*. (1984 and alternate years.) Avalu-Arce.
- 225 GOLDEN AGE PROSE (3). The major prose works of the Golden Age, excluding those of Cervantes. *Fall*. (1984 and alternate years.) Avalu-Arce.
- 229 IDEOLOGICAL FRAMEWORK OF THE GOLDEN AGE (3). An investigation of the phenomena that influenced Golden Age literature: Inquisition, censorship, blood-purity, spiritualism, idea of empire, consciousness of decline, etc. *Spring*. (1983 and alternate years.) Avalu-Arce.
- 231 LOPE DE VEGA AND HIS CONTEMPORARIES (3). *Fall*. (1984 and alternate years.) Ebersole.
- 232 CALDERON AND HIS CONTEMPORARIES (3). *Spring*. (1983 and alternate years.) Ebersole.
- 234 DRAMA OF THE NINETEENTH CENTURY (3). A survey of Spanish drama of the nineteenth century, with particular stress on Spanish Romanticism, the realistic theater of the second half of the century, and the Generation of 98. *Fall*. (1983 and alternate years.) Polo de Bernabé.
- 236 SPANISH STYLISTICS (3). A theoretical and practical approach to the study of style. *Spring*. (1983 and alternate years.) Polo de Bernabé.
- 237 LITERARY CRITICISM IN SPAIN (3). A study of literary doctrines from the Renaissance to the present. *Spring*. (1984 and alternate years.) Ebersole.
- 250 THE EIGHTEENTH CENTURY IN SPAIN (3). Readings from eighteenth-century authors in various genres. *Fall*. (1984 and alternate years.) Ebersole.
- 330 SEMINAR (3). Staff.
- 340 SPECIAL READINGS (3). Member of the graduate faculty (doctoral students only).
- 393 MASTER'S THESIS (3). Member of the graduate faculty.
- 394 DOCTORAL DISSERTATION (3). Member of the graduate faculty.
- 400 GENERAL REGISTRATION (0).

SPANISH AMERICAN

Courses for Graduates and Advanced Undergraduates

- 113 COLONIAL AND NINETEENTH CENTURY SPANISH AMERICAN LITERATURE (3). Prerequisites, Spanish 71, 73. *Fall*. (1984 and alternate years.) Salgado, Pérez.
- 114 MODERNIST AND CONTEMPORARY SPANISH AMERICAN LITERATURE (3). Prerequisites, Spanish 71, 73. *Spring*. Salgado.

Courses for Graduates

- 240 THE NOVEL IN SPANISH AMERICA (3). *Fall.* (1983 and alternate years.) Salgado.
- 241 SPANISH AMERICAN ESSAYS AND SHORT STORIES (3). *Spring.* (1984 and alternate years.) Staff.
- 242 SPANISH AMERICAN POETRY (3). *Spring.* (1983 and alternate years.) Salgado.
- 243 SPANISH AMERICAN THEATRE (3). *Fall.* (1984 and alternate years.) Salgado.
- 335 SEMINAR IN SPANISH AMERICAN LITERATURE (3). *Fall.* Staff.

SEMITICS

(See listings under Linguistics)

Courses for Graduates and Advanced Undergraduates

- 101 ELEMENTARY ARABIC I (3). *Fall.* Cortés.
- 102 ELEMENTARY ARABIC II (3). *Spring.* Cortés.

Courses for Graduates

- 201 ROMANCE-ARABIC STUDIES I (3). *Fall.* Cortés.
- 202 ROMANCE-ARABIC STUDIES II (3). A continuation of Arabic 201. *Spring.* Cortés.

DEPARTMENT OF SLAVIC LANGUAGES

MADELINE G. LEVINE, *Chairman*

Professors

PAUL DEBRECZENY	(2)	Russian Literature
MADELINE G. LEVINE	(4)	Russian and Polish Literature
VASA MIHAILOVICH	(5)	Russian and Serbo-Croatian Literature
JEROME P. SEATON	(8)	Chinese Literature
WALTER VICKERY	(6)	Russian Literature

Associate Professors

LAWRENCE FEINBERG	(3)	Slavic Linguistics, Poetics
VICTOR FRIEDMAN	(7)	Slavic and Balkan Linguistics

The Department of Slavic Languages offers graduate work leading to the degrees of Master of Arts and Doctor of Philosophy. The degree programs meet general requirements of the Graduate School plus certain departmental requirements. The Department also offers courses in Japanese and Chinese at the graduate level, but these do not lead to a graduate degree.

Requirements for the M.A. Degree

For the degree of Master of Arts a student may emphasize either Russian literature or Slavic linguistics:

1) A student wishing to emphasize Russian literature must take at least five courses representing Russian literature from its beginning to the present; at least two courses in Slavic linguistics; and must take outside the Department one course on literary criticism (Comparative Literature 242, Modern Literary Criticism, or another suitable course chosen in consultation with the adviser). The student may take one elective course (3 hours). Students will write and defend a thesis (3 hours). In addition the student is required to satisfy a language requirement in either French or German.

2) A student wishing to emphasize Slavic linguistics must take at least three courses in Slavic linguistics; two courses (one year) in a modern Slavic language other than Russian; and at least two courses in Russian or another Slavic literature. He or she must take at least one course outside the Department in linguistics (normally Linguistics 101, Introduction to Historical and Comparative Linguistics, or Linguistics 120, Introduction to Descriptive Linguistics). The student may take one elective course (3 hours). Students will write and defend a thesis (3 hours). In addition, students are required to satisfy a language requirement in either French or German.

In addition to the above requirements, graduate students will normally be expected to take Russian 111, Advanced Conversation and Composition. Students who obviously are not in need of Russian 111 will be excused from the requirement.

The comprehensive examination covering the student's field of study may be *either* oral *or* written. This is the choice of the candidate. A candidate electing to take a written examination may subsequently, at the discretion of the examination committee, be asked to take an oral examination if the results of his or her written examination indicate to the committee that this would be necessary.

Students are reminded: (1) to acquaint themselves fully with their responsibilities through the reading lists, which are available in the Department; (2) to make sure that thesis topics are acceptable to their examining committee.

Teaching experience is an essential part of professional training. Therefore, teaching assistance instruction equivalent to at least three contact hours a week for one semester is required of all M.A. candidates.

Requirements for the Ph.D. Degree

An admitted candidate must have received an M.A. degree from this University or be able to show that his or her previous studies have provided a knowledge of the Slavic field comparable to that required for the M.A. degree at this University. A student may concentrate in either Russian literature, another Slavic literature, or Slavic linguistics. The candidate in Russian literature must demonstrate a sound knowledge of Russian literature and competence in one other Slavic literature or, in special circumstances, in a non-Slavic European literature. The candidate in a Slavic literature other than Russian must demonstrate a sound knowledge of that literature and competence in Russian literature. The candidate for the doctoral degree with concentration in Slavic linguistics must demonstrate a good working knowledge of Russian, and of one West and one South Slavic language. In addition, all students must satisfy their language requirement in either French or German. All students must write a dissertation based on independent original research.

Teaching experience is an essential part of professional training. Therefore, teaching assistance instruction equivalent to at least three contact hours a week for one semester is required of all Ph.D. candidates.

CZECH

- 101 ELEMENTARY CZECH (3 each). Pronunciation, structure of language, and reading are emphasized. The audio-lingual approach will encourage generating of simple native sentences and thinking in Czech. *Fall and spring*. Staff.
- 103 READINGS IN CZECH LITERATURE (3 each). Prerequisite, Elementary Czech

- 104 101-102 or permission of the instructor. While continuing the study of the language started in Elementary Czech 101-102, this course will provide an introduction to outstanding works in Czech literature. *Fall and spring*. Staff.

POLISH

- 101 ELEMENTARY POLISH (3 each). Pronunciation, structure of language, and reading in modern Polish. *Fall and spring*. Levine.
- 103 READINGS IN POLISH LITERATURE (3 each). Prerequisite, Elementary Polish
- 104 101-102 or permission of the instructor. While continuing the study of the language started in Elementary Polish 101-102, this course will provide an introduction to outstanding works in Polish literature. *Fall and spring*. Levine.
- 111 POLISH LITERATURE (3). Introduction to Polish literature in English translation, focusing on nineteenth- and twentieth-century writers. Some readings in Polish for students who can use the language. *Fall*. Levine.

RUSSIAN

- 101 THE STRUCTURE OF MODERN RUSSIAN (3). Prerequisite, Russian 31. Synchronic phonology, morphology and syntax. *Spring*. Feinberg, Friedman.
- 101X ELEMENTARY RUSSIAN FOR GRADUATE STUDENTS (0). Designed for
- 102X preparation for reading knowledge examination for higher degrees. Passing of 102X will certify that this requirement has been satisfied. *Fall and spring*. Staff.
- 111 ADVANCED RUSSIAN CONVERSATION AND COMPOSITION (3). Prerequisite, Russian 22 or 32, or permission of the instructor. Designed to develop conversational and writing skills in a variety of situations and subjects. Russian used, except for a minimum of linguistic explanations or comments. Staff.
- 112 ADVANCED READING AND LITERARY THEORY (3). Prerequisite, Russian 50 or equivalent. Readings in nineteenth and twentieth century literature. Designed to improve reading ability and to promote understanding of critical methods. For undergraduates, especially majors, and graduates in need of this experience. *Spring*. Vickery.
- 151 PUSHKIN (3). Study of major works. *Fall*. Vickery.
- 162 RUSSIAN POETRY OF THE NINETEENTH CENTURY A(3). Readings and lectures on nineteenth century Russian poetry. Vickery.
- 163 THE RISE OF RUSSIAN PROSE FICTION (3). Prerequisite, Russian 22 or permission of the instructor. Russian prose of the first half of the nineteenth century, especially that of Pushkin, Lermontov, and Gogol. *Spring*. Debreczeny.
- 164 DOSTOEVSKY (3). Study of major works of Dostoevsky and a survey of contemporary authors and literary trends relevant to his creative career. Readings in Russian for majors, in English for non-majors. *Fall*. Debreczeny, Levine.
- 165 CHEKHOV (3). Study of major works of Chekhov and a survey of contemporary authors and literary trends relevant to his creative career. Readings in Russian for majors, in English for non-majors. *Spring*. Debreczeny.
- 168 MASTERPIECES OF SOVIET LITERATURE (3). Prerequisite, Russian 22 or permission of the instructor. A study of outstanding works in Russian literature of the Soviet period, including works by Blok, Zamyatin, Sholokhov, Pasternak, and Solzhenitsyn. Readings in Russian for majors, in English for non-majors. *Fall*. Mihailovich.
- 171 GOGOL (3). Study of major works of N. V. Gogol and a survey of contemporary authors and literary trends relevant to his creative career. Lectures and seminar discussions. Readings in Russian for majors, in English for non-majors. *Fall*. Debreczeny.

- 179 TOLSTOY (3). Study of major works of Tolstoy and a survey of contemporary authors and literary trends relevant to his creative career. Readings in Russian for majors, in English for non-majors. *Spring*. Debreczeny, Levine.
- 192 RUSSIAN VERSIFICATION (3). A study of technical problems and thematic aspects in the development of Russian poetry. *Spring*. Vickery.
- 193 RUSSIAN SHORT STORY (3). Prerequisite, Russian 22 or permission of instructor. Short stories from Pushkin to the present are analyzed both historically and artistically. Readings in Russian. *Spring*. Mihailovich.
- 194 STRUCTURAL ANALYSIS (3). An examination of how attention to verbal structure can deepen our analysis of poetic texts. Analysis of individual Russian poems, combined with extensive reading in formalist/structuralist theory. *Fall*. Feinberg.
- 259 EARLY RUSSIAN LITERATURE TO ABOUT 1700 (3). Literature from the beginning to the Petrine period. Lectures and interpretation of Old Russian texts. Feinberg, Vickery.
- 260 RUSSIAN LITERATURE OF THE EIGHTEENTH CENTURY (3). A survey of leading writers and works of Russian Classicism and the New Sensibility. *Spring*. Vickery.
- 266 RUSSIAN SYMBOLISM (3). Prerequisite, reading knowledge of Russian or permission of instructor. Introduction to the leading writers and works of the Symbolist movement in Russia. Vickery.
- 267 ACMEISM AND FUTURISM (3). A study of major poetic works of Gumilev, Axmatova, Mandel'stam, Majakovskij, and Xlebnikov. Levine.
- 299 HISTORY OF THE RUSSIAN LANGUAGE (3). Elements of phonology, morphology, syntax; reading of Old Russian texts. Feinberg, Friedman.
- 350 SEMINAR IN RUSSIAN LITERATURE (3). Prerequisite, permission of the instructor. Seminar on selected topics in Russian literature. *Spring*. Staff.
- 393 MASTER'S THESIS (3). *Fall and spring*. Staff.
- 394 DOCTORAL DISSERTATION (3 or more). *Fall and spring*. Staff.

SERBO-CROATIAN

- 101 ELEMENTARY SERBO-CROATIAN (3 each). Pronunciation, structure of the language, and reading are emphasized. The audiolingual approach will encourage simple conversation and writing of simple sentences. Mihailovich.
- 102 READINGS IN SERBO-CROATIAN LITERATURE (3 each). Prerequisite, Serbo-Croatian 101-102 or permission of the instructor. While continuing the study of the language started in Serbo-Croatian 101-102, this course will provide an introduction to outstanding works in Serbo-Croatian literature. *Fall and spring*. Mihailovich.

SLAVIC

- 105 INTRODUCTION TO SLAVIC LINGUISTICS (3). Introduction to the sound pattern of Slavic languages from the late Indo-European to the split of the Common Slavic linguistic unity. *Spring*. Feinberg, Friedman.
- 107 STRUCTURE OF A BALKAN LANGUAGE (Linguistics 107) (3). Study of grammar and readings in selected languages. Choice of language based on student interest: Albanian, Bulgarian, Macedonian, Romany, Turkish; also some adjacent languages: Avar, Georgian and Tadjik. *Fall and spring*. Friedman.
- 108 ADVANCED STRUCTURE OF A BALKAN LANGUAGE (Linguistics 108) (3). Continuation of Slavic 107 at a more advanced level. *Fall and spring*. Friedman.
- 112 SOUTH SLAVIC LITERATURES (3). Introduction to the literatures of the South Slavic peoples (chiefly Serbo-Croatian and Bulgarian), with some consideration of their relations to West European literatures. Mihailovich.

- 115 SLAVIC FOLK LITERATURE (Folklore 115) (3). Development of heroic songs. Folk tales, and ballads in various Slavic areas and their influence on the development of written literature. *Spring*. Friedman.
- 125 TOPICS IN SLAVIC LITERATURES (3). Material not presently covered in any course. The specific topic will be announced in advance. Staff.
- 135 PRAGUE SCHOOL STRUCTURALISM (Linguistics 135) (3). Prerequisite, Linguistics 100. Alternate years. Discussion of selected works by Trubetskoj, Jakobson, Mathesius and other scholars associated with the Prague Linguistic Circle. Evaluation of their influence on more recent linguistic trends in Europe and America. Feinberg.
- 207 OLD CHURCH SLAVONIC (3). Elements of phonology, morphology, syntax; reading of Old Slavic texts. *Fall*. Friedman, Feinberg.
- 240 READING COURSE (3 or more). *On demand*. Staff.
- 305 SEMINAR IN SLAVIC LINGUISTICS (3). Selected issues in Slavic synchronic and diachronic linguistics. *On demand*. Staff.
- 393 MASTER'S THESIS (3 or more). Staff.
- 394 DOCTORAL DISSERTATION (3 or more). Staff.
- 400 GENERAL REGISTRATION (0).

CHINESE

- 101 ELEMENTARY CHINESE (3). Introduction to Mandarin Chinese providing instruction in the basic grammar common to both the spoken and written language. Spoken Mandarin will be emphasized and text materials will be in romanization. Five hours per week, three devoted to instruction in grammar and two to oral practice. *Fall*. Seaton.
- 102 ELEMENTARY CHINESE (3). Continued emphasis on spoken Mandarin but with accelerated presentation of characters. The aim is to present a total vocabulary of 300 characters by the end of the term. Five hours per week, three devoted to grammar and two to oral practice and drill in the writing of characters. *Spring*. Seaton.
- 103 INTERMEDIATE CHINESE (3 each). Prerequisite, Elementary Chinese or permission of instructor. Second year level of study of grammar of spoken language and written vernacular. Emphasis on reading and writing of characters. *Fall and spring*. Seaton.
- 110 ADVANCED CHINESE (3). Prerequisite, Intermediate Chinese or permission of instructor. Advanced readings in Chinese. Three hours per week. *Fall and spring*. Seaton.
- 115 TOPICS IN CHINESE LITERATURE AND LANGUAGE (3). Prerequisites, Chinese 111 or permission of instructor. Directed readings in Chinese literature and language on topics not covered by scheduled courses. *Fall and spring*. Seaton.
- 120 LITERARY CHINESE (3 each). An introduction to the literary language of the Chinese classics. *Fall and spring*. Seaton.
- 143 CHINESE LITERATURE IN TRANSLATION (3). A survey of Chinese literature from the classic period to the modern period. *Fall*. Seaton.
- 144 CHINESE LITERATURE IN TRANSLATION (3). Selected topics in Chinese literature concentrating on one period or one genre. *Spring*. Seaton.

JAPANESE

- 101 ELEMENTARY JAPANESE (3 each). Introduction to Modern Japanese with text materials. Hiragana and Katakana scripts will be used and a limited number of kanji will be introduced. Three hours per week devoted to grammar and drill. *Fall and spring*. Higuchi.

- 103 INTERMEDIATE JAPANESE (3 each). Prerequisite, Elementary Japanese or permission of instructor. Continued study of grammar and introduction of 400 basic kanji. *Fall and spring*. Higuchi.
- 104
- 105 ADVANCED JAPANESE (3). Prerequisite, Japanese 104 or equivalent. Readings in Japanese language and literature for students who learned more than 400 *kanji*. Discussions from readings and other materials and creative writing will also take place. *Fall*. Higuchi.
- 106 ADVANCED JAPANESE (3). Prerequisite, Japanese 105 or equivalent. Readings in Japanese language and literature for students who learned more than 700 basic *kanji*. Discussions from readings and creative writing will also take place. *Spring*. Higuchi.
- 115 TOPICS IN JAPANESE LANGUAGES AND LITERATURE (3). Prerequisite, Japanese 103 or equivalent. Readings in Japanese language and literature not covered by existing courses. This course may be taken more than once for credit. Permission of instructor required. *Fall and spring*. Higuchi.

SCHOOL OF SOCIAL WORK

JOHN B. TURNER, *Dean*

Professors

- | | | |
|----------------------|------|---|
| PHILIP W. COOKE | (5) | Planning and Administration, Training and Organizational Development, Marriage Counseling |
| ANDREW W. DOBELSTEIN | (7) | Local Political Systems, Aging, Social Welfare Policy |
| MAEDA J. GALINSKY | (12) | Social Group Work, Research, Public Welfare Practice |
| JANE H. PFOUTS | (28) | Family Theory, Childhood Socialization, Family Research |
| MORTON I. TEICHER | (32) | Social Policy, Administration, Social Planning |
| JOHN B. TURNER | (33) | Community Organization, Organizational Development, Urban Social Policy |

Associate Professors

- | | | |
|-------------------------|------|--|
| MORRIS H. COHEN | (4) | Community Organization, Community Development, Social Planning |
| S. RACHEL DEDMON | (38) | Mental Health Practice, Human Behavior, Staff Development |
| H. CARLISLE HENLEY, JR. | (18) | Research, Public Health, Child Welfare |
| ALBERT L. JOHNSON | (20) | Management of Service Organizations, Epidemiologic Research, Health Policy |
| AUDREYE E. JOHNSON | (47) | Social Welfare Policy, Ethnicity, Health |
| RICHARD H. UHLIG | (34) | Research, Social Planning, Urban Studies |
| REGINALD O. YORK | (41) | Administration, Child Welfare, Social Planning |

Assistant Professors

- | | | |
|-----------------------|------|--|
| PETER J. JOHNSON | (79) | Community Mental Health, Social Work Practice Theory, Research |
| ALBERT W. KING | (23) | Family Therapy, Suicidology, Crisis Intervention |
| HORTENSE K. MCCLINTON | (26) | Social Casework, Mental Health, Family and Children's Services |
| JANICE H. SCHOPLER | (31) | Social Group Work, Child Welfare, Social Work Practice Theory |

Lecturers

- | | | |
|-------------------|------|--|
| DOROTHY N. GAMBLE | (64) | Community Organization, Community Development in Cross-cultural Perspective, Social Action |
| GEORGE R. GAMBLE | (75) | International Community Development, Applied Anthropology, Social Research |

ELAINE L. GOOLSBY	(15)	Developmental Disabilities
ROGER A. HARDISTER	(53)	Social Planning, Social Administration, Staff Development
HANSEL H. HOLLINGSWORTH	(19)	Social Group Work, Group Dynamics, Child Welfare
ERWIN H. PLUMER	(29)	Consultation, Social Casework, Group Child Care
EDWARD B. RICE	(62)	Juvenile Justice, Institutional Administra- tion and Management, Institutional Treatment
CLIFFORD W. SANFORD	(30)	Child Welfare, Consultation, Staff Training
WILLIAM G. SAUR	(63)	Clinical Social Work, Marriage and Family, Developmental Disabilities
PATRICIA B. SIPP	(54)	Child Welfare, Public Health, Staff Training
SARAH H. SMITH	(71)	Mental Health, Development of Minority Content in Social Work Curriculum
J. ANN SULLIVAN	(80)	Child Welfare, Consultation, Staff Training
LARRY A. WEESE	(76)	Consultation, Group Child Care, Child Welfare

Assistant Professor Emerita

ALSI C. ROBINETTE

The School of Social Work offers a curriculum leading to the Master of Social Work degree in two curriculum areas—Services to Individuals, Families and Small Groups (Direct Services) and Organizational and Community Services (Indirect Services). The educational plan of each student includes classroom and practicum experience.

Admission is based on an evaluation of the applicant's transcripts, references, written statement of interests in the field, graduate record examination scores, and readiness to undertake graduate professional education. A personal interview may be required. The applicant must have received a bachelor's degree from a college or university, preferably with substantial preparation in the social sciences and humanities. The student deficient in these requirements may be required to remove the deficiencies before being eligible for admission to the School.

The School operates an off-campus program, offered at selected sites within the state, in which the first year of graduate professional education may be taken on a part-time basis over two successive academic years. Admission to these programs is granted on the same bases as admission for on-campus study. Upon completion of the off-campus program, the student attends the on-campus program to complete the degree as a full time student.

The normal time period for the degree is four semesters. However, graduates of undergraduate social work programs which are accredited by

the Council on Social Work Education, who meet specific course requirements, and who graduated no more than three years prior to the initial registration in the School of Social Work are eligible to apply for a limited number of advanced standing positions in the Direct Services concentration—Services to Individuals, Families and Small Groups. The undergraduate major work is considered equivalent to the first year of graduate study.

Further information in a separate bulletin may be secured from the School of Social Work.

Courses for Graduates and Advanced Undergraduates

- 100 PERSPECTIVES ON HUMAN BEHAVIOR AND SOCIAL ENVIRONMENT I (3). Examination of selected perspectives and theories about the nature of man and society with focus on the assumptions underlying these perspectives and the implication of each for an understanding of social functioning and social work practice. McClinton.
- 101 FOUNDATIONS OF SOCIAL WELFARE AND SOCIAL WORK (3). This course offers an introduction to public welfare policy through lecture and discussion of the purposes public welfare serves, and a description of the most important programs created by those policies. Dobelstein, A. E. Johnson.
- 102 SOCIAL WORK RESEARCH I (3). An overview of the assumptions underlying scientific methods and the applicability of various research designs in either developing knowledge relative to some problem area or in assessing the results of various intervention strategies applied by social workers. Henley, Uhlig.
- 105 DEVELOPMENTALLY HANDICAPPED CHILDREN AND THEIR FAMILIES: AN INTERDISCIPLINARY APPROACH (Physical Therapy 105) (Maternal and Child Health 105) (3). Provides content of the range and complexities of developmental disabilities; presents a model of interdisciplinary diagnosis and management of developmentally disabled children and their families. Knobeloch and DDDL staff.
- 105L LABORATORY FOR 105 (1).
- 106 RACISM: IMPLICATIONS FOR HUMAN SERVICES (Human Services Administration 106) (3). An examination of the forces of racism on individuals, groups, and institutions and an exploration of these forces in the context of implications for practice in the human services professions. A. E. Johnson, McClinton.
- 140 SUICIDOLOGY AND CRISIS INTERVENTION (3). A study of suicide and self-destructive behavior within the contexts of cultural attitudes, psycho-social environments, historical/philosophical/legal perspectives, epidemiologic and demographic variables, theory and dynamics, clinical management, and research. King.
- 150 SYNERGETICS (3). A series of laboratory-seminar sessions designed to develop synergetic solutions to personal, group, and social conflicts through application of the theory, techniques, and methods of synergetics. A. L. Johnson, N. A. Coulter, Jr.

Courses for Graduates

- 200 PERSPECTIVES ON HUMAN BEHAVIOR AND SOCIAL ENVIRONMENT II (2). Prerequisite, Social Work 100. A study of the life cycle from prenatal life through old age with emphasis on maturational crises and their relevance to social service intervention, using the perspective of Erik Erikson as a framework. McClinton.

- 201 FOUNDATIONS OF SOCIAL WELFARE AND SOCIAL WORK II (3). Prerequisite, Social Work 101. A study of significant contemporary social welfare policies and the effectiveness of social service programs administered under those policies. Dobelstein, A. E. Johnson.
- 205 HUMAN VALUES AND SOCIAL PROBLEMS (3). A consideration of the nature of human values, personal and professional, as a factor in shaping human behavior and in the definition and selection of approaches toward the resolution of social problems.
- 206 WOMEN IN SOCIAL WORK: PRACTITIONERS AND CLIENTS (3). An examination of theory and research concerning the participation of women as social work practitioners and as clients of the helping professions including implications for the organizational and delivery service and social policy.
- 220 SOCIAL WORK PRACTICUM I (4). A practicum for students to provide opportunities to learn beginning practice skills and to identify and critically appraise the social worker's operational activities within the context of organizations and systems designed to meet human need. All day Tuesday and Thursday in the first semester for Concentration A and in the second semester for Concentration B. Special Fee: \$150. Staff.
- 221 SOCIAL WORK PRACTICUM II (4-6). Prerequisite, successful completion of Practicum I. The student becomes directly engaged in the providing of professional services and is involved in translating theory into practice and learning skills appropriate to the learning objectives of the chosen concentration. All day Tuesday and Thursday in the second semester for Concentration A and all day Monday, Wednesday, and Friday in the third semester for Concentration B. Special Fee: \$150. Staff.
- 222 SOCIAL WORK PRACTICUM III (6). Prerequisites, Social Work 220 and 221. A second year practicum to provide students with the opportunity to further develop practice skills in the area of the concentration and provide opportunities to apply these skills and knowledge to a specialized area. All day Monday, Wednesday, and Friday in the third semester for Concentration A and in the fourth semester for Concentration B. Special Fee: \$150. Staff.
- 223 SOCIAL WORK PRACTICUM IV (6). Prerequisites, Social Work 220, 221, 222. Final practicum offering the student in-depth development, integration, and reinforcement of confidence through performance in his or her specialized area. All day Monday, Wednesday, and Friday in the fourth semester for Concentration A. Special Fee: \$150. Staff.
- 225 THEORETICAL BASES FOR SERVICES TO INDIVIDUALS, FAMILIES AND SMALL GROUPS (3). A conceptual framework of practice issues and tasks is presented and used to analyze selected models and approaches of service delivery to client systems. Galinsky, Hollingsworth.
- 226 SOCIAL WORK SERVICES TO FAMILIES (3). With a focus on the family as the unit of social work treatment, this course introduces the student to the theory and practice of family therapy and places emphasis on patterns of family communication and interaction. Hollingsworth, King, McClinton.
- 227 SOCIAL WORK SERVICES TO INDIVIDUALS (3). A course in the helping process of working with individuals, applying selected theories to the differential assessment, goal setting, and interventive strategies related to problems of increasing complexity. P. Johnson.
- 228 SOCIAL WORK WITH GROUPS (3). A course designed to give students a theoretical and practical foundation in the methods of social group work practice. Examination of group work models and application to student experience. Galinsky, Hollingsworth, Schopler.

- 229 PRINCIPLES AND PROBLEMS OF AGENCY CHILD CARE (3). An examination of process, structure and principles involved in caring for children away from their own homes, such as in foster family, group and part-time care, placement for adoption, counseling, and protective services. Schopler.
- 230 PSYCHOPATHOLOGY OF HUMAN BEHAVIOR (3). A course designed to engage students in a study of psychosocial behaviors which are considered maladaptive in today's American society. Dedmon, Saur.
- 231 PERSPECTIVES ON THE FAMILY (3). An examination of the strengths and weaknesses of the family as an institution and as a small group, with particular interest on social work practice issues. Pfouts.
- 232 SMALL GROUP THEORY (3). Selected concepts from small group theory as a basis for social work practice. Hollingsworth, Cooke.
- 233 MAJOR PROBLEMS OF FAMILY FUNCTIONING (3). Using the dual perspectives of family dynamics and social policy, this course explores the effect on individual family members and on the family as a unit, of serious family crises resulting from inadequacies in structure, income, health, and behavior. Pfouts, Schopler.
- 240 BIOLOGICAL PROCESSES AND INTERVENTIVE STRATEGIES (3). An overview of human developmental processes from conception to death with particular emphasis upon prevalent pathologies and therapeutic related strategies at each developmental phase. Goolsby, A. L. Johnson.
- 241 SOCIAL COMPONENTS OF HEALTH CARE (3). The course develops avenues of investigation regarding societal changes causing altered morbidity/mortality patterns, the major features of proposed health systems for this country, and the most likely health policies in the years ahead. A. L. Johnson.
- 242 APPLICATION OF SOCIO-BEHAVIORAL TECHNIQUES TO SOCIAL WORK PRACTICE (3). An examination of socio-behavioral techniques appropriate for application to social work practice, particularly in each student's field experience. Schopler.
- 243 MARRIAGE COUNSELING (3). A clinical seminar which analyzes the operations and character of marriage counseling as a human service technique. P. Johnson.
- 244 MENTAL RETARDATION AND SOCIAL WORK (3). An examination of mental retardation as an individual and social problem from various perspectives; definition, epidemiology, historical trends, behavioral functioning, impact on family/community, and the role of social work in service delivery.
- 245 MENTAL HEALTH METHODS (3). Prerequisites, Sowo 227 and 230. Seminar for student clinicians to provide opportunities to build on an individual/group method base and to examine, in depth, specific therapeutic procedures appropriate for clients of mental health services. Dedmon, P. Johnson, Saur.
- 246 DIRECT PRACTICE WITH OLDER ADULTS (3). The course offers content in biopsychosocial aspects of aging, some physical/mental/social problems experienced by the older adult, and examination of helping principles and techniques appropriate for work with the older adult. Staff.
- 247 SOCIAL WORK PRACTICE IN HEALTH (3). An examination of the role and contribution of social work in providing direct service in health care in both in-patient and out-patient settings. A. E. Johnson.
- 250 THEORETICAL BASES FOR SERVICES TO LARGER GROUPS, COMMUNITIES, AND INSTITUTIONAL SYSTEMS (3). A variety of concepts of community and its functioning are reviewed, the major principles on which community work is based are examined, and the knowledge required to participate effectively as a professional in community planning and problem-solving is identified. Cohen, D. Gamble.

- 251 CITIZEN PARTICIPATION AND GRASS ROOTS ORGANIZATION (3). A course in which the roles of the social worker in facilitating citizen participation and in the development of grass roots organizations for problem solving, community action, and improvement are analyzed and methods for practice are identified. Cohen.
- 252 PLANNING AND COORDINATING FOR PROBLEM SOLVING AND SERVICE DELIVERY (3). A review of agencies engaged in planning, coordinating, and interorganizational functions; an examination of theories, perspectives and procedures in social planning; and an identification of knowledge and skills necessary to problem solution. Cohen.
- 260 POLITICS OF SOCIAL PROGRAM ADMINISTRATION (3). An exploration of the constraints on local program administration as a result of contemporary issues and innovations in local governance and of the effects of these constraints on the delivery of social services. Staff.
- 275 DESIGN, MANAGEMENT, AND EVALUATION OF SERVICE ORGANIZATIONS (3). The focus is on forces influencing the design and operation of service organizations as distinct from production and/or regulatory organizations. Attention is paid to bureaucracies and bureaucrats as inhibitors of human development. A. L. Johnson.
- 276 PRINCIPLES AND PRACTICE OF ADMINISTRATION (3). The student is expected to acquire basic diagnostic and problem solving skills in administration through the examination of organizational ideology, behavior in organizations, and the functions of the manager. York.
- 277 HUMAN SERVICE SUPERVISION (3). Tasks, functions, and processes of middle management in human service enterprises are examined in the context of contemporary organizations. Emphasis is given to the role and tasks of the line managers. Cooke.
- 278 TRAINING AND ORGANIZATIONAL DEVELOPMENT (3). Principles of program planning and administration are applied to developmental efforts aimed at human resources and organizations. Training is examined as a way to influence the functioning and performance of agencies/organizations. Cooke.
- 280 INTRODUCTION TO CONCEPTS AND PROGRAMMING FOR COMMUNITY MENTAL HEALTH (3). A course designed to provide a comprehensive understanding of the organization and delivery of community mental health services, with an effort to integrate concepts from several other human service disciplines. Smith.
- 281 COMPREHENSIVE PLANNING FOR CHILD AND FAMILY SERVICES (3). Course to develop a framework for analyzing social policy development and program planning for child and family services—public and private.
- 285 ANALYSIS OF INCOME MAINTENANCE SYSTEMS (3). An examination of programs for economic security, including national employment policies, fiscal policies, and income maintenance programs with emphasis on the problem identification and formulation phase of policy making. Cohen.
- 286 ANALYSIS OF SOCIAL SERVICE SYSTEMS (3). Prerequisite, second year standing. This course examines the various systems into which social services are organized and delivered; the problems related to effective planning of service systems; and the economic, social, professional, and racial barriers to service delivery. Turner.
- 287 SOCIAL WORK AND THE LAW (3). An introduction to law designed to provide legal system information, including sources of law, legal process in social service areas, information on due process, and attitudes of social work and legal professions for each other.
- 288 SOCIAL WORK ADMINISTRATION (3). Problems and principles in the administration of a social agency. Readings, class reports, and discussion.
- 289 LEGISLATIVE PROCESS IN SOCIAL WELFARE (3). Study of selected social welfare issues illustrating ways in which state and national legislative processes make

- their intended and unintended consequences felt on programs and populations. Dobelstein.
- 290 SOCIAL WORK RESEARCH II (3). Designed to explore basic principles, and to provide advanced instruction, in data analysis including the construction and analysis of tables, statistical tests, and introduction to the use of computer programs. Henley.
- 291 PROGRAM PLANNING AND ANALYSIS (3). An introduction to the use of systematic analysis in the planning, programming, budgeting, and evaluation of alternative human service programs within the context of professional accountability. Uhlig, York.
- 300 SEMINAR: STUDIES IN SOCIAL WORK PROCESS (3). The completion of a substantial study, professional in content and manner of presentation, in which the student examines some service problem or area of practice in which there has been personal engagement, such as in field practica, and for which personal learning, experience, and practice can be applied in support of findings. Staff.
- 301 SEMINAR IN ADVANCED PRACTICE (1-6).
- 305 SEMINAR IN HUMAN BEHAVIOR AND SOCIAL ENVIRONMENT (1-6).
- 311 SEMINAR IN SOCIAL POLICY (1-6).
- 315 SEMINAR IN SOCIAL RESEARCH (1-6).
- 325 SEMINAR IN SERVICES TO INDIVIDUALS, FAMILIES AND SMALL GROUPS (1-6).
- 350 SEMINAR IN SERVICES TO LARGER GROUPS, COMMUNITIES AND INSTITUTIONAL SYSTEMS (1-6).
- 375 SEMINAR IN ADMINISTRATION AND PLANNING IN SOCIAL WELFARE (1-6).
- 378 SEMINAR IN SOCIAL WORK SUPERVISION (1-6).
- 400 GENERAL REGISTRATION (0).

DEPARTMENT OF SOCIOLOGY

JOHN D. KASARDA, *Chairman*

Professors

BRUCE K. ECKLAND	(4)	Education, Stratification, Social Biology
JOHN D. KASARDA	(32)	Human Ecology, Urban Sociology, Demography
HENRY A. LANDSBERGER	(11)	Welfare State Problems, Modernization, Social Movements
GERHARD LENSKI	(12)	Societal Evolution, Technology and Social Change
DUNCAN MACRAE, JR.	(13)	Public Policy Analysis, Political Sociology
N. KRISHNAN NAMBOODIRI	(14)	Demography, Research Methods, Statistics
ANTHONY OBERSCHALL	(39)	Social Movements, Social Change
JOHN SHELTON REED	(27)	Regional, Methods, Public Opinion
RICHARD L. SIMPSON	(18)	Occupations, Organizations, Social Organization
J. RICHARD UDRY	(19)	Demography, Family
ROBERT N. WILSON	(24)	Health, Art and Literature

Associate Professors

M. RICHARD CRAMER	(2)	Race Relations, Social Psychology
DARNELL FELIX HAWKINS	(31)	Law, Deviance/Crime, Race Relations
RONALD R. RINDFUSS	(34)	Demography, Social Epidemiology
PETER UHLENBERG	(20)	Demography, Family
JAMES A. WIGGINS	(22)	Social Psychology, Methods, Education

Assistant Professors

CRAIG J. CALHOUN	(35)	Theory, Historical and Comparative, Political
T. ANTHONY JONES	(30)	Modernization, Soviet Society, Historical and Comparative
SHERRYL KLEINMAN	(38)	Social Psychology, Symbolic Interaction, Field Research Methods
PETER V. MARSDEN	(36)	Network Analysis, Stratification, Organizations, Methods
RACHEL ROSENFELD	(40)	Social Stratification, Education, Quantitative Methodology
BARBARA STENROSS	(37)	Law, Economic Development, Social Change

Emeritus Professors

LEONARD S. COTTRELL, JR.
AMOS H. HAWLEY
KATHARINE JOCHER
GUY BENTON JOHNSON
HARVEY L. SMITH
EVERETT K. WILSON

The Department offers the Master of Arts and Doctor of Philosophy degrees in Sociology. Students receive training that will equip them for careers in both teaching and research. All sociology students take basic work in sociological theory, research methods and statistics, and substantive areas. The program emphasizes balanced training and the integration of theory, method, and substantive knowledge. All Ph.D. candidates in sociology who have not had equivalent courses take Sociology 200, 201, 208, 209, 211, or equivalents, plus one elected course in research methods, a minimum of four courses in a major field of concentration, two courses in a minor field of concentration, and two courses selected from 214A, 215A, 216A, 217A, 218A and 219A. All M.A. candidates in sociology take 200, two courses selected from 214A, 215A, 216A, 217A, 218A and 219A, plus one elected course in research methods. Detailed information on graduate degree procedures is given in information brochures available from the Department. For further information, including information about financial aid available to students, inquiries should be directed to the Department's Director of Graduate Studies.

The Department's main concentration of faculty research interest and graduate training are in comparative social organization and societal change, demography and human ecology, social psychology, research methods and social statistics, stratification, complex organizations, and sociology of health and health professions.

A large proportion of first-year, as well as more advanced, students receive financial assistance. Sources of aid include: Teaching Assistantships, Research Assistantships, and a few nonservice fellowships.

The Department works closely with the Institute for Research in Social Science and with the University Computation Center. The Institute maintains a Statistical Laboratory with modern processing equipment for training and research. Computer programming assistance, consultation, and computing services are available without charge for student research. The Department sponsors and edits *Social Forces*, a national sociological journal.

Courses for Graduates and Advanced Undergraduates

- 100 AMERICAN SOCIETY (3). Introduction to institutional sociology with special emphasis on the social organization and culture of the United States. The society as a whole and its different subgroups and institutional spheres are analyzed. Simpson; staff.
- 101 HUMAN SOCIETIES (3). Introduction to comparative sociology. The major types of society that have existed or now exist are analyzed, together with major patterns of social change. Lenski; staff.
- 102 SOCIAL INTERACTION (3). The individual in society. An examination of how people conduct their interactions with others in different kinds of social relationships. Emphasis on the social psychological causes and consequences of such conduct. Wiggins; staff.

- 110 FORMAL ORGANIZATIONS AND BUREAUCRACY (3). Consideration of major theories of organization; research on organizational structures and processes; effects of organizations on the individual and society. Marsden.
- 111 SOCIAL MOVEMENTS AND COLLECTIVE BEHAVIOR (3). Study of non-routine collective actions such as demonstrations, strikes, riots, social movements and revolutions, with an emphasis on recent and contemporary movement. Landsberger, Oberschall.
- 112 SOCIAL STRATIFICATION (3). Analysis of social structure and stratification in terms of class, status, prestige, and rank. Attention to social roles of elites, professionals, the middle class, the working class and to comparative topics. Eckland, Marsden.
- 113 SOCIAL ORGANIZATION IN ECOLOGICAL PERSPECTIVE (3). Examination of how human groups become functionally organized in adapting to changing environmental opportunities and constraints. Special attention is given to the interrelationships among population, social system, technology and environment. Kasarda.
- 114 THE CITY AND URBANIZATION (3). The city as a social, spatial, and political-economic phenomenon in the modern world. Analysis of urban demographic trends, spatial characteristics and economic functions. Substantive topics include segregation, social turmoil, unemployment, fiscal problems, suburbanization and urban public policy. Kasarda.
- 120 THE STATE AND SOCIETY (3). Analysis of the reciprocal influences of state and social organizations upon each other; the social bases of political authority and stability, of revolution and counter-revolution. Stenross.
- 121 RELIGION AND SOCIETY (Religion 190) (3). Sociological analysis of group beliefs and practices—both traditionally religious and secular—through which fundamental life experiences are given coherence and meaning. Reed.
- 122 SOCIOLOGY OF HEALTH (3). A sociological analysis of (1) the social processes affecting conditions of health and disease and (2) the cluster of social relationships and organizations that comprise the institution of medicine. Robert Wilson.
- 123 EDUCATION AND STRATIFICATION (3). A study of theory and research on the educational institution, with emphasis upon the multiple and changing effects of formal education in industrial societies. Eckland.
- 124 SOCIOLOGY OF LAW (3). A sociological analysis of comparative legal systems, the role of law in social change and in shaping social behavior. Topics may include the legal profession; property distribution; and the role of law in achieving racial and sexual justice. Hawkins, Stenross.
- 125 FAMILY AND SOCIETY (3). Comparative analysis of kinship systems and family relations. Courtship, marriage, and parent-child relationships viewed within a life-cycle framework. Udry, Uhlenberg, Wiggins.
- 126 LITERATURE AND SOCIETY (3). An examination of selected modern literary works as social process and aesthetic object. Topics discussed include literary creativity, the writer's social role, and social psychological approaches to the contents of literature. Robert Wilson.
- 130 SOCIOLOGICAL CRIMINOLOGY (3). An analysis of the social construction of crime and delinquency as legal categories, perspectives on causation, and the consequences of variable social reactions to crime and delinquency. Hawkins, Jones.
- 131 AGING (3). The process of aging from birth to death, with a concentration on the later years of life, examined from a broad perspective. Topics include individual change over the life-course, the social context of aging, and the aging of American society. Uhlenberg.
- 132 POPULATION PROBLEMS (Genetics 186) (3). Social and economic causes of population structure and change. Illustrations drawn from developing countries and the less developed regions and sections of the United States. Namboodiri, Rindfuss, Uhlenberg.

- 133 SCIENCE AND POLICY (Political Science 179) (3). Problems of using expert knowledge in democratic policy formation. Questions of communication within scientific disciplines; scientists' values; and use of scientific information and personnel in decision-making. MacRae.
- 134 RACE AND SOCIAL POLICY (3). Explores the links between race relations, economic and social subordination and racial groups, and governmental policy for the U.S. and other multiracial societies. Emphasis on reciprocal relations of legal and governmental institutions and other social institutions. Hawkins.
- 140 SOCIALIZATION (3). Examines how persons become members of groups, communities and organizations. Emphasis on general social psychological principles and concepts of socialization. Calhoun, Kleinman.
- 141 SOCIAL DEVIANCE (3). Examines how people initiate, continue, and end stigmatized behavior; social construction of deviant categories, identities, and careers; the social psychology of labelling deviants. Hawkins, Kleinman.
- 142 OPINIONS, ATTITUDES, AND VALUES (3). The interrelations of ideology, information, attitudes, and behavior. Use of sample surveys in social psychological research and polling. Reed.
- 143 CONFLICT AND AGGRESSION (3). Survey and analysis of various explanations for conflict and aggression at the interpersonal and group levels. Suggestions for control and elimination. Cramer, Wiggins.
- 144 SOCIAL PROCESS IN EDUCATION (3). Examines social influences (e.g., community, school, family, peers) affecting academic performance and attitudes, with particular emphasis on the disadvantaged and the dropout. Wiggins.
- 150 THEORY AND PROBLEMS OF DEVELOPING SOCIETIES (3). Theories concerning the development process (motivational vs. institutional, economic vs. political and social development; similarity of sequential stages and outcomes) will be related to policy problems facing the developing nations. Landsberger.
- 151 WESTERN EUROPEAN SOCIETIES (3). Changes in the social structures of the United Kingdom, West Germany, and France; the growth of the welfare state; the handling of issues such as industrial relations, health, education, income maintenance, environment protection, and urbanization. Landsberger, Oberschall.
- 152 SOVIET SOCIETY (3). Development of social structure in the USSR since 1917. Study of contemporary social groups and institutions, and of the implications of the Soviet experience for theories of modernization. Jones.
- 153 SOCIAL CHANGE IN LATIN AMERICA (3). Introduction to Latin American ideologies and values; economic and demographic changes; major pressure groups (old elites, entrepreneurs, peasants and working classes, military and intellectuals); and relations with the United States. Landsberger.
- 154 AFRICAN SOCIETY (3). Process of change and modernization in Black Africa, especially since World War II. Topics include the European penetration, nationalist movements, immigration and urbanization, economic changes, new forms of stratification, civil strife, and problems of development and state formation. Case studies of selected countries. Oberschall, Stenross.
- 155 SOCIETY AND CHANGE IN MODERN INDIA (3). A range of developmental issues: population change, agrarian reform, labor-intensive productive technology, income distribution, status of women, urbanization, unemployment and underemployment. Careful attention to Indian data. Focus on explanations of slow rates of improvement. Namboodiri.
- 158 COMPARATIVE MINORITY RELATIONS (3). A comparative analysis of dominant-minority group relations. Includes both cultural and racial minorities. Cramer.
- 159 REGIONALISM IN THE MODERN WORLD (3). Overview of "regional sociology" as practiced at the University of North Carolina in the 1930s and 1940s. Contemporary approaches to the sociological study of regions: center and periphery, ethnic/-

- nationalist, cultural geography. Special attention to the United States and the American South, some comparative material. Reed.
- 160 CONTEMPORARY SOCIAL THEORY (3). Prerequisite, Sociology 50. Analysis of current problems in general social theory: action and structure, justice and equity, social change and reproduction. Contrast and evaluation of leading approaches to solutions. Calhoun.
- 171 URBAN PUBLIC POLICY (PUPA 171)(3). Defining and clarifying urban concerns and policies; emphasis on programs to revitalize cities. Issues include migration of people and jobs, housing, unemployment, poverty, crime, fiscal strain; linkages among settlement patterns, economic development strategies, energy and environmental objectives. Kasarda.
- 175 METHODS FOR POLICY ANALYSIS AND EVALUATION (Political Science 175) (3). Introduction to selected techniques such as multiple regression, decision theory, research design, experiments, and quasi-experiments, and program evaluation, as well as policy-related models. MacRae.

Courses for Graduates

- 200 HISTORY OF SOCIAL THOUGHT (3). Prerequisite, graduate standing in Sociology, or written permission of instructor. Historic social ideas of western culture considered against a background of general cultural analysis in terms of systematic theory. Required of all graduate degree candidates in Sociology. Calhoun, Jones.
- 201 CONSTRUCTION OF SOCIAL THEORIES AND MODELS (3). After an examination of social theory from the perspectives of the philosophy of science and the sociology of knowledge, an introduction is provided to principles of theorizing, specification of models, and elementary aspects of empirical testing. Causal theories and models are emphasized. Staff.
- 202 MAJOR SOCIOLOGICAL THEORIES (2-3). Examination of selected writing, concepts, and issues of some major sociological theory or theoretical approach. Staff.
- 203 CURRENT ISSUES IN SOCIAL THEORY (3). An examination of selected recent work of general significance in sociology. Themes will vary. Calhoun; staff.
- 207 MEASUREMENT AND DATA COLLECTION (3). Provides an introduction to measurement theory and a review of various methods of data-gathering. Gaining experience with a variety of techniques of measurement and preparing a pretested research proposal are required for all students. Wiggins.
- 208 MATHEMATICS FOR SOCIOLOGISTS (3). Elements of finite mathematics, matrix algebra, calculus, probability and statistics. Focus is on issues and techniques of value to research sociologists. Uhlenberg.
- 209 STRUCTURAL EQUATION MODELS IN SOCIOLOGY (3). Prerequisite, Sociology 208. Principles of specification, identification, and parameter estimation for structural models. Analytic devices such as regression analysis, factor analysis, two-stage least squares, the Joreskog techniques, and DYNAMO simulations are presented as means of estimating model parameters and as ways of dealing with problems like measurement errors, unmeasured variables, feedback and higher order feedbacks. Marsden.
- 211 ANALYSIS OF CATEGORICAL DATA (3). Prerequisite, permission of instructor. Introduction to techniques and programs for analyzing categorical variables and nonlinear models. Special attention is given to decomposition of complex contingency tables, discriminant function analysis, Markov chains, and nonmetric multidimensional scaling. Namboodiri, Marsden.
- 212 DEMOGRAPHY: THEORY, SUBSTANCE, TECHNIQUES. PART I (3). A basic introduction to the discipline of demography. Materials covered include: population history; data sources; mortality and fertility trends and differentials and techniques of analysis. Namboodiri, Rindfuss, Uhlenberg.

- 213 **DEMOGRAPHY: THEORY, SUBSTANCE, TECHNIQUES. PART II (3).** A continuation of Sociology 212. Materials covered include: population growths; table population theory; migration and distribution; population policy; population estimates and projections. Namboodiri, Rindfuss, Uhlenberg.
- 214A **MARX AND MARXISM (2).** Brief exposition and evaluation of Marx's theory of human nature, societal change and evolution, class, the state, family, and other institutions. Summary of dependency theory and critical theory. Landsberger, Calhoun.
- 214B **SEMINAR ON MARX AND MARXISM (1).** Prerequisite, 214A. Seminar continuation of 214A. Landsberger, Calhoun.
- 215A **EVOLUTIONARY THEORY (2).** Introduction to the new evolutionary theory. Lenski.
- 215B **SEMINAR ON EVOLUTIONARY THEORY (1).** Prerequisite, 215A. Seminar continuation of 215A. Lenski.
- 216A **STRUCTURAL-FUNCTIONALISM (2).** To achieve an understanding of structural-functional analysis, its merits and defects as a mode of conceptualizing social process. Robert Wilson.
- 216B **SEMINAR ON STRUCTURAL-FUNCTIONALISM (1).** Prerequisite, 216A. Seminar continuation of 216A. Robert Wilson.
- 217A **BEHAVIORAL SOCIAL PSYCHOLOGY (2).** An examination of social learning and social exchange theories. In combination with cognitive social psychology provides a review of major social psychological theories. Wiggins.
- 217B **SEMINAR ON BEHAVIORAL SOCIAL PSYCHOLOGY (1).** Prerequisite, 217A. Seminar continuation of 217A. Wiggins.
- 218A **HUMAN ECOLOGY (2).** An examination of how human populations organize themselves in adapting to constantly changing yet restricting environments. Special emphasis on linkages among environment, technology, population, and social structure. Kasarda.
- 218B **SEMINAR ON HUMAN ECOLOGY (1).** Prerequisite, 218A. Seminar continuation of 218A. Kasarda.
- 219A **COGNITIVE SOCIAL PSYCHOLOGY (2).** An examination of symbolic interaction, cognitive consistency, and affect control theories. Together with behavioral social psychology provides a review of major social psychological theories. Staff.
- 219B **SEMINAR OF COGNITIVE SOCIAL PSYCHOLOGY (1).** Prerequisite, 219A. Seminar continuation of 219A. Staff.
- 223 **SOCIAL ATTITUDES (3).** Basic theories and methods in attitude research with special attention to attitude dynamics and social relations. Reed.
- 229 **SOCIAL STRUCTURE AND PERSONALITY (3).** The generic processes by which individuals become members of a society, with emphasis on the influence of social structure on socialization and the patterning of personality. Kleinman.
- 230 **SOCIAL STRATIFICATION (3).** Prerequisite, Sociology 120 or equivalent. Analysis of major theories of social stratification and of relevant evidence from contemporary societies. Special attention to political and economic elites. Lenski, Marsden.
- 234 **SOCIAL MOVEMENTS (3).** The structure and dynamics of social movements and their societal environment, with special reference to socio-political movements of minority and low status groups in industrialized and third world societies. Landsberger, Oberschall.
- 245 **SOCIOLOGY OF ORGANIZATIONS (3).** Prerequisite, permission of instructor. Structural features of organizations. Behavior in organizations. Organizational career patterns. Comparative analysis of structure, behavior, and careers in different types of organizations. Interorganization and organization-environment relations. Simpson.
- 246 **OCCUPATIONS AND PROFESSIONS (3).** Societal roles of occupational groups; types of occupations and work settings as these bear on the structuring of careers;

- interoccupational networks, cooperation, competition; professionalization and de-professionalization. Simpson.
- 253 EXPERIMENTAL DESIGN IN SOCIOLOGY (3). Prerequisite, permission of instructor. Statistical aspects of experimental designs with emphasis on applied problems involved in executing a statistically sound design. *On demand.* Namboodiri.
- 254 SURVEY SAMPLING (3). Prerequisite, permission of instructor. The different sampling techniques are discussed. Major emphasis on planning of large scale sample surveys rather than on statistical theory. *On demand.* Namboodiri.
- 260 HEALTH ORGANIZATIONS AND OCCUPATIONS (3). Considers various treatment settings, socialization and job performance of health workers, patienthood, the relation between organizational structure and effectiveness, and professional self-regulation. Robert Wilson.
- 261 SOCIAL EPIDEMIOLOGY OF CHRONIC AND MENTAL DISEASE (3). Considers differential distribution of health states in population groups, assessment of social psychological precursors of illness, etiology of chronic physical and psychological disorders, and implications of differential risk for preventive strategies in social medicine. Robert Wilson.
- 262 COMMUNITY ORGANIZATION AND HEALTH CARE DELIVERY (3). Study of community health care delivery systems, to include the supply and distribution and medical personnel and facilities, mechanisms of health care financing, role of the consumer in policy formulation, and community power and analysis. Robert Wilson.
- 263 SOCIAL GERONTOLOGY (3). Prerequisite, permission of instructor. The study of the aged in our society. Staff.
- 269 EXPERIMENTAL ANALYSIS OF INTERPERSONAL BEHAVIOR (3). Analysis of social behavior from the perspective of exchange theory and experimental methods. Evaluation of laboratory and field experiments pertaining to interaction, power, conformity, cooperation, aggression, delinquency, education. Design and pretest of experiments. Wiggins.
- 274 SEMINAR IN URBAN SOCIOLOGY (3). Theory and research in the study of the location and growth of urban areas, the effect urban areas have upon behavior, and the study of social behavior in different urban subareas. Each member of the seminar will complete a project interrelating theory and research. Kasarda.
- 287 MIGRATION AND POPULATION DISTRIBUTION (3). Prerequisite, Sociology 186. Treats migration trends, patterns, and differentials and their effects on population distribution in continental and regional areas. Attention is given to theoretical and methodological problems in the study of population movement. *On demand.* Uhlenberg.
- 289 SOCIO-ECONOMIC FACTORS IN FERTILITY (3). Prerequisite, Sociology 186. Fertility differentials by social and economic factors, changes therein over time, the manner in which these factors affect fertility and the implications thereof for fertility control programs will be studied. *On demand.* Namboodiri, Rindfuss.
- 300 TRAINING PROGRAM SEMINARS (1). Continuing seminars in selected topics. Staff.
- 301 READING AND RESEARCH (3 each semester). Registered by permission of instructor. Advanced reading. Library research or field research on a selected topic under guidance of the instructor. Staff.
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- 307 SEMINAR ON POLICY ANALYSIS (Political Science 307) (3). Common normative, political, and behavioral aspects of policy choice in diverse fields, e.g., urban, education, health, welfare, population, and foreign policy. Public policies may modify or replace the market. MacRae.
- 308 SEMINAR IN COMPARATIVE AND HISTORICAL SOCIOLOGY (3). Prerequisite, graduate standing in Sociology or permission of the instructor. Examination of

issues involved in societal comparison, with an emphasis upon comparative and historical analysis of substantive issues at the macro-societal level. Special attention will be given the methodological problems. Landsberger, Calhoun; staff.

- 309 SEMINAR IN THE ANALYSIS OF SOCIALIST SOCIAL SYSTEMS (3). An analysis of special problems in the study of societies governed by a communist party. Stress is on major social institutions and on the course and sources of structural change. Lenski, Jones.
- 311 SEMINAR IN POLITICAL SOCIOLOGY (Political Science 311) (3). The relationships between social structure and political decisions. Regimes and social structure; bureaucracies, political associations, and professions; science and politics; closed and open politics; political movements and change. Calhoun, MacRae.
- 312 SEMINAR ON SOCIAL NETWORKS (3). Prerequisite, second year graduate standing. Anthropological, social structural, and sociometric approaches to the analysis of interaction networks. Small groups, communities, and interorganizational relations. *On demand*. Calhoun, Marsden.
- 314 SEMINAR IN SOCIAL CONTROL AND DEVIANCE (3). Registration by permission of the instructor. The relation of social norms to conforming and deviant behavior. Types of social and personal controls. Theoretical and research problems are reviewed. *On demand*. Hawkins.
- 315 READING AND RESEARCH IN METHODOLOGY (3 each semester). Registration by permission of the instructor. Special work on selected problems of research methodology. Staff.
- 316
- 320 SYSTEMATIC METHODS OF QUALITATIVE RESEARCH (3). Course designed to teach methods of data collection and analysis for qualitative research. Kleinman.
- 321 FIELD RESEARCH (3 each semester). Registration by permission of the instructor.
- 322 Staff.
- 326 SEMINAR IN SELECTED TOPICS (1-3). Course description for particular semester is available in Department Office. Registration by permission of the instructor.
- 327 Staff.
- 329 SEMINAR IN SOCIALIZATION AND GROUP PROCESS (3). Prerequisite, permission of instructor. Analysis of theoretical issues and empirical research relevant to socialization. Special emphasis upon group process effects on the evolution of the social self, the "fit" between personality and role, and other issues. Staff.
- 333 SEMINAR IN MARRIAGE AND THE FAMILY (3). *On demand*. Staff.
- 380 SEMINAR ON THE TEACHING OF SOCIOLOGY (3). Prerequisite, doctoral candidate in Sociology or permission of instructor. Examines teacher's role and teaching process; planning a course, constructing syllabi, testing for teaching or grading, evaluating teacher performance, needs of different student populations. Cramer.
- 393 MASTER'S THESIS (3 or more). Individual research in a selected field under the direction of a member of the Department. Staff.
- 394 DOCTORAL DISSERTATION (3 or more). Individual research in a selected field under the direction of a member of the Department. Staff.
- 400 GENERAL REGISTRATION (0).

DIVISION OF SPEECH AND HEARING SCIENCES

ROBERT B. MAHAFFEY, *Acting Director*

Professor

ROBERT W. PETERS (9) Auditory Processing, Speech Perception, Stuttering

Associate Professor

ROBERT B. MAHAFFEY (7) Aphasia; Anatomy, Physiology and Neurology of Speech and Hearing; Computer Applications

Assistant Professors

ROBERT JAY (38) Diagnostic and Industrial Audiology; Gearubg Aids, Computer Applications
THOMAS L. LAYTON (25) Language, Language Disorders, Learning Disabilities
PATRICIA B. PORTER (31) Communication Disorders of the Severely, Profoundly and Multiply Handicapped

Clinical Associate Professors

RODGER DALSTON (38) Speech/Language Disorders in Patients with Cranio-Facial Anomalies
SOPHIA HADJIAN (4) Disorders of Articulation, Disorders of Voice
F. CALVIN KNOBELOCH (5) Developmental Aspects of Language, Speech, and Hearing; Disorders of Language, Speech and Hearing in Children
W. GRADY THOMAS (11) Audiology, Auditory Physiology and Psychoacoustics

Clinical Instructors

MARGUERITE J. BECKER (33) Speech and Language Disorders in Children and Adults, Clinical Supervision
EILEEN DALSTON (43) Language and Speech Disorders in Preschool Children
HOLLY HARRIS (44) Language, Articulation, Voice and Stuttering Disorders in Children
MELODY HARRISON (40) Language Development, Language and Communication Disorders of the Hearing Impaired, American Sign Language
SHARON RINGWALT (42) Language Development, Language Programming for Severely and Profoundly Handicapped. Oral-motor Skills, Articulation, Aphasia

Adjunct Associate Professors

STANLEY J. MARTINKOSKY	(13)	Alaryngeal Speech and Aphasia
ROBERT G. PAUL	(8)	Clinical Audiology

Adjunct Instructors

THOMAS CAMERON	(27)	Pediatric Audiology
JAMES W. LETTINGA	(34)	Speech Pathology
W. DAVID MILLS	(37)	Speech Pathology

The Division of Speech and Hearing Sciences in the Department of Medical Allied Health Professions, School of Medicine, provides academic and professional training for speech and language pathologists and audiologists at the master's level. The study of speech and hearing concerns knowledge and practices pertaining to both normal and abnormal speech, hearing and language. The Speech and Hearing Curriculum provides an environment where learning can be based on laboratory, both clinical and experimental, experiences. Four major tracks of study are possible within the master's curriculum: Audiology, Speech Pathology, Language and Language Disorders and Speech and Hearing Sciences. The program is interdisciplinary in that personnel and clinical and research activities of other University departments and institutions as well as the Division of Speech and Hearing Sciences are involved in the educational program.

The entrance, academic and residence requirements for the master's degree correspond to those of the Graduate School. All students following professional tracks are prepared to meet licensure and certification requirements necessary for the practice of speech and language pathology and/or audiology. More complete information describing the graduate training can be obtained by writing to the Division of Speech and Hearing Sciences, Department of Medical Allied Health Professions, School of Medicine.

Courses for Graduates and Advanced Undergraduates

- 100 MANUAL COMMUNICATION I A, B and C (1). May be repeated for credit. Basic course in finger-spelling and language of signs. Special emphasis placed on excessive and receptive use of manual communication, various systems employed (SEE¹, SEE², ASL, LVE), historical and philosophical aspect of manual communication as a viable language. *Fall and spring.* Staff.
- 101 MANUAL COMMUNICATION II A, B and C (1). May be repeated for credit. Advanced course in fingerspelling and sign language. Emphasis will be placed on developing skills in both expressive and reverse interpreting. A major emphasis will be in the syntax of AMESLAN. *Fall and spring.* Staff.
- 120 MANUAL COMMUNICATIONS III (2). Advanced course in fingerspelling and sign language. Emphasis will be placed on developing skills in both expressive and reverse interpreting, various systems employed, historical and philosophical aspects of manual communication as a viable language. *Fall.* Staff.

- 121 MANUAL COMMUNICATIONS IV (2). Emphasis will be placed on developing advanced skill in both expressive and reverse interpreting, various systems employed, historical and philosophical aspects of manual communication as a viable language. *Spring*. Staff.
- 123 AUDIOLOGY I (Education 243) (3). Theory and practice of the measurement of hearing, causative factors in hearing loss, evaluation of audiometric results, demonstration and participation in clinical program in audiology. *Fall*. Knobloch.
- 130 INTRODUCTION TO PHONETICS (Speech 158) (3). A detailed study of the International Phonetic Alphabet with emphasis on the sound system of American English. Application of Phonetics to problems of pronunciation and articulation. *Fall*. Peters.
- 140 ADVANCED PHONETICS (Speech 140) (3). *As the demand warrants*.
- 162 LANGUAGE ACQUISITION (3). Theories of language learning; stages of language development; and relevant literature, including semantics, syntax, pragmatic, non-verbal, dialects and psycholinguistics. *Fall*. Layton.
- 163 LANGUAGE: ASSESSMENT AND MANAGEMENT (3). Prerequisite, SPHS 162. A two course offering in analysis and measurement (assessment), modification of behaviors, education and re-educative processes (all modalities) and breakdown of process in language disorders. *Spring*. Layton.
- 170 ANATOMY AND PHYSIOLOGY OF THE SPEECH AND HEARING MECHANISMS (Speech 150) (3). Anatomy and physiology of the speech producing and aural mechanisms. *Fall*. Mahaffey.
- 180 HABILITATION AND REHABILITATION OF THE HEARING IMPAIRED (3). Course deals with speechreading, auditory training, speech production, sensory processing, communication methodologies, clinical organization, educational placement and other current issues relevant to the hearing impaired. *Spring*. Staff.
- 181 PHYSICAL AND PSYCHOLOGICAL ACOUSTICS (3). This course covers hearing development, speech perception, psychoacoustics, acoustics and instrumentation. *Fall and spring*. Peters, Mahaffey.
- 183 ORIENTATION TO SPEECH, HEARING AND LANGUAGE DISORDERS (Education 143) (3). *Fall, spring, summer*. Lubker.
- 184 FOUNDATIONS OF PHONOLOGICAL AND VOICE DEVIATIONS (Education 144) (3). Prerequisite, SPHS 130 or its equivalent. One component of a two course offering in evaluation, analysis and measurement (assessment), modification of behaviors, breakdown of processes in speech disorders with emphasis on voice and articulation disorders. *Spring*. Hadjian.
- 185 INTRODUCTION TO THE STUDY OF COMMUNICATIVE DISORDERS (3). Basic processes and disorders of speech, hearing and language. *Fall*. Porter.

Courses for Graduates

- 201 INTRODUCTION TO RESEARCH IN SPEECH AND HEARING (3). Experimental and descriptive research designs in speech and hearing sciences including criteria for the evaluation of research articles. *Fall*. Peters.
- 203 METHODS OF TEACHING SPEECH TO THE HEARING IMPAIRED (3). Course is to review general principles of speech development, the underlying problems in speech acquisition by moderate to profoundly hearing-impaired individuals, deviant spoken language, practical and theoretical aspects of evaluating and establishing speech. *Summer*. Harrison.
- 206 SPEECH PROCESSES (3). The nature of speaking behaviors, respiration, phonation, resonance, articulation and non-auditory feedback mechanisms and acoustic phonetics. *As demand warrants*. Staff.

- 207 LANGUAGE PROCESSES (2). The study of speech processing with reference to input, storage, retrieval, transformations, output, chunking and analysis by synthesis and synthetic speech and memory. *As demand warrants*. Staff.
- 221 BIOLOGICAL PROCESSES IN HEARING (3). Prerequisite, SPHS 181. Neuroanatomy and neurophysiology of the auditory system, peripheral and central, dynamics of the cochlea, electrophysiological data in various levels of the auditory system. *Fall*. Staff.
- 224 AUDIOLOGY II (3). Prerequisite, SPHS 223 or its equivalent. Emphasis on special tests, diagnostic evaluations, use of hearing aids, hearing conservation and instrumentation. Demonstration and participation in clinical program in audiology. *Spring*. Jay.
- 225 DISORDERS OF AUDITION (3). Breakdown of processes in audition and their management. *As demand warrants*. Staff.
- 241 BIOLOGICAL PROCESSES IN LANGUAGE AND SPEECH (3). Neurophysiology, anatomy, speech processes with reference to both normal and abnormal, neuropathologies, and linguistic, psychological and neurological integration of speech. *As demand warrants*.
- 244 FOUNDATIONS OF NEUROLOGICAL AND FLUENCY DEVIATIONS (Education 244) (3). Prerequisite, SPHS 184. Second component of a two-course offering as described under 184 with emphasis on stuttering and organic disorders of speech. *Spring*. Mahaffey, Peters.
- 264 LANGUAGE IMPAIRMENTS OF CHILDREN (3). Second part of two course offering described in 163. *Spring*. Layton.
- 282 SPEECH SCIENCE (3). Speech analysis, synthesis, perception, observable phenomena of speech behaviors and models and procedures utilized in the understanding of speech behaviors. *As demand warrants*. Staff.
- 302 PROBLEMS IN SPEECH AND HEARING SCIENCES (1-3). May be repeated for credit. *Fall, spring and summer*. Staff.
- 303 CLINICAL PRACTICUM OBSERVATION IN SPEECH PATHOLOGY (1-3). Supervised clinical observation. May be repeated for credit. *Fall, spring and summer*. Becker.
- 304 CLINICAL PRACTICUM IN SPEECH PATHOLOGY (1-3). Supervised clinical experience. May be repeated for credit. *Fall, spring, summer*. Becker.
- 305 CLINICAL PRACTICUM OBSERVATION IN AUDIOLOGY (1-3). Supervised observation in clinical experience. May be repeated for credit. *Fall, spring, summer*. Jay.
- 306 CLINICAL PRACTICUM IN AUDIOLOGY (1-3). Supervised clinical experience. May be repeated for credit. *Fall, spring, summer*. Jay.
- 321 SEMINAR IN AUDIOLOGY, SEC. 1 (3). Advanced Clinical Audiology. *Fall, spring*. Jay; SEC. 2 (3). Hearing Aids. *Spring*. Jay; SEC. 3 (3). Pediatric Audiology. *Fall*. Staff; SEC. 4 (3). Hearing Conservation. *1st Summer*. Jay.
- 330 INDEPENDENT STUDY (1-6). This course gives enrolled graduate students in the Curriculum an opportunity to pursue research supervised by one or more faculty members culminating in a written report as an option to writing a thesis. *Fall, spring, and summer*. Staff.
- 341 SEMINAR IN SPEECH PATHOLOGY (3). Special topics and significant literature in the field of speech pathology. *On demand*. Staff.
- 342 APHASIA (3). Discussion of aphasic manifestations, diagnosis prognoses and therapy procedures; combined lectures and seminars. *Fall*. Mahaffey.
- 343 PHONOLOGICAL DEVIATIONS: ASSESSMENT AND MANAGEMENT (3). Course deals specifically with the major diagnostic tests of articulation and the specific management programs associated with each. Thorough examination of the research supporting each test and treatment plan is included. *Fall*. Hadjian.

- 344 ORGANIZATION AND ADMINISTRATION OF SPEECH AND HEARING PROGRAMS (3). Historical review of organization and management models; administrative procedures associated with speech and language pathology and audiology service delivery systems; issues and implications of recent legislation. *Summer*. Hadjian.
- 345 DIAGNOSTIC PRINCIPLES AND METHODS (3). Diagnostic tests and methods in speech and language pathology, including interview, counseling, and report writing procedures. *Fall*. Hadjian.
- 346 STUTTERING (3). Major theories, treatment, identification and diagnosis with respect to child and adult stuttering. *Summer*. Peters.
- 347 NEUROPATHOLOGIES (3). Presentation of eighty neuropathologies that have implications for speech, hearing and language. Etiologies, manifestations, prognoses, etc. are discussed. *Spring*. Mahaffey.
- 348 VOICE DISORDERS (3). Assessment and management of children and adults with voice disorders and laryngectomy. *Spring*. Hadjian.
- 349 DIAGNOSIS AND CLINICAL MANAGEMENT OF PERSONS WITH ORAL-FACIAL ANOMALIES (3). In-depth analysis of the embryologic and physiologic bases of oral-facial anomalies and the team approach to assessment and habilitation. Particular emphasis placed upon the following specialties: genetics, plastic surgery, prosthodontics, orthodontics, otolaryngology and speech/language pathology. *Spring*. Dalston.
- 361 SEMINAR IN LANGUAGE AND LANGUAGE DISORDERS (1-3). May be repeated for credit. Special topics and significant literature in the field of language and language disorders. *On demand*. Layton.
- 362 LANGUAGE AND LEARNING DISORDERS (3). Course in normal and abnormal learning from a language perspective. Emphasis on evaluation and treatment from a neuro-psycholinguistic model. *Summer*. Layton.
- 381 SEMINAR IN HEARING SCIENCE (1-3). May be repeated for credit. Advanced special topics and current research in hearing science. *As demand warrants*. Staff.
- 382 SEMINAR IN SPEECH SCIENCE (1-3). May be repeated for credit. Advanced special topics and current research in speech science. *As demand warrants*. Staff.
- 383 LABORATORY IN SPEECH AND HEARING SCIENCES (1-3). May be repeated for credit. Practical experience in various areas involving laboratory usage. *As demand warrants*. Staff.
- 393 MASTER'S THESIS (3 or more). *Fall, spring and summer*. Staff.

DEPARTMENT OF SPEECH COMMUNICATION

BEVERLY WHITAKER LONG, *Chairperson*

Professors

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|-----------------------|------|--|
| PAUL D. BRANDES | (2) | Communication Theory, Rhetoric and Public Address |
| BEVERLY WHITAKER LONG | (11) | Performance of Literature, Performance Criticism, Recent American Poetry |

Associate Professors

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|---------------------|-----|---|
| J. ROBERT COX | (5) | Rhetoric and Public Address, Augmentation |
| HOWARD D. DOLL | (6) | Oral Interpretation of Literature, Reader's Theatre |
| MARTHA NELL HARDY | (7) | Oral Interpretation of Literature, Reader's Theatre |
| JAMES W. PENCE, JR. | (8) | Rhetoric and Public Address, Instructional Communication |
| JULIA T. WOOD | (4) | Communication Theory, Small Group and Interpersonal Communication |

Assistant Professors

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|---------------------|------|--|
| V. WILLIAM BALTHROP | (12) | Rhetoric and Public Address, Argumentation |
| CHARLES R. CONRAD | (13) | Organizational Communication, Communication Theory |
| MARY E. W. JARRARD | (9) | Communication Theory, Instructional Communication |
| CRAIG A. SMITH | (14) | Communication Theory, Rhetoric and Public Address |

The Department of Speech Communication offers graduate work leading to the degree of Master of Arts. Areas of emphasis are three: communication studies, rhetorical studies, and oral interpretation. The M.A. degree offers preparation for administrative, staff, and teaching positions in public and private agencies. Research and practical experience are emphasized. The thesis is a concise research task of high quality. Experiential education occurs in a variety of settings; instructional communication, the practicum, and the internship.

Requirements include satisfactory completion of thirty semester hours, mastery of a research tool, a comprehensive examination covering course work, a thesis, and an oral defense of the thesis. A minor may be chosen outside the department, but the graduate program as a whole must be unified.

Courses for Graduates and Advanced Undergraduates

- 111 THE RHETORIC OF THE SOPHISTS, PLATO AND ARTISTOTLE (Classics/-Comparative Literature 111) (3). Detailed study of the conceptualization of rhetoric in Greece, the sophistic movement. Plato's *Gorgias* and *Phaedrus*, and Aristotle's *Rhetoric*. Fall. Kennedy.
- 112 CLASSICAL, CHRISTIAN, AND POST-CLASSICAL RHETORICS (Classics/-Comparative Literature 112) (3). Prerequisites, Classics/Comparative Literature/-Speech Communication 111 or permission of instructor. Study of the classical tradition in rhetoric and reactions against it from the fourth century B.C. to the 18th century of the Christian era. Special attention to Cicero, Quintilian, Augustine, the humanists, Ramus, and British rhetoricians of the 18th century. Spring. Kennedy.
- 134 CONTEMPORARY RHETORICAL THEORIES (3). Prerequisite, Speech 51 or 61 or 63. Investigates contemporary theories of purposive symbolic behavior; focus is upon rational, psychological, and dramatic explanations of human behavior. Fall or spring.
- 136 DELIBERATION AND THE DECISION-MAKING PROCESS (3). Prerequisite, Speech 35 or 53 or permission of instructor. Analyzes arguments in 20th century decisions in attempt to understand bases of "justification." Topics include deliberation about values, the logic of prediction, and the criterion of "reasonableness" in selection of a policy alternative. Fall or spring.
- 138 THE RHETORIC OF LEADERSHIP (3). Prerequisite, Speech 55. Designed to examine the phenomenon of leading as a communicative function which varies according to the situations in which it is implemented. Focuses on the factors (events) which influence and are influenced by leading communication. Fall or spring.
- 141 READER'S THEATRE (4). Prerequisite, Speech 41 or equivalent. Preparation for and participation in oral interpretation activities in both individual and group forms. Preparation will include detailed analysis of novels, plays and poems and their adaptation to being read aloud. Fall or spring.
- 143 ORAL INTERPRETATION OF POETRY (3). Prerequisite, Speech 41. Textual and dramatic approaches to the analysis and oral interpretation of narrative, lyric, dramatic, and didactic poetry of English and American poets. Emphasis on the oral reading techniques of communicating the meanings and emotions of poetry. Fall or spring.
- 144 ORAL INTERPRETATION OF DRAMATIC LITERATURE (3). Prerequisite, Speech 41 or English 26. A study and performance of poetic drama. The relationships between poetry and dramatic action are considered through discussions, papers, and performances. Fall or spring.
- 145 ORAL INTERPRETATION OF PROSE (3). Prerequisite, Speech 41. Approaches to the analysis of oral interpretation of prose, with emphasis on narrative fiction. In depth study of selected prose periods, styles and forms, in preparation for oral presentation. Fall or spring.
- 150 VOICE AND ITS PRODUCTION (3). Anatomy and physiology of the speech-producing and aural mechanisms. Fall or spring.
- 151 THEORIES OF HUMAN COMMUNICATION (3). Prerequisite, Speech 51. A study of contemporary theories of human communication, focusing on speech communication. Examines communication theories, variables, and research findings in light of their contribution to our understanding of speech communication. Fall or spring.
- 152 INTERPERSONAL COMMUNICATION (3). Intensive study of the theory of interpersonal communication and of the ways in which communication affects individuals in relationships. Fall or spring.

- 153 SOCIAL DIALECTS (3). An examination of dialects in North Carolina and a survey of the scholarship on culturally disadvantaged speech. *Fall or spring.*
- 154 PERSUASION (3). Fusion of classical canons of rhetoric with contemporary persuasion theory. One day speaking in field, collecting data. Results computerized for term report. *Fall or spring.*
- 155 PSYCHOLOGY OF SPEECH (3). An investigation of psychological aspects of speech, such as oral humor, stage fright, speech snobbery, the oral lie, and the relationships between speech and personality. *Fall or spring.*
- 156 COMMUNICATION DEVELOPMENT IN CHILDREN (3). An investigation of the acquisition and development of communication in the normal child. Study of strategies that enhance communication development. *Fall or spring.*
- 157 APPLIED PHONETICS (3). Prerequisite, Speech 130 or equivalent. A study of the acoustic, articulatory, auditory and physiological aspects of the production of speech.
- 158 INTRODUCTION TO PHONETICS (3). Prerequisite, Speech 40 or equivalent. A detailed study of the International Phonetic Alphabet with emphasis on the sound system of American English. Application of Phonetics to problems of pronunciation and articulation. *Fall or spring.*
- 159 PRINCIPLES OF SPEECH CORRECTION (EDSP 143) (3). An introduction to communication disorders. *Fall or spring.*
- 161 THE RHETORIC OF DEVELOPING AMERICA (TO 1900) (3). Prerequisite, Speech 61 or 63 or a relevant course in history. Examines public discourse in America from several perspectives: situations, personalities, movements, controlling ideas. Special attention to the relationship of discourse to other events. *Fall or spring.*
- 163 THE RHETORIC OF TWENTIETH CENTURY AMERICA (3). Prerequisite, Speech 61 or 63 or a relevant course in history. Examines public discourse in 20th Century America from several perspectives: situations, personalities, movements, controlling ideas. Special attention to current discourse. *Fall or spring.*
- 165 SPEECHWRITING (3). Prerequisite, Speech 33 or 35 or 53. Introduces the student to the principles of speech writing with special attention to features of oral style. *Fall or spring.*
- 171 SPECIAL TOPICS IN ORAL INTERPRETATION (3). Prerequisite, Speech 41 or 143. This course is an in-depth study of a literary movement, group of writers, single writers, periods, or forms of poetry, prose fiction, dramatic literature, or non-fiction. Topics vary through performance, discussion, and reports. *Fall or spring.*
- 181 INTRODUCTION TO QUANTITATIVE RESEARCH (3). Basics of data collection, measurement instrument development, and data analytic approaches to communication research are presented the student. Emphasis is placed on practical application of research. *Fall or spring.*
- 185 COMMUNICATION IN ORGANIZATIONS (3). Examines internal and external systems of communication; information flow; public, small group, and interpersonal communication. *Fall and spring.*

Courses for Graduates

NOTE: Courses are offered *on demand* except as otherwise noted.

- 231 RHETORICAL CRITICISM (3). Prerequisite, Speech 111, 112 or 134. This course investigates the function of rhetorical criticism, the critical method and a variety of approaches to the performance of rhetorical criticism.
- 241 STUDIES IN LITERARY CRITICISM (English 241) (3). The classical tradition in criticism.
- 243 LITERARY AND PERFORMANCE CRITICISM (3). Prerequisites, Speech 141 and one course from among 143, 145, 171, or permission of instructor. This course

- deals with the key methods of describing and evaluating literature and literature in performance.
- 245 DIRECTING GROUP PERFORMANCE (3). Prerequisite, 141 or equivalent. Examines in depth the theories and techniques of preparing group performances.
- 256 SMALL GROUP COMMUNICATION VARIABLES (3). Prerequisite, Speech 55 or permission of the instructor. An in-depth study of the variable involved in oral communication in small groups. Includes a critical review and synthesis of recent research findings.
- 281 DESIGN AND INTERPRETATION OF QUANTITATIVE RESEARCH IN COMMUNICATION (3). Prerequisite, Speech 181. The designs and analysis of communication data gathered in lab and field settings are reviewed. The specific emphasis of the course centers on multivariate data analytic techniques and their interpretation.
- 298 BIBLIOGRAPHY AND METHODOLOGY (3). Introduction to research methods and materials in Speech Communication. *Fall*.
- 331 SEMINAR IN RHETORICAL STUDIES (3). Prerequisites, 231, and one course from among 111, 134, 136, 161, 163. Special problems in rhetoric.
- 341 SEMINAR IN ORAL INTERPRETATIONAL/READER'S THEATRE (3). Prerequisite, permission of instructor. Special problems in oral interpretation/reader's theatre.
- 351 SEMINAR IN COMMUNICATION STUDIES (3). Prerequisite, Speech 151, 181, and one course from among 152, 154, 183, 185, 281. Special problems in communication studies.
- 391 PRACTICUM IN SPEECH COMMUNICATION (3). Prerequisite, permission of departmental coordinator of internships. Individualized practical experience supervised by a faculty advisor and by the departmental coordinator of internships. May be repeated once with approval of the departmental faculty.
- 393 MASTER'S THESIS (3 or more). Prerequisite, graduate standing in speech. Individual supervision of theses. *Fall and spring*.
- 395 DIRECTED RESEARCH (3). Prerequisite, permission of the graduate faculty member involved. Individual research on a problem defined by the graduate student and a graduate faculty member in conference. May be repeated once with the permission of the departmental graduate faculty.

DEPARTMENT OF STATISTICS

WALTER L. SMITH, *Chairman*

Professors

CHARLES R. BAKER	(1)	Statistical Communication Theory, Probability, Stochastic Processes
STAMATIS CAMBANIS	(2)	Statistical Communication Theory, Stochastic Processes
INDRA M. CHAKRAVARTI	(3)	Design of Experiments, Combinatorics, Information and Coding Theory
NORMAN L. JOHNSON	(5)	Multivariate Analysis, Statistical Inference
GOPINATH KALLIANPUR	(20)	Statistics, Probability and Stochastic Processes
MALCOLM ROSS LEADBETTER	(7)	Probability, Stochastic Processes
GORDON D. SIMONS	(8)	Statistical Inference, Probability
WALTER L. SMITH	(10)	Probability, Stochastic Processes

Associate Professors

RAYMOND J. CARROLL	(12)	Robustness, Sequential Analysis
DOUGLAS G. KELLY	(6)	Probability, Combinatorics, Operations Research

Assistant Professors

JANET M. BEGUN	(21)	Statistical Inference, Asymptotic Theory, Survival Analysis
DONALD ST.P. RICHARDS	(23)	Multivariate Analysis, Characterization
DAVID RUPPERT	(15)	Stochastic Approximation, Robust Statistics, Linear Models

Adjunct Professors

BARRY MARGOLIN	(18)	Design of Experiments, Data Analysis
PRANAB KUMAR SEN	(22)	Nonparametric Methods, Multivariate Analysis, Large Sample Theory

Adjunct Associate Professor

NORMAN KAPLAN	(19)	Stochastic Processes
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Professors Emeriti

R. C. BOSE		
WASSILY Hoeffding		

Courses for Graduate Students Not Majoring in Statistics

The offerings of the Department of Statistics include a variety of courses of potential value to students majoring in other disciplines. The basic ideas of probability and statistics are taught in Statistics 101. Somewhat more theoretical and mathematical than 101 are Statistics 126 and 127.

In addition to these basic courses, the Department offers courses in operations research (180, 181), statistical methods (102, 160, 200), stochastic processes (129), time series analysis (133), and combinatorics (156, 158).

Graduate Program in Statistics

The Department of Statistics offers both M.S. and Ph.D. programs in statistics. Students who plan to teach statistics or to engage in research of any kind should work for the degree of Doctor of Philosophy. This requires at least three years of full-time graduate work, predicated upon a substantial undergraduate mathematical preparation. Research is an important part of the work of candidates for the doctorate. Those interested in obtaining an understanding of the fundamental notions of statistical theory and practice are directed into the Master of Science degree program. This degree may be obtained with or without the writing of a thesis, and normally requires three semesters for completion.

Doctoral students not holding an M.S. degree in statistics complete the M.S. program without delay of their Ph.D. work.

The philosophy of the Department is that its Ph.D. graduates should be broadly based in statistical theory and practice, and at the same time be able to conduct basic research in some special area. The typical first year program is Statistics 105, 112, 129, 134 in the fall semester and 111, 132, 135, 150 in the spring. In the second and third years a student taking advanced courses may specialize in an area of interest. Six main areas of specialization are currently recognized: Inference, Design of Experiments, Multivariate Analysis, Operations Research, Probability, and Statistical Communication Theory. Students may also take courses offered by other departments such as the Departments of Mathematics and Biostatistics, on the Chapel Hill Campus, and by various departments of North Carolina State University in Raleigh and of Duke University in Durham.

The Department is located in Phillips Hall and Smith Building, together with the Departments of Mathematics and Physics. In addition to a statistical laboratory, equipped with calculating machines and a programmable electronic calculator, the Department has several remote teletype computer terminals available for student and faculty use. The Mathematics-Physics-Statistics Library, located in Phillips Hall, maintains an extensive collection of books and journals pertaining to statistics.

Short series of lectures on specific topics in statistics by distinguished authorities and visiting scholars are arranged on a regular basis, and a

statistics colloquium meets on alternate weeks for the presentation of the latest research developments.

The graduate curriculum in the Department of Statistics places strong emphasis on the mathematical theory of probability and statistics. A sound mathematical preparation is thus an essential prerequisite for admission to the department. An applicant's mathematical background should include a one year course in advanced (multivariable) calculus or real analysis, and at least a one semester course in matrix algebra. Introductory courses in probability and statistics are desirable but not required.

Application forms for admission and/or financial aid may be obtained by writing either to the Graduate School or to the Department of Statistics. Applicants are strongly urged to submit scores for both the Aptitude and Advanced Mathematics portions of the Graduate Record Examinations in support of their application, and a supplementary sheet providing brief course descriptions, including text title where applicable, or previous undergraduate and graduate courses in mathematics and statistics.

Applicants for financial aid are considered for assistantships within the Department and also for various fellowships and limited service awards provided on a competitive university-wide basis by the Graduate School. Assistants perform academically-related duties, such as teaching, which typically require not more than ten hours service per week. Other awards include Limited Service Assistantships, University Graduate and Alumni Fellowships, George E. Nicholson, Jr., Fellowships, Pogue Fellowships, and Morehead Fellowships. Stipends range from \$3800 to \$7500 for the academic year, with tuition included with Fellowship awards.

Application for admission and financial aid may be made simultaneously simply by indicating on the admission application form a desire to be considered for financial aid.

More detailed information about the Department of Statistics is available in the Department's separate catalogue. Requests for this publication and specific inquiries should be addressed to the Director of Graduate Admissions, Department of Statistics.

Courses for Graduates and Advanced Undergraduates

- 101 STATISTICAL METHODS I (Biostatistics 150) (3). Prerequisite, integral calculus. Basic probability; descriptive statistics; introduction to statistical inference, including estimation, hypothesis testing, simple linear regression, one-way ANOVA, nonparametric tests, contingency tables. *Fall and spring*. Begun, Carroll, Ruppert.
- 102 STATISTICAL METHODS II (3). Prerequisite, Statistics 101 or equivalent. Linear regression; experimental designs; multivariate analysis; introduction to statistical computer software. *Spring*. Begun, Carroll, Ruppert.
- 104 SAMPLE SURVEY METHODOLOGY (Biostatistics 164) (3). Prerequisite, Statistics 101 or equivalent. *Spring*. Kalsbeek.
- 107 LIFE CONTINGENCIES (Mathematics 167) (3). Prerequisite, Mathematics 32 or permission of instructor. Values of and premiums for annuities and assurances on one

- or more lives. Multiple decrement functions and their applications to pension funds and disability and accidental death benefits. *Spring*.
- 111 METHODS OF MATHEMATICAL STATISTICS (3). Prerequisite, advanced calculus. Introductory treatment of special mathematical techniques of particular importance in probability and statistics, including complex variables, Fourier and Laplace transforms, elements of finite difference equations. *Spring*. Simons, Smith.
- 112 MEASURE AND INTEGRATION (3). Prerequisite, advanced calculus. Lebesgue and abstract measure and integration, convergence theorems, differentiation, Radon-Nikodym theorem, product measures, Fubini theorems. Lp spaces. *Fall*. Baker, Cambanis, Kallianpur, Leadbetter.
- 126 INTRODUCTION TO PROBABILITY (Mathematics 146) (3). Prerequisite, Mathematics 34. Introduction to mathematical theory of probability covering random variables, moments, binomial, Poisson, normal and related distributions, generating functions, sums and sequences of random variables, and statistical applications. *Fall and spring*. Baker, Cambanis, Kelly.
- 127 MATHEMATICAL STATISTICS (3). Prerequisite, Statistics 126 or equivalent. Functions of random samples and their probability distributions; introductory theory of point and interval estimation, and of hypothesis testing; elementary decision theory. *Fall and spring*. Begun, Carroll, Kelly.
- 129 INTRODUCTION TO STOCHASTIC PROCESSES (3). Prerequisite, Statistics 126. Elementary theory and application of random process models; recurrent events, random walks. Markov chains. Poisson processes, birth-and-death processes, queuing processes, branching processes, Brownian motion, stationary processes. *Fall*. Kelly, Leadbetter.
- 132 INTERMEDIATE PROBABILITY (Mathematics 195) (3). Prerequisite, Statistics 112 or permission of instructor. Foundations of probability. Basic classical theorems. Modes of probabilistic convergence. Central limit problem. Generating functions, characteristic functions. Conditional probability and expectation. *Spring*. Cambanis, Leadbetter.
- 133 INTRODUCTION TO TIME SERIES ANALYSIS (3). Prerequisite, Statistics 126. Topics chosen from: Time series data analysis. Fitting parametric models, such as regression-autoregression models to time series. Spectrum analysis. Filtering. *Spring*. Leadbetter.
- 134 INTERMEDIATE STATISTICAL THEORY I (3). Prerequisite, two semesters of advanced calculus. Fundamentals of probability and distribution theory including: axiomatic treatment of probability, independence, random variables, characteristic functions, convergence and approximation common distributions. *Fall*. Kelly, Simons.
- 135 INTERMEDIATE STATISTICAL THEORY II (3). Prerequisite, Statistics 134 or equivalent. Fundamentals of statistical inference including: sufficient statistics, estimation, hypothesis testing, decision theory, various classical tests, Linear estimation, analysis of variance and regression are largely excluded (see Statistics 150). *Spring*. Chakravarti, Simons.
- 140 LINEAR SYSTEMS (3). Prerequisites, advanced calculus, elements of Fourier transform theory; linear algebra and Lebesgue integration helpful. Introduction to linear spaces, including basic results on normed linear spaces, Hilbert space geometry, bounded linear operators. Linear system theory, including signal representations, impulse response, transfer functions, dynamical systems, state variable methods, elementary modern control theory. *Fall*. Cambanis, Leadbetter.
- 141 LINEAR OPERATORS AND OPTIMIZATION (3). Prerequisite, Statistics 140 or a knowledge of the basic theory of normed linear spaces and linear operators. Basic properties of compact operators. Dual spaces. Optimization in linear spaces, especially algorithmic methods. Optimization of functions and constrained optimization. *Spring*. Baker.

- 142 INTRODUCTION TO ESTIMATION AND DETECTION THEORY (3). Prerequisites, Statistics 129, 134 and 140. The Wiener-Kolmogorov and the Kalman-Bucy filtering theories. Modulation theory. Basic problems of detection theory. *Spring*. Cambanis.
- 150 ANALYSIS OF VARIANCE WITH APPLICATION TO EXPERIMENTAL DESIGNS (3). Corequisite, Statistics 135. Linear estimation. Gauss-Markov theorem. Sums of squares. Analysis of variance and simple factorial designs. Intrablock analysis of incomplete block designs. Balanced, lattice and Latin square designs. *Spring*. Carroll, Chakravarti, Ruppert.
- 156 COMBINATORIAL MATHEMATICS (Mathematics 148) (3). Prerequisites, Mathematics 135 or 136, Mathematics 121 or permission of the instructor. Topics chosen from: Generating functions, Polya's theory of counting, partial orderings and incidence algebras, principle of inclusion-exclusion. Mobius inversion, combinatorial problems in physics and other branches of science. *Fall*. Brylawski, Kelly.
- 158 INTRODUCTION TO GRAPH THEORY (Mathematics 149) (3). Prerequisite, linear algebra. Basic concepts of directed and undirected graphs. Connectivity, traversability, and factorization of graphs. Planar graphs. Extremal problems. Automorphism group of a graph. Matrix representations. Coloring problems and the chromatic polynomial. *Spring*. Kelly.
- 160 APPLIED MULTIVARIATE ANALYSIS I (Biostatistics 166) (3). Prerequisite, Statistics 102. Exploratory and inferential multivariate techniques and applications. *Spring*. Staff.
- 170 ORDER STATISTICS (3). Prerequisite, Statistics 127. Distribution of moments of order statistics. Estimation of location and scale parameters, censoring. Robust estimation. Shortcut procedures. Treatment of outliers. Extreme value theory. *Spring*. Carroll.
- 171 INTRODUCTION TO NONPARAMETRIC STATISTICS (Biostatistics 256) (3). Prerequisites, Statistics 105, and basic courses in statistical theory. Sign test, rank sum tests, rank correlation methods, order statistics. Kolmogorov-Smirnov goodness-of-fit tests, Fisher-Pitman randomization theory, K-sample tests, method of paired comparisons, power and asymptotic relative efficiency. *Summer*. Quade.
- 180 STOCHASTIC MODELS IN OPERATIONS RESEARCH (ORSA 180) (3). Prerequisite, Statistics 126. Introduction to queueing theory (substantial), Markovian sequential decision process, inventory theory and topics from stochastic linear programming, simulations, scheduling, game theory. Applications. *Spring*. Simons, Smith.
- 181 LINEAR AND INTEGER PROGRAMMING (MATH 151, ORSA 181) (3). Prerequisite, Mathematics 147. Fundamentals of linear programming; simplex algorithm, duality, sensitivity analysis, applications. Integer programming; branch-and-bound techniques, applications. Dynamic programming (if time permits). *Fall*. Kelly, Smith.
- 200 APPLIED MULTIVARIATE ANALYSIS II (2). Prerequisite, Statistics 105 or 135. Relations between multiple regression, analysis of variance, multivariate analysis and factor analysis. Principal components. Discriminant analysis. Canonical analysis. Scaling methods. Classification problems. Cluster analysis. *Spring*.
- 210 DESIGN AND ANALYSIS OF EXPERIMENTS (3). Prerequisites, Statistics 102 and 150. The principles of the design and analysis of experiments. Randomized blocks. Latin and Graeco-Latin squares, factorial experiments. Confounding, fractional factorials, split plots, missing plots. Interblock analysis, Covariance analysis, Response surfaces. *Fall or spring*. (1981-1982 and alternate years.) Chakravarti.
- 220 THEORY OF ESTIMATION AND HYPOTHESIS TESTING (3). Prerequisites, Statistics 132, 135. Bayes procedures for estimation and testing. Minimax procedures.

- Unbiased estimators. Unbiased tests and similar tests. Invariant procedures. Sufficient statistics. Confidence sets. *Fall*. Staff.
- 221 SEQUENTIAL ANALYSIS (3). Prerequisites, Statistics 132 and 135. Hypothesis testing and estimation when sample size depends on the observations. Sequential probability ratio tests. Sequential design of experiments. Optimal stopping. Stochastic approximation. (1981-1982 and alternate years.) *Spring*. Simons.
- 222 NONPARAMETRIC INFERENCE (3). Prerequisites, Statistics 132, 135 and 112. Estimation and testing when the functional form of the population distribution is unknown. Density estimation. Rank, sign, and permutation tests. Optimum nonparametric tests and estimators, Robust procedures. (1981-1982 and alternate years.) *Spring*. Ruppert.
- 223 STATISTICAL LARGE-SAMPLE THEORY (3). Prerequisites, Statistics 132 and 135. Asymptotically efficient estimators; maximum likelihood estimators; maximum probability estimators. Asymptotically optimal tests; likelihood ratio test. (Alternate years.) *Spring*. Staff.
- 231 ADVANCED PROBABILITY (3). Prerequisites, Statistics 132, 112. Advanced theoretic course, covering topics selected from: weak convergence theory, central limit theorems, laws of large numbers, stable laws, infinitely divisible laws, random walks, martingales. (Alternate years.) *Spring*. Kallianpur, Simons, Smith.
- 232 GENERAL THEORY OF STATISTICAL DECISION (3). Prerequisites, Statistics 135 and 112. Selected topics in the general theory of statistical decision, based on the work of Abraham Wald. *Spring*. (Alternate years.) Staff.
- 235 STOCHASTIC PROCESSES (3). Prerequisites, Statistics 112 and 132. Advanced theoretic course including topics selected from: Foundations of stochastic processes, renewal processes, stationary processes, markov processes, martingales, point process. *Fall*. (1981-1982 and alternate years.) Baker, Cambanis, Leadbetter, Smith.
- 237 TIME SERIES ANALYSIS (3). Prerequisites, Statistics 112, 132. Analysis of time series data by means of particular models such as autogressive and moving average schemes. Spectral theory for stationary processes and associated methods for inference. Stationarity testing. *Spring*. (1980-1981 and alternate years.) Leadbetter.
- 242 PROBABILITY IN LINEAR SPACES (3). Prerequisites, Statistics 112, elements of theory of normed linear spaces. Results from linear topology. Borel structures. Probability measures on Borel sets of separable Banach spaces. Characteristic functionals. Extension of cylinder set measures. Gaussian measures. Orthogonality and equivalence of measures. *Spring*. Baker.
- 245 ADVANCED TOPICS IN STATISTICAL COMMUNICATION THEORY (3). Prerequisite, Statistics 242. Applications of probability in linear spaces to problems in information theory, signal detection, and sample path analysis of stochastic processes. *Fall*. Baker.
- 251 COMBINATORIAL PROBLEMS OF THE DESIGN OF EXPERIMENTS (3). Prerequisite, Statistics 150. Finite fields and finite geometries. Construction of orthogonal Latin squares and balanced incomplete block designs. Difference sets. *Fall*. Chakravarti.
- 252 INFORMATION THEORY (3). Prerequisite, Statistics 134. Transmission of information, entropy, message ensembles, discrete sources, transmission channels, channel encoding and decoding for discrete channels. *Spring*. Chakravarti.
- 253 ERROR CORRECTING CODES (3). Prerequisite, Statistics 251, or permission of the instructor. Linear codes and their error-correcting capabilities. Hamming codes. Reed-Muller codes. Cyclic Codes, BCH/Goppa codes. Burst error corrections. Majority logic decoding. *Spring*. Chakravarti.
- 254 SPECIAL TOPICS IN DESIGN OF EXPERIMENTS I (3). Prerequisite, Statistics 150. Factorial experiments. Confounding, construction and analysis of symmetrical and fractional factorial designs. Orthogonal arrays. Asymmetrical factorial designs.

- Response surface designs, second and third order rotatable designs. Mixture design. Recent developments. *Fall*. Chakravarti.
- 255 SPECIAL TOPICS IN THE DESIGN OF EXPERIMENTS II (3). Prerequisite, Statistics 251. Combinatorial properties and construction of balanced, group divisible and partially balanced designs. Impossibility proofs. Orthogonal Latin squares of non-prime power orders. Orthogonal arrays. Asymmetrical fractionally replicated designs. Recent developments. *Spring*. Chakravarti.
- 260 MULTIVARIATE ANALYSIS (3). Prerequisites, Statistics 135 and matrices. Multivariate normal distributions. Related distributions. Tests and confidence intervals. Multivariate analysis of variance, covariance and regression. Association between subsets of a multivariate normal set. Theory of discriminant, canonical and factor analysis. *Fall*. Chakravarti, Richards.
- 261 ADVANCED PARAMETRIC MULTIVARIATE ANALYSIS (3). Prerequisite, Statistics 260. Distribution problems involved in the normal theory analysis of general multivariate linear models including the growth curves. Roy's union intersection principle and its role in multivariate analysis. An introduction to zonal polynomials and orthogonal groups. *Spring*. (1980-1981 and alternate years.) Sen, Chakravarti, Richards.
- 262 INTRODUCTORY NONPARAMETRIC MULTIVARIATE ANALYSIS (3). The problem of symmetry in the multivariate case. Nonparametric MANOVA in one-way classifications. Robust rank order estimation in MANOVA. Large sample properties of the tests and estimates. Tests for independence. *Fall*. (1980-1981 and alternate years.) Sen.
- 263 ADVANCED NONPARAMETRIC MULTIVARIATE ANALYSIS (3). Prerequisite, Statistics 262. Nonparametric inference in multifactor multiresponse experiments. Robust procedures in general linear models including the growth curves. Nonparametric classification problems. *Spring*. (1980-1981 and alternate years.) Sen.
- 280 ADVANCED STOCHASTIC METHODS OF OPERATIONS RESEARCH (3). Prerequisites, Statistics 132 and 180. Topics chosen from: renewal theory; queues with random arrivals; inequalities for queues; priority systems; theory of reservoirs; stochastic inventory problems. *Spring*. (1981-1982 and alternate years.) Smith.
- 300 SEMINAR IN STATISTICAL LITERATURE (1 each). Prerequisite, Statistics 135.
- 301 *Fall and spring*. Staff.
- 302 SEMINAR IN STATISTICAL DATA ANALYSIS (1-3). Prerequisite, Statistics 105. *Spring*. Staff.
- 310 SEMINAR IN THEORETICAL STATISTICS (1-3). Prerequisite, Statistics 135.
- 311 *Fall and spring*. Staff.
- 321 SPECIAL PROBLEMS (1-3). Prerequisite, permission of the instructor. *Fall and spring*. Staff.
- 322 *spring*. Staff.
- 331 ADVANCED RESEARCH (1-3). Prerequisite, permission of the instructor. *Fall and spring*. Staff.
- 332 *and spring*. Staff.
- 393 MASTER'S THESIS (3 or more). Prerequisite, permission of the student's adviser. *Fall and spring*. Staff.
- 394 DOCTORAL DISSERTATION (3 or more). Prerequisite, permission of the student's adviser. *Fall and spring*. Staff.
- 400 GENERAL REGISTRATION.

CURRICULUM IN TOXICOLOGY

TOM S. MIYA, *Chairman*

Professors

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|---------------------|------|--|
| MARIO C. BATTIGELLI | (1) | Environmental Toxicology, Pulmonary Medicine, Occupational Health |
| GEORGE H. COCOLAS | (2) | Stereochemistry of Drug-Receptor Interactions; Biological Activity and Structure Modification |
| KENNETH H. DUDLEY | (14) | Drug Metabolism; Stereochemical Aspects of Biotransformation Reactions; Analytical Methods for Drugs and Metabolites |
| DAVID A. FRASER | (3) | Occupational Health, Air Pollution |
| JOE W. GRISHAM | (4) | DNA Replication and Repair in Cellular Pathology; Environmental Pathology; Liver Disease |
| PHILIP F. HIRSCH | (5) | Endocrine Pharmacology, Calcium Metabolism |
| DAVID G. KAUFMAN | (20) | DNA Replication; Chemical Carcinogenesis |
| MARTIN R. KRIGMAN | (6) | Heavy Metal Intoxication and the Developing Nervous System; Morphometric Analysis of the Central Nervous System |
| LARRY J. LOEFFLER | (7) | Radioimmunoassays of Drugs and Metabolites; Chemistry and Design of Drugs |
| ARTHUR J. MCBAY | (8) | Analytical and Forensic Toxicology |
| TOM S. MIYA | (9) | Pharmacodynamics and Biochemical Pharmacology and Toxicology of Central Nervous System Drugs |
| LORCAN A. O'TUAMA | (23) | Neuropharmacology; Blood-Brain Barrier Physiology and Toxicology |
| JOHN P. PERKINS | (10) | Biological Regulatory Mechanisms; Cyclic Nucleotides |
| CARL M. SHY | (11) | Environmental Epidemiology; Cancer Epidemiology |
| BETSY J. STOVER | (12) | Toxicology of Radionuclides |
| WALTER E. STUMPF | (13) | Neuroendocrinology and Neuropharmacology, Autoradiography, Immunocytochemistry |

Associate Professors

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|--------------------|------|--|
| JOHN T. GATZY, JR. | (15) | Cellular Toxicology of Heavy Metals; Lung Permeability |
| BARRY GOZ | (16) | Virus and Cancer Chemotherapy |
| IRIS H. HALL | (17) | Hypolipidemic, Antifertility, Anti-inflammatory and Antineoplastic Drugs |
| CURTIS HARPER | (18) | Biochemical Toxicology |

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| DAVID J. HOLBROOK, JR. | (19) | Nucleic Acid and Protein Metabolism,
Xenobiotic Metabolism |
| PAUL MUSHAK | (22) | Trace Element Biochemistry and Analysis;
Toxicology of Heavy Metals and Drugs |
| DORIS T. POOLE | (25) | Intracellular pH |
| RONALD G. THURMAN | (26) | Drug and Alcohol Metabolism |
| ALVIS G. TURNER, JR. | (27) | Environmental Health, Aerobiology |

Assistant Professors

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|-------------------|------|---|
| MITCHELL FRIEDMAN | (28) | Pulmonary Microcirculation; Airways
Function |
| AVRAM GOLD | (29) | Structure-Reactivity Relationships in
Metabolism and Mutagenicity of
Polycyclic Aromatic Hydrocarbons |
| MILAN J. HAZUCHA | (30) | Air Pollutants; Human Studies |
| J. DOUGLAS MANN | (31) | Heavy Metal Intoxication and the Central
Nervous System |
| WILLIAM A. WARGIN | (45) | Pharmacokinetics, Drug Analysis in
Biological Fluids |

Research Associate Professor

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| RICHARD B. MAILMAN | (46) | Neurotoxicology and Neuropharmacology
of the Central Nervous System |
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Adjunct Professors

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| COLIN F. CHIGNELL | (32) | Binding of Ligands to Proteins and
Membranes; Spin Labeling |
| JOHN W. DRAKE | (33) | Mutagenesis |
| WILLIAM F. DURHAM | (34) | Toxicology of Pesticides |
| JAMES R. FOUTS | (35) | Drug Metabolism, Developmental
Pharmacology |
| LEON GOLBERG | (36) | Toxic Action of Environmental Chemicals;
Subcutaneous Carcinogenesis |
| PAUL NETTESHEIM | (37) | Pulmonary Function and Toxicology |
| MONROE E. WALL | (38) | Chemistry of Natural Products; Cancer
Chemotherapy; Cannabinoid Chemistry
and Metabolism |
| MICHAEL D. WATERS | (39) | Bioassay Systems for Toxic Substances |

Adjunct Associate Professors

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|-----------------|------|---|
| JOHN R. BEND | (47) | Xenobiotic Metabolism in Mammalian and
Marine Species; Target Organ Toxicity |
| M. ROBERT BLUM | (40) | Basic and Clinical Pharmacokinetics and
Biopharmaceutics |
| THOMAS E. ELING | (49) | Prostaglandins; Carcinogenesis; Metabo-
lism by Prostaglandin Synthetase |
| GARY E. R. HOOK | (48) | Lung Biochemistry and General
Toxicology |
| JOHN G. KELLER | (50) | Carcinogenesis Bioassays, Risk
Assessment, Regulatory Affairs |

GEORGE W. LUCIER	(41)	Biochemical Indicators of Organ-Specific Toxicity; Metabolism and Binding of Chemicals in Developing Systems
CAROL M. SCHILLER	(44)	Gastrointestinal Function and Toxicology
RICHARD M. WELCH	(42)	Role of Metabolism in Drug Toxicity

Adjunct Assistant Professor

LAWRENCE W. REITER	(43)	Behavioral Toxicology of Environmental Pollutants
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The Curriculum

The Curriculum in Toxicology administers degree programs, authorized in April 1979, leading to the award of the Doctor of Philosophy in Toxicology and the Master of Science in Toxicology. The Curriculum is an interdisciplinary program, and its faculty is drawn from various administrative units of the Schools of Medicine, Pharmacy, and Public Health. The research interests of the faculty encompass essentially all areas of toxicology and include biochemical, heavy metal, neuro-, and pulmonary toxicology, and carcinogenesis/mutagenesis. The research activities of the Curriculum in Toxicology are conducted in the laboratory facilities assigned to each faculty member by a participating administrative unit.

Applications

Applications for predoctoral studies are considered from students who have received or expect to receive a bachelor's degree or M.S. degree in a scientific discipline. A desirable background includes courses in biological sciences (including histology, and animal physiology), in chemistry (including analytical, organic and physical), and mathematics through calculus, although all of these are not absolutely essential. A strong course in general biochemistry accelerates the student's progress. Applicants are evaluated on the basis of undergraduate (and graduate) academic performance, Graduate Record Examination scores (aptitude test, and advanced test if the latter is given in the field of the undergraduate major), and letters of recommendation. Students are accepted on the basis of their achievement and potential. Special circumstances, including prior research experience and publications, are considered in individual cases in the assessment of qualifications for admission. Students are encouraged to proceed for the Ph.D. degree without an intermediate M.S. degree from the Curriculum. The Curriculum will offer a program leading to the M.S. Degree only under special circumstances.

Requirements for the Ph.D. Degree

The selection of a predoctoral student's graduate courses is influenced by that student's prior academic background. The minimum academic

courses which we consider to be desirable for graduate training in toxicology constitute approximately 38 credit hours in didactic courses including biochemistry (two courses), biostatistics, epidemiology, histology, pathology, pharmacology (two courses), physiology, toxicology (special problems), and three elective courses. In addition, each predoctoral student is expected to participate in a minimum of 12 credit hours of non-didactic training activities; i.e., two semesters of laboratory research experience prior to the doctoral research and four seminars. The satisfactory completion of appropriate courses during the prior academic career permits a student to have a greater latitude in the selection of courses.

A major requirement for the Ph.D. degree is a doctoral dissertation based on the student's independent laboratory research. Written and oral examinations are required in the fields of general toxicology and the major research interest.

Financial Aid

The Curriculum seeks to fund a limited number of predoctoral students each year. All applicants are considered for financial-aid awards. Completed applications for admission and financial aid should be received by February 1 to be considered for the fall semester.

Courses for Graduates and Advanced Undergraduates

- 123 DEVELOPMENTAL TOXICOLOGY AND TERATOLOGY (Anatomy 123) (2). Review of aspects of development which are particularly susceptible to teratogenic insults; mechanisms by which teratogens affect development. *Two lecture hours per week, spring.* Anatomy: Johnston, Pratt (Coordinators).
- 142 BIOCHEMICAL TOXICOLOGY (Biochemistry 142) (3). Prerequisite, Biochemistry 100, and one additional biochemistry course (or permission of Coordinator). Biochemical actions of toxicants, and assessment of cellular damage by biochemical measurements. Course intended primarily for graduate students. *Three lecture hours per week, spring.* Biochemistry: Holbrook (Coordinator).
- 170 MUTAGENESIS AND GENETIC TOXICOLOGY (Genetics 170) (2). Prerequisite, course in general genetics and general biochemistry. A survey of basic mechanisms of mutagenesis, its impact on populations, mutagenicity screening systems and their development. *Two lecture hours per week, spring.* Genetics: Drake, deSerres.

Courses for Graduates

- 202 PRINCIPLES OF PHARMACOLOGY AND TOXICOLOGY (Pharmacology 202) (5). Prerequisites, Biochemistry 100, Physiology 140, or their equivalents, and permission of the instructor. Introduces the major areas of pharmacology and toxicology and serves as a basis for more advanced courses. *Five lecture hours per week, spring.* Pharmacology: Goz (Coordinator).
- 207 RECENT ADVANCES IN TOXICOLOGY (Pharmacology 207) (2). Prerequisites, Pharmacology 202 or permission of the instructor. Recent advances in food additives, cardio-, hepato-, and pulmonary toxicology and the mode of action of radionuclides,

- heavy metals, toxins from plants and animals, solvents and propellants, insecticides, and halogenated hydrocarbons. *Two lecture hours per week, fall.* Pharmacology: Gatz (Coordinator).
- 209 BIOTRANSFORMATION OF XENOBIOTICS (Pharmacology 209) (2). Prerequisites, Biochemistry 100 or equivalent or Pharmacology 202 or permission of instructor. Recent advances in the mechanisms by which drugs and other foreign chemicals are metabolized to active and/or inactive products. The importance of metabolic pathways to therapy/toxicity. *Two lecture hours per week, fall.* Pharmacology: Harper, Dudley, Thurman, Fouts.
- 215 INTRODUCTION TO TOXICOLOGICAL RESEARCH (4). Prerequisite, permission of course coordinator for nonmajors. Introductory laboratory experience from research projects of limited scope to acquaint students with the experimental approaches, techniques and equipment of current research in toxicology. *May be repeated. Twelve laboratory hours per week, fall, spring and summer.* Toxicology Faculty.
- 219 SPECIAL PROBLEMS IN TOXICOLOGY (N.C. State University, Toxicology 590) (2). Orientation to the principles of toxicology (including methodology, risk assessment, and aspects of regulation and socio-economic issues) as encountered in research institutes, governmental regulatory agencies and industry. Presented at Research Triangle Park by senior scientific staff from Burroughs Wellcome Company, Chemical Industry Institute of Toxicology, Environmental Protection Agency, and National Institute of Environmental Health Sciences. *Three hours per week for 12 weeks, summer.*
- 221 SEMINAR IN TOXICOLOGY (1). Prerequisite, permission of course coordinator for nonmajors. Student-conducted presentations and discussions of recent advances in toxicology; emphasis on critical evaluation of published investigations and on organization and oral delivery of presentations. *May be repeated up to six times. One hour per week, fall and spring.* Toxicology Faculty.
- 292 SEMINAR IN CARCINOGENESIS (Pathology 292) (2). Prerequisite, permission of instructor. Survey of classical and current literature on selected critical issues in carcinogenesis. Discussions consider experimental methods and observations as well as theories and generalizations. *Two seminar hours per week, fall.* (1982 and alternate years.) Pathology: Kaufman (Coordinator).
- 301 RESEARCH IN TOXICOLOGY (3-9). *May be repeated for credit. Hours and credits to be arranged. Fall, spring and summer.* Toxicology faculty.
- 393 MASTER'S THESIS (0-9). *May be repeated. Hours and credits to be arranged. Fall, spring and summer.* Toxicology Faculty.
- 394 DOCTORAL DISSERTATION (0-9). *May be repeated. Hours and credits to be arranged. Fall, spring and summer.* Toxicology Faculty.
- 400 GENERAL REGISTRATION (0).

Registration for the following course is through Inter-Institutional Residence Credit (see pages 97-98 of this *Record*).

GENERAL PATHOLOGY FOR TOXICOLOGISTS (Duke University, Pathology 382) (3). General principles of pathology and pathobiology for graduate students in toxicology who do not have a background in medicine. Principles of cell injury, inflammation, circulatory disturbances, and neoplasia using toxicological principles and models. Prerequisites, biochemistry, physiology, microbiology and histology or by permission of the coordinator. Presented jointly by faculty members from both Duke University and this University. *Lecture and laboratory hours, fall.* D. Graham (Duke) (Coordinator).

DEPARTMENT OF ZOOLOGY¹

LAWRENCE I. GILBERT, *Chairman*

Professors

J. ALAN FEDUCCIA	(3)	Vertebrate Evolution, Avian Evolution and Paleontology
LAWRENCE I. GILBERT	(37)	Developmental Biology, Insect Physiology and Neuroendocrinology
NELSON G. HAIRSTON	(30)	Population Biology, Community Ecology, Evolution
JOHN H. HARRISON		Protein Chemistry, Enzyme Mechanisms, Structure Function Relationships
CHARLES E. JENNER	(7)	Marine Invertebrate Zoology, Aquatic Ecology, Photoperiodism
H. EUGENE LEHMAN	(8)	Invertebrate Larvae, Embryology and Evolution
JOHN C. LUCCHESI	(10)	Molecular Genetics, Biochemical Regulation in <i>Drosophila</i>
ELIZABETH A. MCMAHAN	(11)	Terrestrial Biology, Insect Diversity in Salt Marshes
HELMUT C. MUELLER	(13)	Animal Behavior, Predator-Prey Interactions Behavioral Ecology, Migration
REINHARD M. RIEGER	(15)	Invertebrate Evolution, Meiofauna, Marine Invertebrate Zoology
DARREL W. STAFFORD	(17)	Biochemistry of Development, Gene Control: Ribosomal Genes
ALAN E. STIVEN	(18)	Population and Community Ecology: Regulation Processes in Salt Marsh and Stream Systems
R. HAVEN WILEY	(20)	Animal Behavior, Social Organization, Communication

Associate Professors

W. E. BOLLENBACHER	(38)	Invertebrate Neuroendocrinology
ALBERT K. HARRIS	(5)	Embryology, Cytology, Morphogenetic Movements
JOHN K. KOEPE	(32)	Cell Physiology, Invertebrate Endocrinology, Protein Synthesis
GUSTAVO P. MARONI	(33)	Biochemical Genetics, Genic Regulation, <i>Drosophila</i>
DONALD W. MISCH	(12)	Cell Biology, Electron Microscopy, Membranes
CHARLES H. PETERSON		Ecology and Population Interactions

1. With recommendation of the Department and the approval of the Administrative Board of the Graduate School, special courses and the direction of graduate studies are offered by members of the staff of the Institute of Marine Sciences.

SETH R. REICE	(14)	Systems Ecology, Mathematical Modeling, Stream Ecology
EDWARD D. SALMON	(34)	Cell Biology, Mechanisms of Mitosis and Cell Motility, Barobiology
JOANN WHITE	(19)	Population Biology, Evolutionary Biology, Insect Ecology

Assistant Professor

PATRICIA J. PUKKILA	(35)	Mechanisms in Genetic Recombination, Eukaryotic Genome Organization
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Associated Faculty

BURKE HAYCOCK JUDD	(36)	Chromosome Organization, Gene Function and Regulation, Recombination Mechanisms
RONALD W. OPPENHEIM		Behavioral and Neural Embryology, Hatching Behavior in Birds
WOLFGANG E. STERRER		Invertebrate Evolution, Ecology of Meiofauna
AUSTIN B. WILLIAMS	(23)	Crustacea

Emeritus Professors

DOUGLAS G. HUMM
CLAIBORNE S. JONES
MAURICE WHITTINGHILL

The Department of Zoology offers programs of study leading to the degrees of Master of Arts, Master of Science, and Doctor of Philosophy. The curricula are primarily designed for students who plan to continue for the Ph.D. A master's degree may be taken as part of the program leading to the Ph.D. in this or other departments; however, a master's degree is not an essential part of the doctoral program.

The Master of Arts is a research degree and as such is valuable preparation for advanced study toward the Ph.D. It also prepares one for positions as research or technical assistants in colleges, universities, medical schools, and institutes for biological research. Students desiring a master's degree for teaching in high schools and junior colleges are referred to the Master of Arts in Teaching in the School of Education.

The Master of Science degree differs from the M.A. in requiring a written report based upon library research in lieu of the master's thesis. It may be taken as a terminal degree or as preparation for research for the Ph.D.

The Doctor of Philosophy prepares one for independent research in special areas of biology and qualifies one for teaching in colleges and universities and for research positions in private, industrial or governmental institutes, laboratories and experimental stations.

Graduate Program and Facilities

The Department of Zoology is housed in a modern building and is well equipped for graduate instruction and research in:

Behavior, Ecology and Evolutionary Biology, including *Ecology and Population Biology*, (Focusing on life histories, photoperiodism, population and systems phenomena in terrestrial, freshwater and marine ecosystems); *Behavior* (with emphasis on behavior of social insects, social and mating systems of vertebrates, communication, ecology and ontogeny of behavior, and predator-prey interactions); *Marine Biology* (with emphasis on marine ecology, oceanography, and the biology of interstitial fauna); and *Vertebrate and Invertebrate Zoology* (with emphasis on development, ecology, systematics, evolution, and paleontology).

Cell, Genetic and Developmental Biology, including *Biochemistry and Molecular Biology* (with emphasis on development, protein synthesis, and enzyme mechanisms and control); *Cytology and Cell Biology* (with special emphasis on mitotic mechanisms, histochemistry and ultrastructure); *Developmental Biology* (with emphasis on vertebrate and invertebrate development, larval stages, metamorphosis, experimental morphogenesis, morphogenetic movements, and tissue culture); *Genetics* (with emphasis on developmental and molecular genetics); *Physiology* (with emphasis on the comparative endocrinology of higher invertebrates).

The research facilities include general laboratory and special instrumentation required for instruction and experimentation in the areas listed as research courses 300 or higher.

Students in *Marine Biology*, after completing required course work in the department, have access to the research facilities of the Institute of Marine Sciences, Morehead City, N.C. Additional opportunities for marine studies are provided by the facilities of the Wrightsville Biomedical Marine Laboratory. By cooperative arrangements, deep water research can be carried out through the use of the research vessel, *Cape Hatteras*, of the Duke Marine Laboratory.

Interdepartmental degree programs in *Genetics*, *Ecology*, *Neurobiology*, and *Marine Science* offer unusual opportunities for special training through participation of staff from the Department of Zoology and many other departments in Arts and Sciences and Health Affairs.

The departmental library subscribes to the major American and foreign journals related to the fields of research direction in the department. It has a good working collection of treatises, monographs, the more important symposium volumes, and a large collection of reprints; among the latter are included the H. V. Wilson and E. N. Harvey Collections. The botany and medical libraries are nearby and contain most biological references not included in the departmental holdings.

A major research asset is the central location of the University in the state which makes the varied fauna and flora of the Smoky Mountains, Piedmont Plateau, Coastal Plain and Atlantic Coast all accessible for research and instruction. The department operates a small field station a few miles from the Chapel Hill campus surrounded by several hundred acres of upland and floodplane habitats.

Requirements for Admission and Graduate Appointments

Applications for admission and graduate appointments accompanied by credentials and Graduate Record Examinations scores should be submitted by February 1.

Requirements for admission to graduate study in zoology include: (a) the general prerequisites of the Graduate School as stated on pages 49-51; (b) an overall B average or better in undergraduate courses which will include eight courses in biology, two courses each in mathematics, physics and organic chemistry, and two courses in a modern foreign language; (c) satisfactory scores on the verbal, quantitative and advanced sections of the Graduate Record Examinations.

Departmental Awards

Graduate Teaching Fellowship, with duties totaling 12 hours per week including 6 laboratory contact hours and 6 hours of other services associated with instruction.

Graduate Teaching Assistantships, with duties totaling 12 to 15 hours per week including 6 laboratory contact hours and 6 to 9 hours of preparation or other services associated with instruction.

Research Assistantships, salaries and duties variable as determined by research needs of the faculty. Applications for these appointments must be made personally to faculty members directing grant supported research.

H. V. Wilson Marine Scholarship, a nonservice award for summer graduate study at a marine laboratory.

University Awards

Several special service and nonservice appointments are made each year by the Graduate School from applicants recommended to the Graduate School by University departments.

Awards restricted to first-year graduate students include First-Year-Graduate Fellowships with stipend plus tuition, and Limited Service awards requiring the payment of tuition and fees, and limited duties not in excess of 10 hours per week.

Requirements for the Master of Arts and Master of Science

A minimum of 30 semester hours of graduate credit beyond those counted for the bachelor's degree are required. It is recommended that at least 6 of these hours be taken in courses outside the department. If a student elects a minor, all 9 hours of the minor must (by Graduate School regulations) be taken outside the department.

The master's curriculum will include: (a) a minimum of 30 semester hours including courses recommended at the time of a preliminary oral evaluation, (b) at least one zoology course in an approved area of specialization, (c) at least one zoology seminar, (d) research in a field numbered 300 or higher not to exceed 6 hours credit, (e) a written examination to be taken no later than the fourth semester of residence, (f) an approved thesis prepared in acceptable form presenting the results of original research (M.A.), or an approved library report (M.S.), and (g) a final oral examination.

Completion of the program for the master's degree will usually take more than one year but generally not more than two years.

Requirements for the Doctor of Philosophy

Students taking their Ph.D. degree through the Department of Zoology graduate program are expected to possess a breadth of knowledge of the basic concepts and principles of biology, as well as a high degree of comprehension of their special field within biology. Each must acquire professional competence, command of the literature, and mastery of techniques necessary for scholarly research in one of the subdisciplines of biology. Each must be capable of experimental design, independent research, objective evaluation, and literary competence in the preparation of the Ph.D. dissertation. No amount of course work alone will qualify one for the doctor's degree.

Students are encouraged to take appropriate courses in other departments. If a student elects a minor, all 15 hours of the minor must (by Graduate School regulations) be taken outside the department. Graduate courses taken for a master's degree may, with approval after passing the doctoral oral examination, be credited towards the doctoral program.

The doctoral curriculum will include: (a) zoology courses recommended at the time of the preliminary oral evaluation, (b) a zoology seminar each semester, (c) research in an approved area of zoology numbered 300 or higher and continued as long as is necessary to acquire material for an acceptable doctoral dissertation, (d) a doctoral written and (e) a doctoral oral examination to be taken no later than the fourth semester of residence, (f) a defense of dissertation oral examination, and finally (g) laboratory teaching equivalent to 6 contact hours per week for at least two semesters or until teaching competence is acquired.

Courses for Graduates and Advanced Undergraduates

- 104 VERTEBRATE EMBRYOLOGY (3). Prerequisite, Zoology 52. Principles of development with special emphasis on gametogenesis, fertilization, cleavage, germ layer formation, organogenesis, and mechanisms with experimental analysis of developmental process. *Three lecture hours a week, fall.* Lehman, Harris.
- 104L VERTEBRATE EMBRYOLOGY LABORATORY (1). Prerequisite or corequisite, Zoology 104. Descriptive and some experimental aspects of vertebrate development. *Three laboratory hours a week, fall.* Lehman, Harris.
- 105 INTRODUCTION TO THE INVERTEBRATES (4). Prerequisites, Zoology 11, 11L and one additional course in Zoology. The biology of animals in the major invertebrate phyla including structure, function, classification and ecology. *Three lecture and three laboratory hours a week, fall.* Jenner, Rieger.
- 106 ADVANCED INVERTEBRATE ZOOLOGY (4). Prerequisites, Zoology 11, 11L, and 105 or permission of instructor. The biology of animals in the minor invertebrate phyla with emphasis on interrelationships of all phyla. *Three lecture and three laboratory hours a week, spring.* Jenner, Rieger.
- 107 BIOCHEMISTRY FOR STUDENTS OF BIOLOGY AND CHEMISTRY (Biochemistry 100) (3). Prerequisites, Zoology 11, 11L, or one course in biological science, and Chemistry 11, 11L, 21, 61, 62. The mechanisms and regulation of reactions in living organisms with emphasis on general principles, protein structure, enzyme function, intermediary metabolism, metabolic controls, genetic expression, and metabolic disease. *Three lecture hours a week, fall and spring.* Staff (Biochemistry).
- 107L BIOCHEMISTRY LABORATORY (2). Prerequisite or corequisite, Zoology 107. Experiments on cell growth, subcellular fractionation, isolation and kinetic studies on enzymes, intermediary metabolism, the preparation and biosynthesis of macromolecules, fractionation of lipids, and modern biochemical techniques. *Four laboratory hours a week, fall and spring.* Staff (Biochemistry).
- 109 INTRODUCTION TO HYDROBIOLOGY (4). Prerequisite, Zoology 54 or 105, or permission of the instructor. A study of the biology of aquatic organisms with emphasis on freshwater communities. *Two lecture and six laboratory and field hours a week, spring.* (Alternate years.) Jenner.
- 110 GENERAL PARASITOLOGY (4). Prerequisites, Zoology 11, 11L and 105 or one additional course in Zoology. A comparative study of structure, life cycles and classification of parasites of invertebrates and vertebrates with laboratory methods for the collection, culture, and microscope preparation of parasitological materials. *Two lecture and four laboratory hours a week, spring.* (Alternate years.) Hendricks (Parasitology, School of Public Health).
- 114 AVIAN BIOLOGY (3). Prerequisites, Zoology 11, 11L and one additional course in Zoology, or permission of the instructor. A study of avian evolution, zoogeography, migration patterns, behavior, food and feeding habits, and a survey of the families of birds of the world with emphasis on North Carolina avifauna. *Three lecture hours a week, fall.* (Alternate years, or on demand.) Feduccia.
- 114L AVIAN BIOLOGY LABORATORY (1). Prerequisite or corequisite, Zoology 114. Avian anatomy, field biology, and a study of the birds of North Carolina. *Three laboratory hours a week, fall.* (Alternate years, or on demand.) Feduccia.
- 116 POPULATION BIOLOGY (3). Prerequisite, Zoology 54. Introduction to the structure, interactions, and evolution of biological populations. *Three lecture hours a week, fall or spring.* White.
- 118 COMPARATIVE ANIMAL HISTOLOGY (3). Prerequisite, Zoology 52. An evolutionary survey of cell specializations in invertebrates and vertebrates; structure, function and formation of the major animal tissue types, and comparative histology of the

- principal invertebrate and vertebrate organ systems. *Three lecture hours a week, fall.* (Alternate years.) Rieger.
- 118L COMPARATIVE ANIMAL HISTOLOGY LABORATORY (1). Prerequisite or corequisite, Zoology 118. Preparation and study of major tissue types and organizations in selected vertebrates and invertebrates with demonstrations of modern histological microtechniques. *Three laboratory hours a week, fall.* (Alternate years.) Rieger.
- 120 COMPARATIVE PHYSIOLOGY (3). Prerequisites, Zoology 52, 53 or 62; one course in Physiology is recommended. Comparative physiology of the major organ systems with emphasis on common principles underlying homeostasis. *Three lecture hours a week, spring.* (Alternate years.)
- 120L COMPARATIVE PHYSIOLOGY LABORATORY (1 to 3). Corequisite, Zoology 120, and permission of the instructor. Instrumentation and techniques in comparative physiology. *Hours and credits by prior agreement (with two to three laboratory hours a week per unit credit), fall.*
- 122 HUMAN GENETICS (3). Prerequisite, Zoology 53. Applications of traditional and contemporary methods of genetic analysis to matters of human concern; pedigree analysis, population genetics, tissue transplants, immunogenetics, somatic cell genetics, and recombinant DNA in medical applications. *Three lecture hours a week, fall or spring.* Maroni.
- 125 INTRODUCTION TO NEUROPHYSIOLOGY (3). Prerequisite, Zoology 52, or permission of the instructor. The neurophysiological basis of behavior with emphasis on structure and function of membranes, neurons, synapses, and complex functional units of nervous system. *Three lecture hours a week, on occasion.* Staff.
- 126 OCEANOGRAPHY (Marine Science 101; Environmental Science 127) (3). Prerequisites, Zoology 11 or Botany 11, and Chemistry 21 and Physics 25, or permission of the instructor. An interdisciplinary study of the sea and the interrelationships of marine processes. *Three lecture hours a week, fall.* Neumann (Marine Sciences); Kuenzler (Environmental Sciences).
- 128 TOPICS IN MEMBRANE BIOLOGY (3). Prerequisites, Zoology 52 and Chemistry 62, or permission of the instructor. The structure and function of various biological membranes. *Three lecture and discussion hours a week, fall.* (Alternate years.) Misch.
- 132 COMPARATIVE VERTEBRATE ENDOCRINOLOGY (3). Prerequisite, Zoology 52 or 62. Principles of systems endocrinology with consideration of the developmental anatomy and physiology of glands of internal secretion with special emphasis on hormone chemistry and gland relationships. *Three lecture hours per week, spring.* Bollenbacher.
- 134 INVERTEBRATE DEVELOPMENT AND EVOLUTION (Marine Sciences 134) (3). Prerequisites, Zoology 52 or 105 or permission of the instructor. A survey of diversity in animal development and life cycles with emphasis on free-living marine invertebrates. *Three lecture hours a week, fall.* (Alternate years.) Lehman.
- 134L INVERTEBRATE DEVELOPMENT LABORATORY (Marine Sciences 134L) (1). Prerequisite or corequisite, Zoology 134. Laboratory experience in obtaining, culturing, and identifying embryonic, larval and planktonic materials, with emphasis on free-living marine forms. *Two scheduled and two or more independent laboratory hours a week, spring.* (Alternate years.) Lehman.
- 140 BIOLOGICAL OCEANOGRAPHY (Marine Sciences 104; Environmental Sciences 136) (4). Prerequisites, Zoology 54 or 105, or permission of the instructor. Physical, chemical, and biological factors characterizing estuarine and marine environments emphasizing factors controlling animal and plant populations including methods of analysis, sampling and identification. *Three lecture and two laboratory hours a week, spring.* Frankenberg (Marine Sciences).

- 141S SPECIAL PROBLEMS IN MARINE BIOLOGY (Marine Sciences 141S) (3 to 6). Prerequisite, Zoology 140 and/or permission of instructor. Comprehensive survey of problems and laboratory methods in any of the following areas: Mollusca (Chestnut), Vertebrate (Fahy, Schwartz), Fungi (Kohlmeyer), Ecology (Peterson). *Hours and credits by prior agreement (with five or more laboratory and conference hours a week per unit credit), first or second summer terms (offered on demand at Morehead City, N.C.).* Staff of Institute of Marine Sciences.
- 144 DEVELOPMENTAL BIOLOGY (3). Prerequisites, Zoology 52 and Chemistry 61. An experimental approach to an understanding of the action of chemical mediators in controlling cell growth and cell differentiation. *Three lecture hours per week, spring in alternate years.* Gilbert.
- 146 MARINE ECOLOGY (Marine Sciences 146) (3). Prerequisites, Zoology 54, or 105, or permission of the instructor. An introductory study of oceanography as it pertains to the ecology of marine organisms. *Three lecture hours a week, spring.* Rieger and Peterson.
- 150 ANIMAL SOCIETIES AND COMMUNICATION (3). Prerequisite or corequisite, Zoology 73, or permission of the instructor. Comparative review of animal societies; diversity of social structure, social dynamics, communications, ecology, and evolution of social organization. *Three lecture hours a week, fall.* (Alternate years.) Wiley.
- 150L ANIMAL SOCIETIES AND COMMUNICATION LABORATORY (3). Prerequisite or corequisite, Zoology 150 and permission of the instructor. Techniques for analysis of animal social behavior and communication. *Six laboratory hours a week, fall.* (Alternate years.) Wiley.
- 151 BEHAVIORAL ECOLOGY (3). Prerequisites, Zoology 54 or 73, or permission of the instructor. Behavioral aspects of population regulation, territory, competition, habitat selection, predator-prey relationships, and other eco-ethological problems. *Three lecture hours a week, spring.* (Alternate years.) Mueller.
- 154 COMPARATIVE INVERTEBRATE ENDOCRINOLOGY (3). Prerequisites, Zoology 52 and Chemistry 61, and permission of the instructor. An experimental analysis of the means by which invertebrates regulate growth, development and reproduction, with emphasis on the chemistry and mode of action of hormones in arthropods. *Three lecture hours per week, spring, in alternate years.* Gilbert.
- 156 MARINE INVERTEBRATE FIELD ZOOLOGY (4). Prerequisites, Zoology 105 or 134, and permission of the instructor. Biological aspects of selected groups of marine invertebrates (especially of the North Carolina coast) with assistance from visiting specialists. Content will change with each offering and the course may be repeated with credit. *Three lecture and three laboratory hours a week, with two weekend field trips to the North Carolina coast, one three-day cruise on the research vessel Eastward, and one field trip to the Florida Keys during spring recess, spring.* (Alternate years.) Jenner.
- 158 EVOLUTIONARY PATTERNS (3). Prerequisites, Zoology 54, or 116, and permission of the instructor. A discussion of principles of evolution, including theories of the relationship between ecological processes and the predictability of evolution. *Three lecture hours a week, spring.* Hairston.
- 159 MARINE MEIOBENTHOLOGY (4). Prerequisites, Zoology 105, and permission of the instructor. A detailed survey of meiobenthic invertebrates; environments considered include sandy beaches, mudflats, *Spartina* marshes and mangrove swamps, with field trips to the North Carolina coast, and (on occasion) to Georgia and/or Florida Keys. *Two lecture and three laboratory hours a week, fall (on demand).* Rieger.
- 160A ADVANCED GENETICS: DEVELOPMENTAL (3). Prerequisite, Zoology 53. The genetic control and molecular basis for gene expression during development. *Three lecture hours a week, fall.* (1981.) Lucchesi.

- 160B ADVANCED GENETICS: MOLECULAR GENETICS OF EUKARYOTES (3). Prerequisite, Zoology 53 or permission of the instructor. The physical and genetic organization of the genome of higher organisms, gene expression and its regulation with discussion of methodologies and specific examples. *Three lecture hours a week, fall.* (1982.) Pukkila.
- 160L ADVANCED GENETICS LABORATORY (3). Prerequisites, Zoology 53 and permission of the instructor. Methods of developmental, biochemical and cytogenetics; each student will develop an individual project in the laboratory of one of the instructors. *Six laboratory hours a week, fall.* Lucchesi, Maroni, or Pukkila (with 160A or 160B).
- 164 MOLECULAR BIOLOGY (3). Prerequisite or corequisite, Chemistry 61. The nature, production, and replication of biological compounds and their relation to structure and function in development. *Three lecture hours a week (on occasion).* Stafford.
- 166 UNSOLVED PROBLEMS IN CELLULAR BIOLOGY (3). Prerequisite, Zoology 52 or 53, or permission of the instructor. A survey of areas of current interest in cytology, embryology, and genetics with concentration on problems which remain unsolved, but which appear to be near solution. *Three lecture and discussion hours a week, fall.* (Alternate years.) Harris.
- 168 BIOPHYSICAL CYTOLOGY (3). Prerequisites, Zoology 52 or permission of the instructor. Emphasis on theory and application of analytical and quantitative methods in light and electromicroscopy; molecular and structural probes of dynamic changes in organization in living cells. *Three lecture and demonstration hours a week, spring 1982 and alternate years.* Salmon.
- 168L BIOPHYSICAL CYTOLOGY LABORATORY (3). Prerequisite or corequisite, Zoology 168 and permission of the instructor. Laboratory experience in quantitative polarization, interference and fluorescence microscopy; photometry; video recording techniques and methods in micromanipulation and microinjection. Each student will develop an individual research project. *Six laboratory hours a week, fall or spring.* Salmon.
- 169 METHODS IN CELL BIOLOGY (3). Prerequisites, Zoology 52 and Chemistry 62, and permission of the instructor. Survey of the theory and biochemical analysis of biologically important molecules, including chromatographic, electrophoretic and radioimmunological methods and radio-tracer methodology. *Three hours a week, fall.* Bollenbacher.
- 170S ELECTRON MICROSCOPY (4). Permission of the instructor. Introduction to ultrastructure and optical bases of microscopy with basic methods for the preparation of biological materials for ultrastructural studies. *Four and one-half lecture and fifteen laboratory hours a week, summer session (on occasion or demand).* Misch.
- 174 ADVANCED PHYSIOLOGY (3). Prerequisites, Zoology 62, 120, or permission of instructor. Lectures in selected areas of Physiology. Exact topics will vary from year to year. May be repeated with credit. *Three lecture hours a week, fall or spring.* (Alternate years.) Koeppel.
- 175 SPECIAL TOPICS (3). Prerequisite, permission of the instructor. Lectures by visiting faculty, usually on the exchange program with the University of Vienna. Topic will change with each offering; may be repeated for credit. *Three lecture and discussion hours a week, fall or spring (on occasion).* Visiting staff.
- 185 POPULATION ECOLOGY (3). Prerequisite, Zoology 54, or permission of instructor. An advanced treatment of topics in animal population and community ecology, stressing analytical and interpretation approaches. Topics will vary from year to year and the course may be repeated with credit. *Three lecture and discussion hours per week, fall or spring (yearly).* Stiven or White.

- 185L LABORATORY IN POPULATION ECOLOGY (2). Corequisite, Zoology 185 and permission of instructor. Methodology in the analysis and interpretation of population and community phenomena. *Six laboratory and field hours per week, fall or spring (yearly)*. Stiven or White.
- 186 SYSTEMS ECOLOGY (3). Prerequisite, Zoology 54 or permission of instructor. The ecosystem approach to ecology, Specific topics will vary but may include: mathematical modeling of ecological systems, spatial and temporal heterogeneity in ecosystems, the interaction of community structure and function, decomposition, freshwater ecology. *Three lecture hours per week, fall or spring (yearly)*. Reice.
- 186L SYSTEMS ECOLOGY LABORATORY (2). Corequisites, Zoology 186 and permission of instructor. Ecosystem modeling and computer simulation; ecosystem analysis in the field. Individual and group projects. *Six laboratory and field hours per week, fall or spring (yearly)*. Reice.
- 199 SENIOR SEMINAR (2). Prerequisite, or corequisite, Zoology 99, or a B average in previous Zoology courses, and permission of the instructor. Presentation and discussion of research papers of current interest. May not be counted to satisfy a major course requirement for the BA or BS in Zoology. *Two hours a week, fall and spring*. Staff.

(Zoology majors with at least a B average in Zoology, who need fewer than fifteen hours to complete the bachelor's degree may take one or two courses at the 200-level for the purpose of later receiving graduate credit, with the approval of the instructor and the Graduate School.)

Courses for Graduates

- 204 EXPERIMENTAL METHODS IN VERTEBRATE EMBRYOLOGY (3). Prerequisite, Zoology 104, or permission of the instructor. Laboratory techniques for parthenogenesis, hybridization, tissue culture, transplantation, chorioallantoic grafting and other experimental techniques for embryological research. *Six laboratory and conference hours a week, fall or spring (on demand)*. Lehman.
- 205 FUNCTIONAL CYTOLOGY (3). Prerequisite, Zoology 118 or permission of the instructor. Protoplasmic organization revealed by microscopic and submicroscopic structure as related to metabolic, synthetic, and replicating systems in cells. *Three lecture and discussion hours a week, spring*. (Alternate years.) Misch.
- 205L METHODS IN CYTOLOGICAL ANALYSIS (2). Prerequisites, Zoology 118 and permission of the instructor. Laboratory techniques for identification and localization of cell constituents including carbohydrates, lipids, proteins, minerals, enzymes and cellular organelles. *Six laboratory hours a week, spring*. (Alternate years.) Misch.
- 207 INTRODUCTION TO NEUROBIOLOGY (Neurobiology 107) (3). Prerequisites, one course in biological science and permission of the Director of the Neurobiology Program. Topics to be considered are: Organization of the nervous system, neurochemistry; neurophysiology; neuropharmacology; neurogenetics; computers. *Three lecture hours a week, fall*. (Alternate years.) Staff (Neurobiology).
- 213 ADVANCED MARINE ECOLOGY (3). Prerequisites, Zoology 109 and 146, or 146 and special permission of the instructor. A study of the organisms of coastal waters in relation to their physical, chemical, and biotic environments. *Six lecture, seminar, or laboratory hours a week, and one or more field trips to the coast, spring*. Jenner, Rieger, and Staff of the Institute of Marine Sciences.
- 218 EXPERIMENTAL ENDOCRINOLOGY (Neurobiology 218) (2). Prerequisites, permission of the instructor. A survey of hormonal and neural mechanisms in vertebrates and invertebrates; the comparative anatomy and physiology of neurons and functional units of nervous systems; endocrine structure, function, and mode of hormone action. *Six laboratory hours a week, spring*. (Alternate years.)

- 220 ADVANCED CELLULAR PHYSIOLOGY (3). Prerequisites, Zoology 120 and permission of the instructor. The physiochemical aspects of protoplasm, including permeability, surface tension, pH, cellular metabolism and other measurable properties of living cells. *Three lecture and discussion hours a week, fall (on occasion or demand)*. Humm.
- 220L EXPERIMENTAL METHODS IN CELLULAR PHYSIOLOGY (2). Prerequisites or corequisites, Zoology 120 or 220 and permission of the instructor. Laboratory techniques in micro-respiration, spectrophotometry, chromatography, and identification and metabolism of subcellular fractions. *Six or more laboratory hours a week, fall (on occasion or demand)*. Humm.
- 224 CHARACTERIZATION OF BIOLOGICAL MACROMOLECULES (3). Prerequisite or corequisites, Zoology 164, or permission of the instructor. Isolation and characterization of cellular extracts, chromatography, and use of radioactive tracers including autoradiography. *Six or more laboratory hours a week (on occasion)*. Stafford.
- 225 EXPERIMENTAL NEUROPHYSIOLOGY (Neurobiology 225) (3). Prerequisite, permission of the instructor. *Six or more laboratory hours a week (on occasion)*. Staff (Neurobiology).
- 227 SPECIAL TOPICS IN PHYSIOLOGY (3). Prerequisites, Zoology 120 or the equivalent and permission of the instructor. Lecture and seminar consideration of selected advanced aspects of physiology. Topics will vary from year to year; may be repeated with credit. *Two lecture and one seminar hour a week, spring*. Humm or Koeppel.
- 240S ICHTHYOLOGY (5). Prerequisites, Zoology 103 and permission of the instructor. A course in anatomy, embryology, distribution, ecology, taxonomy, and evolution of marine and freshwater fishes. *Five lecture and five laboratory hours a week, second summer session (on demand)*. Schwartz (at the Institute of Marine Sciences).
- 241S TECHNIQUES FOR SAMPLING MARINE FISHES (1). Corequisite, Zoology 240S and permission of the instructor. Design, history, theory, and practice of equipment used in sampling marine organisms; a variety of devices will be used in field exercises. *Six laboratory hours a week, second summer session (on demand)*. Schwartz (at the Institute of Marine Sciences).

The following seminars will survey the current literature, concepts and theories in their respective fields and may be repeated for credit.

- 250 SPECIAL SEMINAR (2). Prerequisite, permission of the professor. Consideration of special topics in Zoology. *Fall or spring (as occasion demands)*. Staff.
- 253 SEMINAR IN EMBRYOLOGY (2). Prerequisite, Zoology 104 or permission of the instructor. *Fall and/or spring*. Harris, Lehman.
- 254 SEMINAR IN CYTOLOGY (2). Prerequisite, Zoology 118 or permission of the instructor. *Fall and/or spring*. Harris, Misch, Salmon.
- 255 SEMINAR IN ECOLOGY (2). Prerequisite, Zoology 102 or permission of the instructor. *Fall and/or spring*. Hairston, Reice, Stiven, White.
- 256 SEMINAR IN INVERTEBRATE ZOOLOGY (2). Prerequisite, Zoology 105 or 106, or permission of the instructor. *Fall and/or spring*. Jenner, Rieger.
- 257 SEMINAR IN EVOLUTIONARY BIOLOGY (2). Prerequisite, permission of the instructor. *Fall and/or spring*. Feduccia.
- 258 SEMINAR IN CELLULAR PHYSIOLOGY (2). Prerequisite, Zoology 120 or 121, or permission of the instructor. *Fall and/or spring*. Humm.
- 259 SEMINAR IN COMPARATIVE ANIMAL BEHAVIOR (Neurobiology 259) (2). *Fall and/or spring*. McMahan, Mueller, Wiley.

- 260 SEMINAR IN COMPARATIVE PHYSIOLOGY (Neurobiology 260) (2). Prerequisite, Zoology 120 or permission of the instructor. *Fall and/or spring.*
- 261 SEMINAR IN ANALYTICAL CYTOLOGY AND ULTRASTRUCTURE (2). Prerequisite, permission of the instructor. *Fall and/or spring.* Misch.
- 264 SEMINAR IN MOLECULAR BIOLOGY (2). Prerequisites, Zoology 110, 164, 120, 121, or permission of the instructor. *Fall and/or spring.* Stafford.
- 265 SEMINAR IN MARINE BIOLOGY (2). Prerequisite, permission of the instructor. *Fall and/or spring.* Jenner, Rieger.
- 266 SEMINAR IN NEUROPHYSIOLOGY (2). Prerequisite, permission of the instructor. *Fall and/or spring.* Koeppel; staff (Neurobiology Curriculum).
- 270 SEMINAR IN GENETICS (2). Prerequisite, permission of the instructor. *Fall and spring.* Lucchesi, Maroni, Pukkila.
- 275 GENETIC SYSTEMS (Genetics 275) (3). Required of all candidates for the degree in Genetics. *Fall.* (Alternate years.) Lucchesi, Maroni, Pukkila and Staff of Genetics Curriculum.
- 290 SEMINAR IN NEUROBIOLOGY (Biochemistry 290, Neurobiology 290, Pathology 290, Pharmacology 290, and Physiology 290) (3). Prerequisites, one graduate course in the biological sciences and permission of the instructor. *Three lecture hours a week, fall and/or spring.* Staff (Neurobiology Curriculum).

Courses numbered above 299 require the permission of the professor and are designed for applicants for advanced degrees. Research may be continued for two or more semesters under the same course number. Each course six or more laboratory and conference hours a week, fall and spring.

- 299 INTRODUCTION TO GRADUATE RESEARCH (3). Graduate research for six weeks in two laboratories. Designed primarily for first year students to acquaint them with research techniques and to assess their propensity for research. Arranged by mutual agreement of students and faculty members during fall orientation. May be repeated once with credit. *Six to nine hours per week, fall and spring.* Staff.
- 300 RESEARCH IN CYTOLOGY AND CELL BIOLOGY (3 or more). Harris, Koeppel, Misch, Salmon.
- 301 RESEARCH IN ECOLOGY (3 or more). Jenner, McMahan, Mueller, Rieger, Stiven, White, Reice, Hariston.
- 302 RESEARCH IN NEUROBIOLOGY (Neurobiology 310, Biochemistry, Pathology, Pharmacology, and Physiology 310) (3 or more). Mueller, Wiley, members of the Neurobiology Curriculum from the above listed departments.
- 303 RESEARCH IN ETHOLOGY AND ANIMAL BEHAVIOR (3 or more). McMahan, Mueller, Wiley.
- 304 RESEARCH IN EMBRYOLOGY (3 or more). Harris, Lehman.
- 305 RESEARCH IN GENETICS (Genetics 305) (3 or more). Maroni, Lucchesi, Pukkila.
- 306 RESEARCH IN MARINE SCIENCES (MASC 300) (3 or more). Jenner, Rieger.
- 307 RESEARCH IN MARINE SCIENCES (at the Institute of Marine Sciences in Morehead City, N.C.) MOLLUSCA, CRUSTACEA, ICHTHYOLOGY, OCEANOGRAPHY (3 or more). Approval by Department of Zoology required. Chestnut, Fahy, Schwartz, Woods.
- 308 RESEARCH IN MOLECULAR BIOLOGY (3 or more). Humm, Koeppel, Stafford.
- 309 RESEARCH IN PHYSIOLOGY: CELLULAR, COMPARATIVE, NEUROPHYSIOLOGY (3 or more). Humm, Koeppel, Salmon.
- 310 RESEARCH IN VERTEBRATE OR INVERTEBRATE ZOOLOGY (3 or more). Feduccia, Jenner, Rieger.

- 393 MASTER'S THESIS (3 or more). *Fall and spring*. Staff.
394 DOCTORAL DISSERTATION (3 or more). *Fall and spring*. Staff.
400 GENERAL REGISTRATION (0).

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