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**BULLETIN  
of  
NORTH CAROLINA  
AGRICULTURAL AND TECHNICAL  
STATE UNIVERSITY  
USPS 401-070**

**Greensboro**



**GRADUATE  
SCHOOL  
1987-1989**



**BULLETIN OF NORTH CAROLINA AGRICULTURAL  
AND TECHNICAL STATE UNIVERSITY**

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Graduate School Office  
Room 122—Gibbs



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Edward B. Fort  
Chancellor

## TO: STUDENTS AND PROSPECTIVE STUDENTS

North Carolina Agricultural and Technical State University is a unique comprehensive state-supported University. It is the only comprehensive University in this State which has both a School of Engineering and a School of Agriculture—in consonance with its land-grant tradition. In addition, strong program offerings are provided in the College of Arts and Sciences, and the Schools of Business and Economics, Education and Nursing. And, the Graduate School continues with its nationally known uniqueness. Additionally, the new School of Technology places emphasis upon programs designed to accommodate the University's Hi-Tech Mode. Consequently, matriculating students are provided unique and varied programmatic offerings.

The University has a distinguished faculty—one committed to excellence in teaching, research and public service. Moreover, its Alumni Association is one of the most active and productive alumni organizations in the State and Nation. Its support for the University and its mission has been exemplary.

This Catalogue provides specific information you will need to know about the University. However, a University is more than its program offerings, its faculty, its students, its alumni or its campus. This University can best be described as one committed to excellence. North Carolina Agricultural and Technical State University—the Institution—would be a barren place without its adherence to that thesis. And that, of course, is what contributes to its heritage and tradition. It is depicted in the lives of both the Institution's Torchbearers as well as the outstanding men and women who left the University their legacy. The heritage and traditions of the University are evident in every facet of University life. When one combines this heritage with the quality of our faculty, the campus commitment to excellence and the soundness of our mission related programs, one readily discerns the greatness of the campus.

I commend this spirit, these programs and this University to all students and prospective students.

Edward B. Fort  
Chancellor

## **NONDISCRIMINATION POLICY AND INTEGRATION STATEMENT**

North Carolina Agricultural and Technical State University 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, North Carolina Agricultural and Technical State University is open to people of all races and actively seeks to promote racial integration by recruiting and enrolling a larger number of white students.

North Carolina A&T State University supports the protections available to members of its community under all applicable Federal Laws, including Titles VI and VII of the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, Sections 799A and 845 of the Public Health Service Act, the Equal Pay and Age Discrimination Acts, the Rehabilitation Act of 1973, and Executive Order 11246.

## 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 of 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 multi-campus 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 1960's 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.

# ORGANIZATION OF THE UNIVERSITY

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The University of North Carolina

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David J. Whichard, II, *Vice Chairman*  
Mrs. Geneva Bowe, *Secretary*

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Ms. Ruth Dial Woods

## Members Emeriti

William A. Dees, Jr.  
William A. Johnson

# NORTH CAROLINA AGRICULTURAL AND TECHNICAL STATE UNIVERSITY

## HISTORICAL STATEMENT

North Carolina Agricultural and Technical State University was established as the A. and M. College for the "Colored Race" by an act of the General Assembly of North Carolina ratified March 9, 1891. The act read in part:

That the leading object of the institution shall be to teach practical agriculture and the mechanic arts and such branches of learning as relate thereto, not excluding academical and classical instruction.

The College began operation during the school year of 1890-91, before the passage of the state law creating it. This curious circumstance arose out of the fact that the Morrill Act passed by Congress in 1890 earmarked the proportionate funds to be allocated in biracial school systems to the two races. The A. and M. College for the White Race was established by the State Legislature in 1889 and was ready to receive its share of funds provided by the Morrill Act in the Fall of 1890. Before the college could receive these funds, however, it was necessary to make provisions for Colored students. Accordingly, the Board of Trustees of the A. and M. College in Raleigh was empowered to make temporary arrangements for these students. A plan was worked out with Shaw University in Raleigh where the College operated as an annex to Shaw University during the years 1890-1891, 1891-1892, and 1892-1893.

The law of 1891 also provided that the College would be located in such city or town in the State as would make to the Board of Trustees a suitable proposition that would serve as an inducement for said location. A group of interested citizens in the city of Greensboro donated fourteen acres of land for a site and \$11,000 to aid in constructing buildings. This amount was supplemented by an appropriation of \$2,500 from the General Assembly. The first building was completed in 1893 and the College opened in Greensboro during the fall of that year.

In 1915 the name of the institution was changed to The Agricultural and Technical College of North Carolina by an Act of the State Legislature.

The scope of the college program has been enlarged to take care of new demands. The General Assembly authorized the institution to grant the Master of Science degree in education and certain other fields in 1939. The first Master's degree was awarded in 1941. The School of Nursing was established by an Act of the State Legislature in 1953 and the first class was graduated in 1957.

The General Assembly repealed previous acts describing the purpose of the College in 1957, and redefined its purpose as follows:

"The primary purpose of the College shall be to teach the Agricultural and Technical Arts and Sciences and such branches of learning as related thereto; the training of teachers, supervisors, and administrators for the public schools of the State, including the preparation of such teachers, supervisors and administrators for the Master's degree. Such other programs of a professional or occupational nature may be offered as shall be approved by the North Carolina Board of Higher Education, consistent with the appropriations made therefor."

The General Assembly of North Carolina voted to elevate the College to the status of a Regional University effective July 1, 1967.

On October 30, 1971, the General Assembly ratified an Act to consolidate the Institutions of Higher Learning in North Carolina. Under the provisions of this Act, North Carolina Agricultural and Technical State University became a constituent institution of The University of North Carolina effective July 1, 1972.

Six presidents have served the Institution since it was founded in 1891. They are as follows: Dr. J.O. Crosby (1892-1896), Dr. James B. Dudley (1896-1925), Dr. F.D.

Bluford (1925-1955), Dr. Warmoth T. Gibbs (1956-1960), Dr. Samuel DeWitt Proctor (1960-1964), and Dr. Lewis C. Dowdy, who was elected President April 10, 1964. Dr. Cleon F. Thompson, Jr., served as Interim Chancellor of the Institution from November 1, 1980 until August 31, 1981. Dr. Edward B. Fort assumed Chancellorship responsibilities on September 1, 1981.

## **HISTORY AND PURPOSE OF THE GRADUATE SCHOOL**

Graduate education at North Carolina A. and T. State University was authorized by the North Carolina State Legislature in 1939. The authorization provided for training in agriculture, technology, applied science and other applied areas of study. An extension of the graduate program, approved by the General Assembly of North Carolina in 1957, provided for enlargement of the curriculum to include teacher education, as well as such other programs of a professional or occupational nature as might be approved by the North Carolina Board of Higher Education.

On July 1, 1967, the Legislature of North Carolina approved regional university status for the institution and renamed it North Carolina Agricultural and Technical State University. Since that time, we have been called a comprehensive and even more recently a research entity as many of our programs are involved in significant research efforts. The graduate responsibilities of institutions so labeled are to prepare teachers, supervisors, and administrators for master's degrees, to offer master's degree programs in the liberal arts and sciences and to conduct such other programs as are deemed necessary to meet the needs of its constituency and of the state.

The University awarded its first master's degree in 1941 to Woodland Ellroy Hall. Since that time, nearly 6,000 students have received this coveted degree of advanced studies. A significant number of these graduates have gone on to other universities to achieve the prestigious doctorate degree in their chosen specialties. More than a dozen or so of these graduates have returned to augment the academic acclaim of this institution at the undergraduate and graduate levels.

The Graduate School through its various disciplines is affiliated with the American Chemical Society, the Accreditation Board for Engineering and Technology, Inc. (ABET), the National Council for the Accreditation of Teacher Education, The Council of Graduate Schools and other prestigious regional and national academic bodies. In addition, many graduate faculty members are associated with distinguished academic and professional organizations that have international relationships.

The Graduate School has an integrated faculty and student body and draws students from all over the world. It coordinates advanced course offerings in all departments within the School of Agriculture, the School of Education, the College of Arts and Sciences, the School of Engineering, and the School of Technology. Thus, the Graduate School offers advanced study for qualified individuals who wish to improve their competency for careers in professions related to agriculture, humanities, education, social studies, science, and technology. Such study of information, techniques and skills is provided through curricula leading to the Master of Science or Master of Arts degree and through institutes and workshops designed for those who are not candidates for a higher degree. Second, the Graduate School provides a foundation of knowledge and of techniques for those who wish to continue their education in doctoral programs at other institutions. Third, the Graduate School assumes the responsibility of encouraging scholarly research among students and faculty members.

It is expected that, while studying at this university, graduate students (1) will

acquire special competence in at least one field of knowledge; (2) will develop further their ability to think independently and constructively; (3) will develop and demonstrate the ability to collect, organize, evaluate and report facts which will enable them to make a scholarly contribution to knowledge about their discipline; and (4) will make new application and adaptations of existing knowledge so as to contribute to their profession and to humankind.

**ORGANIZATION**

**Graduate School Council**

The Graduate School Council is responsible for formulating all academic policies and regulations affecting graduate students, graduate courses, and graduate curricula. The council consists of the chairpersons of the departments offering concentrations in graduate studies, the deans of the schools offering graduate instruction, the Director of the Summer School, the Vice Chancellor for Academic Affairs, the Director of Admissions, the Director of Registration and Records, and the Director of Teacher Education, five graduate students elected from the Association of Graduate Students, and five faculty members selected from the graduate faculty. The Dean of the Graduate School serves as chairperson of the council.

**ADVISORY COMMITTEES OF THE GRADUATE SCHOOL**

Standing committees of the Graduate School are organized to advise the Council on matters pertaining to present policies, to evaluate existing and proposed programs of study, and to process student petitions relating to academic matters. These committees are:

- Committee on Admissions and Retention
- Committee on Curriculum
- Committee on Publications
- Committee on Rules and Policy

**NORTH CAROLINA AGRICULTURAL AND TECHNICAL STATE UNIVERSITY**

**BOARD OF TRUSTEES**

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Roy Harris	.....	<i>Greensboro</i>
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Otis Tillman	.....	<i>High Point</i>

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## OFFICERS EMERITI

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Warmoth T. Gibbs, A.B., Ed.M., LL.D. ....	<i>President Emeritus</i>

## GRADUATE COUNCIL MEMBERS

1987-88

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WALTER WRIGHT, Ph.D. ....	<i>Chairperson, Department of Chemistry</i>

## THE CITY

The City of Greensboro offers a variety of cultural activities and recreational facilities. It has become known for its colleges and universities, art galleries and museum.

The Memorial Auditorium and Coliseum attract outstanding athletic events, concerts, and other popular events. The City offers facilities for bowling, boating, fishing, horseback riding, tennis and golf.

## THE PHYSICAL PLANT

The university campus comprises modern, fire resistant buildings, all thoroughly maintained for the highest level of efficiency, located on land holdings in excess of 181 acres.

### UNIVERSITY BUILDINGS

Lewis C. Dowdy Building (Administration)  
Dudley Memorial Building  
F.D. Bluford Library  
Harrison Auditorium  
Charles Moore Gymnasium  
Coltrane Hall (Headquarters for N.C. Agriculture Extension Service)  
Memorial Union  
The Oaks (President's Residence)  
Corbett Sports Center

### CLASSROOM AND LABORATORY BUILDINGS

Carver Hall ..... School of Agriculture  
Cherry Hall ..... School of Engineering  
Crosby Hall ..... College of Arts and Sciences  
Gibbs Hall ..... Social Sciences & School of Graduate Studies  
Hodgin Hall ..... School of Education  
Marteena Hall ..... Mathematics & Physics  
Merrick Hall ..... School of Business and Economics  
Noble Hall ..... School of Nursing  
Price Hall ..... Division of Industrial Education and Technology  
Benbow Hall ..... Home Economics  
Garret House ..... Home Economics  
Hines Hall ..... Chemistry  
Sockwell Hall ..... Agricultural Technology  
Ward Hall ..... Dairy Manufacturing  
Reid Greenhouses  
Graham Hall ..... School of Engineering  
Frazier Hall ..... Music—Art  
Price Hall ..... Division of Industrial Education & Technology  
Price Hall Annex ..... Child Development Laboratory  
Campbell Hall ..... ROTC Headquarters  
Barnes Hall ..... Biology  
Ronald McNair Engineering Building ..... School of Engineering  
Burleigh C. Webb Hall ..... School of Agriculture

### RESIDENCE HALLS

Barbee Hall	Morrow Hall (200)	Morrison Hall (94)
Cooper Hall (400)	Haley Hall	Scott Hall (1010)
Curtis Hall (148)	Holland Hall (144)	Vanstony Hall (200)

### SERVICE BUILDINGS

Murphy Hall ..... Student Services  
Brown Hall ..... Post Office  
Sebastian Infirmary  
T.E. Neal Heating Plant  
Laundry — Dry Cleaning Plant  
William Hall ..... Cafeteria  
Clyde DeHuguley Physical Plant Building

## OTHER FACILITIES

University Farms — including 600 acres of land and modern farm buildings

Athletic field — including three practice fields for football, quarter mile track, baseball diamond and field house.

## DEGREES GRANTED

The Graduate School of North Carolina A. and T. State University offers the following degrees:

### MASTER OF ARTS

English and Afro-American Literature

### MASTER OF SCIENCE

1. Adult Education
2. Agricultural Economics
  - A. Agricultural Marketing
  - B. Production Economics
  - C. Rural Development
3. Agricultural Education
4. Applied Mathematics
5. Biology
6. Chemistry
7. Education
  - A. Administration
  - B. Curriculum Instructional (Supervision) Specialist
  - C. Educational Media
  - D. Elementary Education
    1. Early Childhood Education
    2. Elementary Education
    3. Intermediate Education
  - E. Secondary Education
    1. Art
    2. Biology
    3. Chemistry
4. English
5. History
6. Mathematics
7. Health & Physical Education
8. Reading
9. Social Science
- F. Guidance
  1. Agency Counseling
  2. Counselor Education
  3. Human Resource Counselor
8. Architectural Engineering
9. Electrical Engineering
10. Engineering
11. Industrial Engineering
12. Mechanical Engineering
13. Plant Science
14. Food and Nutrition
15. French
16. Technology Education
  - A. Industrial Arts Education
  - B. Vocational Industrial Education
17. Safety & Driver Education

# ADMISSION AND OTHER INFORMATION

## ADMISSION TO GRADUATE STUDY

All applicants for graduate study must have earned a bachelor's degree from a four-year college. Application forms must be submitted to the Graduate School Office with two transcripts of previous undergraduate and graduate studies. Processing of applications cannot be guaranteed unless they are received, with all supporting documents, in the Graduate Office at least fifteen days before a registration period. Applicants may be admitted to graduate studies unconditionally, provisionally, or as special students. Applicants are admitted without discrimination because of race, color, creed, or sex.

### Unconditional Admission

To qualify for unconditional admission to graduate studies, an applicant must have earned an over-all average of 2.6 on a 4 point system (or 1.6 on a 3 point system) in his/her undergraduate studies. In addition, a student seeking a degree in Agricultural Education, Elementary Education, Industrial Education, or Secondary Education must possess, or be qualified to possess, a Class A Teaching Certificate in the area in which he/she wishes to concentrate his/her graduate studies. A student seeking a degree with concentration in Administration or Guidance must possess, or be qualified to possess, a Class A Teaching Certificate. See certification except for Vocational-Industrial Education (post secondary/private industry).

### Provisional Admission

An applicant may be admitted to graduate studies on a provisional basis if (1) he/she earned his/her baccalaureate degree from a non-accredited institution or (2) the record of his/her undergraduate preparation reveals deficiencies that can be removed near the beginning of his/her graduate study. A student admitted provisionally may be required to pass examinations to demonstrate his/her knowledge in specified areas, to take specified undergraduate courses to improve his/her background, or to demonstrate his/her competence for graduate work by earning no grades below "B" in his/her first nine hours of graduate work at this institution.

### Special Students

Students not seeking a graduate degree at A. and T. may be admitted in order to take courses for self-improvement or for renewal of teaching certificate if said students meet standard Graduate School entrance requirements. If a student subsequently wishes to pursue a degree program, he/she must request an evaluation of his/her record. The Graduate School reserves the right to refuse to accept towards a degree program credits which the candidate earned while enrolled as a special student; in no circumstances may the student apply towards a degree program more than twelve semester hours earned as a special student.

## HOUSING

The university maintains six residence halls for women and three for men. A request for dormitory housing accommodation should be directed to the Dean of Students at least sixty days prior to the expected date of registration.

## FOOD SERVICES

The university provides food service for students at minimum cost. A cafeteria and a snack bar are operated at convenient locations on the campus. Students who live in the residence halls are required to eat in the cafeteria.

## **IMMUNIZATION RECORD REQUIRED OF ALL GRADUATE STUDENTS**

Both the State of North Carolina and North Carolina Agricultural and Technical State University require that an Immunization Record be filed by all entering graduate students. No applicant is exempt from this requirement and this information is due in the University's Health Center at least 30 days before the individual expects to enroll. Immunization forms may be picked up at the Graduate Office or mailed upon request. For students who have been accepted, a form is mailed to them with an explanation of this requirement. Completed forms are returned to:

University Physician  
Sebastian Infirmary  
North Carolina A. and T. State University  
Greensboro, N. C. 27411

## **DRUG EDUCATION POLICY**

### **PREAMBLE:**

The basic mission of North Carolina Agricultural and Technical State University is to provide an educational environment that enhances and supports the intellectual process. The academic community, including students, faculty and staff have the collective responsibility to ensure that this environment is conducive to healthy intellectual growth. The illegal use of harmful and addictive chemical substances poses a threat to the educational environment. Thus, this Drug Education Policy is being promulgated to assist members of the University community in their understanding of the harmful effects of illegal drugs; the incompatibility of illegal drugs with the educational mission of the University and the consequences of the use, possession or sale of such illegal drugs.

### **OBJECTIVES:**

- I. To develop an educational program that increases the University community's knowledge and competency to make informed decisions relative to the use and abuse of controlled substances
- II. To increase those skills and attributes required to take corrective action conducive to the health and well-being of potential drug abusers.

### **PROGRAM COMPONENTS:**

There are three (3) components to this policy:

- I. Education
- II. Rehabilitation
- III. Sanctions

### **EDUCATION**

It is the intent of the Drug Education Policy of North Carolina A&T State University to insure that all members of the University community (i.e. students, faculty, administrators and other employees) are aware that the use, sale and/or possession of illegal drugs are incompatible with the goals of the University. Moreover, each person should be aware that the use, sale or possession of illegal drugs is, as more specifically set forth later in this policy, subject to specific sanctions and penalties.

Each member of the University family is reminded that in addition to being subject to University regulations and sanctions regarding illegal drugs, they are also subject to the laws of the State and of the nation as they pertain to such drugs. Each individual is also reminded that it is not a violation of "double jeopardy" to be subject

to the terms of this policy as well as the provisions of the North Carolina General Statutes. For a complete listing of relevant State criminal statutes please consult the Office of the University Attorney or the Office of Student Affairs.

From a medical perspective you are reminded also that illegal drug usage, in addition to being habit forming or addictive, can and may cause damage to the body.

Furthermore, each member of the University community is asked to pay particular attention to the full consequences of the sanctions specified in this policy as well as the consequences of the North Carolina criminal law referenced above. Certain violations may jeopardize an individual's future as it relates to continued University enrollment or future employment possibilities, depending on individual circumstances.

It is further a policy of the University that the educational, legal and medical aspects of this issue will be emphasized on an annual basis through the providing of programs and activities in the following areas:

- (a) Annual Drug and Alcohol Education Week—Workshops and seminars on drug abuse led by former drug addicts and community agencies such as MADD, SADD, and Drug Action Council;
- (b) Drug Awareness Fair;
- (c) Media presentations emphasizing the most current programs with drug education messages;
- (d) Exhibits featuring drug related paraphernalia;
- (e) Sixty (60) second radio spots on University radio station, WNAA, on drug abuse education;
- (f) Publication of brochure on drug education;
- (g) Continuous monthly outreach programs in each residence hall.

Although directed primarily to the student population, the above noted educational programs shall also be open to participation by all categories of University employees.

Additionally, the Staff Development Office is the designated University department responsible for the planning and implementation of drug education programs geared toward the special needs of the faculty and staff. Among the programs to be implemented by the Staff Development Office include lunch time seminars jointly conducted by the Drug Action Council, Greensboro Police Department and the Guilford County Mental Health Department.

## **REHABILITATION**

The University recognizes that rehabilitation is an integral part of an effective drug policy. Consistent with its commitment in the areas of education and sanctions, it is the University's intent to provide an opportunity for rehabilitation to all members of the University family. This commitment is evidenced through access to existing University resources and is furthered by referrals to community agencies.

### **STUDENTS:**

The University Counseling Center and the Student Health Center are available to provide medical and psychological assessments of students with drug dependency problems. Based on the outcome of this assessment, treatment can be provided by either or both of these centers. If, however, the scope of the problem is beyond the capability of these Centers, affected students will be referred to community agencies such as Guilford County Mental Health Center and the Drug Action Council. The cost of such services shall be the individual's Responsibility.

### **EMPLOYEES:**

The Services of the Counseling and Health Centers are not normally utilized by faculty and staff members except in emergency situations. This will also hold true

for employees with drug related problems. If these problems are of an emergency nature, services will be made available to affected employees. Otherwise, referrals to local community agencies will be made available. The cost of such services will be the individual's responsibility.

## SANCTIONS

All members of the University community have the responsibility for being knowledgeable about and in compliance with the provisions of North Carolina Law as it relates to the use, possession or sale of illegal drugs as set forth in Article 5, Chapter 90 of the North Carolina General Statutes. Any violations of this law by members of the University family subjects the individual to prosecution both by the University disciplinary proceedings and by the civil authorities. It is not a violation of "double jeopardy" to be prosecuted by both of these authorities. The University will initiate its own disciplinary proceedings against a student, faculty member, administrator or other employee when the alleged conduct is deemed to affect the interests of the University.

Penalties will be imposed by the University in compliance with procedural safeguards applicable to disciplinary actions against students (see the Student Handbook), faculty members (see the Faculty Handbook), administrators (see the Board of Governors Policies Concerning Senior Administrative Officers as well as the EPA Non-Teaching Personnel Policies) and SPA employees (see State Personnel Commission Personnel Policies).

The penalties imposed for such violations range from written warnings with probationary status to expulsion from enrollment and discharges from employment. However, minimum penalties that apply for each violation follow:

a. *Trafficking in Illegal Drugs*

- (1) For the illegal manufacture, sale, delivery, or possession with intent to manufacture, sell or deliver, of any controlled substance identified in Schedule I, N. C. General Statutes 90-89, or Schedule II, N. C. General Statutes 90-90 (including, but not limited to, heroin, mescaline, lysergic acid diethylamide, opium, cocaine, amphetamine, methaqualone), any student shall be expelled and any faculty member, administrator or other employee shall be discharged.
- (2) For a first offense involving the illegal manufacture, sale or delivery, or possession with intent to manufacture, sell or deliver, of any controlled substance identified in Schedules III through VI, N. C. General Statutes 90-91 through 90-94, (including, but not limited to, marijuana, pentobarbital, codeine) the minimum penalty shall be suspension from enrollment or from employment for a period of at least one semester or its equivalent. For a second offense, any student shall be expelled and any faculty member, administrator, or other employee shall be discharged.

b. *Illegal Possession of Drugs*

- (1) For a first offense involving the illegal possession of any controlled substance identified in Schedule I, N. C. General Statutes 90-89, or Schedule II, N. C. General Statutes 90-90, the minimum penalty shall be suspension from enrollment or from employment for a period of at least one semester or its equivalent.
- (2) For a first offense involving the illegal possession of any controlled substance identified in Schedule III through VI, N. C. General Statutes 90-91 through 90-94, the minimum penalty shall be probation, for a period to be determined on a case-by-case basis. A person on probation must agree to participate in a drug education and counseling program, consent to regular drug testing, and accept such other conditions and restrictions, including a program of community service, as the Chancellor or the Chancellor's designee.

nee deems appropriate. Refusal or failure to abide by the terms of probation shall result in suspension from enrollment or employment for any unexpired balance of the prescribed period of probation.

- (3) For second or other subsequent offenses involving the illegal possession of controlled substances, progressively more severe penalties shall be imposed, including expulsion of students and discharge of faculty members, administrators or other employees.

It should be noted that where the relevant sanction dictates a minimum of one semester suspension from employment, the regulations of the State Personnel Commission (as pertaining to SPA employees) do not permit suspension from employment of this duration. Thus, such sanction as applied to SPA employees dictates the termination of employment.

## **SUSPENSION PENDING FINAL DISPOSITION**

The University reserves the right through the Chancellor or his designee to suspend a student, faculty member, administrator and other employees between the time of the initiation of charges and the hearing to be held. Such decision will be made based on whether the person's continued presence within the University community will constitute a clear and immediate danger or disruption to the University. In such circumstances the hearing will be held as promptly as possible.

## **CONCLUSION**

A&T State University recognizes that the use of illegal drugs is a national problem and that sustained efforts must be made to educate the University family regarding the consequences associated with drug abuse. The primary emphasis in this policy has therefore been on providing drug counseling and rehabilitation services through the various programs and activities outlined above.

Past experience suggests that most members of the University family are law abiding and will use this policy as a guide for their future behaviors and as a mechanism to influence their peers and colleagues in a positive direction. However, those who choose to violate any portions of this policy will pay the penalty for non-compliance. The main thrust of this policy has been to achieve a balance between its educational and punitive components.

The effective implementation of this policy rests on its wide dissemination to all members of the University family. This will be accomplished through its publication in the faculty handbook, student handbook and University catalogue. Additionally, all affected individuals will be assured that applicable professional standards of confidentiality will be maintained at all times.

## **RESIDENCE CLASSIFICATION FOR PURPOSES OF APPLICABLE TUITION DIFFERENTIALS**

Residence classification for tuition purposes are set forth by law in North Carolina as follows:

G.S. 116-143.1—(The controlling North Carolina Statute) “To qualify as a resident for tuition purposes, a person must have established legal residence (domicile) in North Carolina and maintained that legal residence for at least 12 months immediately prior to his or her classification as a resident for tuition purposes.” This Statute also sets forth statutory definitions, rules, and special provisions for determining resident status for tuition purposes. These provisions include special rules with respect to persons who are married or who are within identified subclasses of minors.

University regulations concerning the classification of students by residence, for

purposes of applicable tuition differentials, are set forth in detail in *A Manual To Assist The Public Higher Education Institutions of North Carolina in the Matter of Student Residence Classification for Tuition Purposes*. Each student is responsible for knowing the contents of that Manual, which is the controlling administrative statement of policy on this subject. Copies of the Manual are available on request in The Office of Admissions of A. and T. State University for purposes of student inspection.

## FINANCIAL ASSISTANCE

### Graduate Assistants

A limited number of graduate assistantships are available to qualified individuals. The student is assigned to assist a professor or a department fifteen hours per week for the duration of the assistantship. Some graduate assistants are assigned to teach freshman classes. Normally, a graduate assistant will be assigned to teach only one class per semester, but he/she may be assigned to teach a maximum of two. The assistantship offers a stipend that will assist a student to pay required tuition, fees, book, board, and lodging. Application for an assistantship must be made to the Dean of the Graduate School at least five months before fall registration. Only full-time graduate students are eligible.

### Other Assistance

Funds, such as the National Direct Student Loan Fund, are available in limited quantity for students. Requests for information concerning these funds should be directed to the Graduate School. The newest kind of financial assistance available is the Minority Presence Grant. Under the Board of Governors general Minority Presence Grant Program, white students may be eligible for special financial assistance if they are residents of North Carolina, enrolled for at least three hours of degree-credit coursework, and demonstrate financial need.

## EXPENSES

The fee charged to a full-time student carrying nine or more semester hours of work are the same as those charged to full-time undergraduate students. For one academic year, a state resident should expect to pay \$999.00 which will cover tuition and course fees; this sum does not include room and board charges. Tuition and course fees for an out-of-state student carrying a full schedule will total \$4,837.00 for the academic year. Current room and board rates are \$1,099.00 per semester.

As student fees are subject to change without prior notice, it is suggested that the Cashier's Office be consulted for complete information concerning charges for full- and part-time students.

### Special Fees

Fee for processing application (required only for first application for graduate studies) .....	\$15.00
Late Registration .....	20.00
Graduation fees:	
Diploma .....	15.00
Regalia .....	20.00
Transcript .....	2.00
Master's Thesis binding fee .....	20.00

**Auditing**

To audit a course, a student must obtain permission from the Dean of the Graduate School and must submit the necessary forms during the registration period. A part-time student must pay all fees, including tuition, that would be charged to a student taking the course for credit. A full-time student is not required to pay any additional fees for auditing. A change from "credit" registration to "audit" will not be permitted after the close of the deadline date for withdrawing from a course. An auditor is not required to participate in class discussions, prepare assignments, or take examinations.

**SCHEDULE OF DEADLINES**

The Graduate School provides schedules of specific dates for completing various requirements for a degree program. These notices are not sent to individual automatically, but may be found in the calendar of the Graduate School, available upon request.

**REQUEST FOR GRADE REPORTS AND TRANSCRIPTS**

The Office of Registration and Records is the official record keeping office at the college. Requests for official statements regarding courses completed, grade reports, or transcripts should be directed to that office.

**REQUEST FOR GRADUATE COURSE DESCRIPTIONS**

Course descriptions are available upon request from the Dean of the Graduate School.

# GENERAL REGULATIONS

## ADVISING

Until he/she is assigned to an advisor after he/she has been accepted as a candidate in a degree program, a graduate student is advised by a member of the graduate faculty appointed by the Dean of the Graduate School. The student, however, should consult and follow the curriculum guide prepared for his/her area of concentration. Separate curriculum guide sheets are available in the office of the department offering the concentration. They may be secured also from the Graduate School Office.

“Special” students are advised by members of the graduate faculty appointed by the Dean of the Graduate School.

## CLASS LOADS

### Full-Time Students

Class loads for the full-time student may range from 9 to 15 semester hours during a regular session of the academic year. The maximum load is 15 semester hours.

### In-Service Teachers

The maximum load for a fully employed in-service teacher must not exceed six semester hours during any academic year.

### University Staff

The maximum load for any fully employed member of the university faculty or staff will be six semester hours for the academic year.

## CONCURRENT REGISTRATION IN OTHER INSTITUTIONS

A student registered in a degree program in this Graduate School may not enroll concurrently in another graduate school except upon permission, *secured in advance*, from the Dean of the Graduate School.

## GRADING SYSTEM

Grades for graduate students are recorded as follows: A, excellent; B, average; C below average; F, failure; S, work in progress (for courses in research); I, INCOMPLETE; W, withdrawal.

1. In order to earn a degree, a student must have a cumulative average of “B” (a grade point average of 3.0 on a system in which 1 hour of A earns 4 grade points).
2. A graduate student automatically goes on probation when his/her cumulative average falls below “B.”
3. A student may be dropped from the degree program if he/she has not been removed from probation after two successive terms as a full-time student.
4. A student may not repeat a required course in which “C” or above was earned.
5. A student may repeat a required course in which “F” was earned. A student may not repeat the course more than once. If a student fails a second time, he/she is dismissed from the degree program.
6. All hours attempted in graduate courses and all grade points earned are included in the computation of the cumulative average of a graduate student.
7. A student who stops attending a course but fails to withdraw officially may be assigned a grade of “F.”

8. All grades of "I" must be removed during the student's next term of enrollment.
9. A student may not count towards a degree program any course in which a grade of "F" was earned.

Note: The North Carolina State Department of Public Instruction does not accept courses in which a student has received a "D" or "F" for renewal of certification.

### **PROFESSIONAL EDUCATION REQUIREMENTS FOR CLASS A TEACHING CERTIFICATE**

In all graduate degree programs except those leading to professional non-teaching specialties, the advanced education student at A. and T. State University must hold a Class A Certificate before being admitted to candidacy.

To provide the professional education component for the student who enters graduate studies without the required credits in courses in education and who is pursuing a teaching program for the secondary school level, the following program of 24 semester hours is offered: Education 625, Education 400 (Psychological Foundations of Education), Guidance 600 and the Student Teaching Block; Education 500 (Principles and Curricula of Secondary Schools, the appropriate subject methods course, Education 624 and Education 560 (Observation and Student Teaching).

Students who have earned some but not enough undergraduate credits in education and students without "A" certificates who are seeking graduate degrees in early childhood education (Kindergarten-grade 3) should consult with the chairman of the Department of Education or the Dean of the Graduate School to work out programs to meet certification requirements.

To provide the professional education component for Vocational-Industrial Education students who enter graduate studies without the required course credits in education and who are pursuing a teaching program in Trade and Industrial Education, the following program of 24 semester hours is offered: Industrial Education 566, 662, 663, 765, 766; Education 400, 624; Agricultural Education 401.

Students who are entering the graduate program in Vocational-Industrial Education without a Class A certificate should consult with the graduate coordinator of the Department of Industrial Education to work out a specific program that will meet certification requirements. Students seeking a Masters degree in Industrial Education may be required to take undergraduate courses in education and technical options to fulfill certification requirements. Students entering the masters program in Industrial Education who are teaching in technical institutes, community colleges, and from the industrial sector will not be required to meet state certification requirements for candidacy or completion of the Masters degree in Industrial Education.

While taking undergraduate courses in education and psychology to meet certification requirements, a student may enroll in graduate-level courses in his subject matter area of concentration if he has completed the undergraduate requirements in that area.

### **SUBJECT-MATTER REQUIREMENTS FOR CLASS A TEACHING CERTIFICATE**

If a student has not completed sufficient undergraduate courses in a subject-matter field to hold a Class A certificate in that subject, he should consult with the chairman of the department offering that concentration. Together, they must work out a program to satisfy the undergraduate deficiencies by means of undergraduate courses or courses open to undergraduates and graduates.

# REGULATIONS FOR A MASTER'S DEGREE

## ADMISSION TO CANDIDACY FOR A DEGREE

Admission to graduate studies does not guarantee admission to candidacy for a degree. In order to be qualified as a candidate for a degree, a student must have a minimum overall average of 3.0 in at least nine semester hours of graduate work at A. and T., must have removed all deficiencies resulting from undergraduate preparation, and must have passed the Qualifying Essay. Some departments require additional qualifying examinations.

In order to be classified as a candidate for a Master of Science in Engineering degree, a student must have a minimum overall average of 3.0 in at least nine semester hours of approved graduate work at A. and T. and must have removed all deficiencies resulting from undergraduate preparation.

The following is the procedure for securing admission to candidacy:

1. The student secures application forms for admission to candidacy from the Graduate Office, fills them out, and returns them to that office. This step should be taken as soon as possible after the student has decided upon a degree program.
2. The Graduate Office processes the application, notifies the student of the action, and informs him/her of the time when the Qualifying Essay will next be administered.
3. The student may take the Qualifying Essay during the first term of residence in graduate studies. If a student fails the Qualifying Essay, he/she may take it a second time. After a second failure the student must enroll in a prescribed English composition course (English 300 for 621) at this university and must earn a grade of "C" or above.
4. The Graduate Office informs the student of any qualifying examinations required by the department in which he is concentrating his studies.
5. After the student has completed at least nine semester hours of graduate study at the college, he/she becomes eligible for admission to candidacy. If, at that time, he/she has maintained an average of 3.0 in graduate studies, has passed the Qualifying Essay and all departmental qualifying examinations, the Graduate School informs the student that he/she has been admitted to candidacy and assigns him/her to an advisor in his/her field of concentration.

In order to be eligible for graduation during a term, a student must have been admitted to candidacy no less than fifteen days prior to the deadline for filing for graduation during that term.

## CREDIT REQUIREMENTS

The minimum credit requirements for a graduate degree are thirty semester hours for students in thesis and non-thesis programs. It is expected that a student can complete a program by studying full-time for an academic year and one additional summer term or by studying full-time during four nine-week summer sessions.

The minimum credit requirements for a Master of Science in Engineering are thirty semester hours for students who elect to take the thesis option and thirty-three semester hours for students who take the non-thesis option.

## RESIDENCE REQUIREMENTS

A minimum of three-fourths of the hours required for the degree must be earned in residence study at the university.

## **TIME LIMITATION**

The graduate program must be completed within six successive calendar years. Programs remaining incomplete after this time interval are subject to cancellation, revision, or special examination for out-dated work.

When the program of study is interrupted because the student has been drafted into the armed services, the time limit shall be extended for the length of time the student shall have been on active duty, if the candidate resumes graduate work no later than one year following his/her release from military service.

## **COURSE LEVELS**

At the University, six-digit numbers are used to designate all course offerings. The last three digits indicate the classification level of the course. Courses numbered 600 through 699 are open to seniors and to graduate students. Courses numbered 700 and above are open only to graduate students. At least fifty percent of the courses counted in the work towards a Master's degree must be those open only to graduate students; that is, numbered 700 and above.

## **TRANSFER OF CREDIT**

A maximum of six semester hours of graduate credit may be transferred from another graduate institution if (1) the work is acceptable as credit toward a comparable degree at the institution from which transfer is sought, and (2) the courses to be transferred are approved by the Dean of the Graduate School.

To request a transfer of credit, the student must complete an application in the Graduate School Office. It will be the applicant's responsibility to request from the appropriate institution(s) a statement certifying that the work is acceptable as credit toward a comparable degree. The transcript should then be sent to the Graduate School Office of A. and T. State University.

## **FINAL COMPREHENSIVE EXAMINATION**

At least 45 days before a candidate expects to complete all work for the graduate degree, the candidate should file in the Graduate office an application for a final examination.

1. All graduate students are required to pass a written comprehensive examination in their area of speciality.  
In case of Engineering students, the School of Engineering will recommend to the graduate school whether or not this comprehensive examination will be oral or written.
2. Students pursuing a degree of M.S. in Education, subject-matter oriented, will take a comprehensive examination in two parts, subject-matter and professional education. The evaluation will be made by the faculties in the respective areas.
3. If a student fails a comprehensive examination twice, he/she must petition for a third examination. The petition is reviewed by a committee from the student's major concentration. A student who fails a third time is dismissed from the degree program.
4. Comprehensive examinations are to be scheduled by the departments, with the approval of the Graduate Office. A report of the student's performance must be submitted to the Graduate Office at least one month prior to Commencement.

## OPTIONS FOR DEGREE PROGRAM

The student, in consultation with his/her advisor, selects the degree program to be followed. The advisor must notify the chairperson of the department of the program plan which the candidate prefers to follow.

### **Thesis Option**

In order for a student to pursue a thesis program, he/she must be recommended to the Dean of the Graduate School by his/her advisor and the chairperson of the department in which a student is concentrating his/her studies. The Graduate School must then approve the student as a candidate. The thesis program consists of thirty semester hours including the thesis. After receiving written approval to follow the thesis option, the candidate shall prepare and present the thesis proposal to the advisor. Upon the request of the advisor, the Dean of the Graduate School shall appoint a Thesis Proposal Committee and shall fix a time of meeting. Following acceptance of the proposal, the advisor must submit to the Dean of the Graduate School an approved copy of the proposal in its final form. Individuals who have been granted the privilege of following the thesis option are expected to demonstrate research competencies and to prepare a scholarly account of resulting data.

### **Non-Thesis Option**

The non-thesis plan is offered to the candidate who may benefit more from a broader range of studies than from the preparation of a thesis. The program of study must consist of a minimum of 30 credit hours of prescribed courses.

Individuals who are following this plan must demonstrate their ability to conduct and to report the results of original research by preparing a paper as a part of the course Special Problems or Research or Seminary in the appropriate area.

### **Thesis Option [Master of Science in Engineering]**

In order for a student to pursue a thesis program, he/she must be recommended to the Dean of the Graduate School by the Dean of the School of Engineering. The Graduate School must then approve the student as a candidate. The thesis program consists of thirty semester hours including the thesis. After receiving written approval to follow the thesis option, the candidate shall prepare and present the thesis proposal to the chairperson of his/her Advisory Committee. Following acceptance of the proposal, an approved copy of the proposal in its final form must be submitted to the Dean of the Graduate School.

### **The Non-Thesis Option [Master of Science in Engineering]**

The non-thesis plan is offered to the candidate who may benefit more from a broader range of studies than from the preparation of a thesis. The program of study must consist of a minimum of 33 credit hours of prescribed courses.

## MASTER'S THESIS AND FORMAT

The following are regulations for a Master's thesis and the format of the thesis:

1. A student writing a thesis must register for the course, Thesis, prior to the semester in which he/she expects to take the final examination.
2. Three typewritten copies of the completed thesis must be submitted to the Dean of the Graduate School, together with two copies of an abstract of the thesis. The abstract should be 400 to 500 words. Consult the Graduate School's calendar for deadline dates regarding submission of these manuscripts.
3. Additional information concerning the format is available in the Graduate School Office.

## **APPLICATION FOR GRADUATION**

A candidate for graduation must file an application for graduation at least 30 days prior to the close of the session in which he/she expects to complete the requirements for the degree. A student secures the application forms from his/her advisor, who must approve the application before it is sent to the Graduate School Office. Failure to meet the deadline may result in delay of graduation for the candidate.

## **GRADUATE RECORD EXAMINATION**

The Graduate Record Examination is required of all students who desire to become candidates for the Master of Science degree. Information concerning the time, place, and cost of the examination may be obtained from the office of the Dean of the Graduate School.

## **SECOND MASTER'S DEGREE**

The Graduate School of North Carolina A. and T. State University provides an opportunity for a student holding a Master's degree to earn a second Master's degree in another discipline or specialty. To be admitted for a second Master's degree, the student files the appropriate admission application, submits transcripts and provides pertinent examination scores.

During the first semester, the student makes application for candidacy. In the last semester of courses, the student files for the comprehensive examination in the new specialty. In collaboration with the advisor, the student plans the new program to include a minimum of 18 semester hours in the new specialty to be taken in the University. Twelve hours will be accepted from the first Master's providing that degree was completed at North Carolina A. and T. State University. If the student is a transfer student, twenty-four hours must be completed in the new program since University regulations allow only six semester hours to be accepted in transfer credits.

The student taking a second Master's degree in a non-teaching field must fulfill the course appropriate to that field.

## **ADMINISTRATIVE POLICY CONCERNING CHANGES IN REQUIREMENTS FOR STUDENTS ENROLLED IN DEGREE PROGRAMS**

Generally, a student is permitted to graduate according to the requirements specified either in the catalogue current during the year of his/her first application for candidacy or in the catalogue current during the year of his/her application for graduation. If more than six years pass between the student's application for candidacy and his application for graduation, the university reserves the right to require the student to satisfy the regulations in effect at the time of his/her application for graduation. In all instances, the Graduate School reserves the right to require students in programs in Agricultural Education, Education, or Industrial Education to satisfy the requirements specified by the North Carolina Department of Public Instruction at the time of the student's completion of the requirements for the Master of Science degree.

## **COMMENCEMENT**

Diplomas are awarded only at the commencement exercises following completion of all requirements for the degree. Attendance at Commencement is required of all graduating students unless individually excused by the Dean of the Graduate School

## ADDITIONAL REGULATIONS

Additional rules, regulations, and standards for each of the areas of graduate study appear in the appropriate sections of the catalogue. The prospective student should read such sections with care.

## DEPARTMENTS OF INSTRUCTION

### AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

Richard D. Robbins, Chairperson

Room 251, Carver Hall

The department of Agricultural Economics and Rural Sociology offers a program of study leading toward the Master of Science degree in Agricultural Economics. The program prepares students for careers in teaching, research, extension, agriculture-related business, and government service, as well as for further graduate studies for a terminal degree. Students may select a program track for concentration in Agricultural Marketing, Production Economics or Rural Development.

A minimum of 30 semester hours is required for the M.S. degree in Agricultural Economics, including 12 semester hours of "core" courses in advanced economics, a course in statistics and research methods, 9 semester hours of courses in the selected program track, and 6 semester hours of thesis work. In addition, the successful completion and defense of a thesis and a comprehensive examination are required. A GPA of 3.00 in Agricultural Economics courses is required for graduation.

The general requirements for admission are an undergraduate degree from an accredited institution, with a grade point average of 3.00 (on a 4.00 point scale) and a basic preparation in Agricultural Economics, Economics, Mathematics and Statistics. An undergraduate major in Agricultural Economics, Economics, Agribusiness or Business Administration, with preparation in Economics/Statistics generally will provide an acceptable preparation. Applicants who do not meet the requirements will be considered on an individual basis.

The student pursuing the Master of Science degree in Agricultural Economics is required to complete a common core of courses consisting of:

Ag. Econ 710	Advanced Micro Economics	3 Semester Hours
Ag. Econ 720	Advanced Macro Economics	3 Semester Hours
Ag. Econ 705	Advanced Statistics	3 Semester Hours
Ag. Econ 725	Research Methods	3 Semester Hours

In addition, the following courses are required by areas of concentration as specified:

#### Rural Development

Core Courses		12 Semester Hours
Ag. Econ 750	Social Organization of Agriculture	3 Semester Hours
Ag. Econ 730	Rural Development	3 Semester Hours
Ag. Econ 732	Agricultural Policy	3 Semester Hours
Elective		3 Semester Hours
Thesis		6 Semester Hours
	<i>Total</i>	30 Semester Hours

#### Agricultural Marketing

Core Courses		12 Semester Hours
Ag. Econ 734	Agricultural Marketing	3 Semester Hours
Ag. Econ 756	Agricultural Price Analysis	3 Semester Hours
Ag. Econ 736	Marketing Problems and Issues	3 Semester Hours
Elective		3 Semester Hours
Thesis		6 Semester Hours
	<i>Total</i>	30 Semester Hours

## Production Economics

Core Courses	12 Semester Hours
Ag. Econ 740 Production Economics	3 Semester Hours
Ag. Econ 732 Agricultural Policy	3 Semester Hours
Ag. Econ 708 Econometrics	3 Semester Hours
Elective	3 Semester Hours
Thesis	6 Semester Hours
<i>Total</i>	30 Semester Hours

## DIRECTORY OF FACULTY

### Agricultural Economics and Rural Sociology

- Sidney H. Evans, B.S., Virginia State College; M.S., Iowa State University; Ph.D., Ohio State University; Professor.
- Robin G. Henning, B.S., M.S., Ohio State University; Ph.D., Cornell University; Adjunct Assistant Professor.
- Donald R. McDowell, B.S., Southern University A. & M.; M.S., Ph.D., University of Illinois; Adjunct Assistant Professor.
- Abdul R. Mu'Min, B.S., M.S., North Carolina A&T State University; Ph.D., Michigan State University; Adjunct Assistant Professor.
- Richard D. Robbins, B.S., North Carolina A&T State University; M.S., Ph.D., North Carolina State University; Professor.
- Alton Thompson, B.S., North Carolina Central University; M.S., Ph.D., Ohio State University; Adjunct Associate Professor.
- Albert O. Yeboah, B.S., University of Ghana; M.S., University of Guelph; M.A., Ph.D., University of Wisconsin; Adjunct Associate Professor.
- Anthony K. Yeboah, B.S., University of Science and Technology; M.S., Ph.D., Iowa State University; Associate Professor.

## COURSES IN AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

Course	Description	Credit
150-650.	Human Resource Development	3
150-756.	Agricultural Price Analysis	3
150-675.	Computer Application in Agriculture	3
150-705.	Econometrics	3
150-710.	Micro Economics	3
150-720.	Macro Economics	3
150-725.	Research Methods in Agricultural Economics	3
150-730.	Rural Development	3
150-732.	Agricultural Policy	3
150-734.	Agricultural Marketing	3
150-735.	Economic Development	3
150-736.	Agricultural Marketing Problems and Issues	3
150-738.	International Economics	3
150-740.	Production Economics	3
150-750.	Social Organization of Agriculture	3
150-798.	Thesis Research I	3
150-799.	Thesis Research II	3

## AGRICULTURAL EDUCATION AND EXTENSION

A.P. Bell, Chairperson

Office: 242 Carver Hall

The Department of Agricultural Education and Extension offers programs leading to the Master of Science Degree. The programs are designed to meet the needs of individual students and emphasize the professional improvement of teachers and professional workers in related areas with education responsibilities. They provide advanced preparation for employment in administration, supervision, teacher education, and research in agricultural education and related fields.

### **Degree Offered**

Agricultural Education — M.S.

### **General Program Requirements**

Admission of students to the Master's Degree Program in Agricultural Education is based on the general admission requirements of the Graduate School. The candidate must have a Baccalaureate Degree from an accredited undergraduate institution. He/she must have a minimum of 18 credits in professional education or certification as a teacher of agricultural education or equivalent professional experiences. Failure to meet any of these criteria may necessitate rejection of the application or requirement of additional undergraduate work.

### **Departmental Requirements**

A minimum of 33 semester hours is required for completion of the graduate degree. The degree is not conferred for a mere collection of credits. A well-balanced, unified, and complete program of study will be required. A student may meet the degree requirements by either full-time or part-time enrollment and by attendance in any combination of terms.

The student may follow a thesis or non-thesis program. Those candidates who do not write a thesis must present a suitable investigative paper. Its nature and content will be determined by the department.

Courses in the major and minor areas will be selected on the basis of the individual's needs and interests. To qualify for the graduate certificate to teach in the public schools of North Carolina the candidate should complete 18 semester credits in subject-matter agriculture. The candidate may concentrate in one subject-matter area.

Other requirements include: Graduate Record Examination (Aptitude Test and Advanced Test in Education), 3.0 grade point average for all graduate courses, and Final Comprehensive Examination in Agricultural Education.

### **Career Opportunities**

The Graduate Program in Agricultural Education provides advanced preparation for employment in administration, supervision, teaching in schools and colleges, agricultural extension, business and industry, and research in agricultural education and related fields.

### **Directory of Faculty and Courses**

Arthur P. Bell, B.S., North Carolina A&T State University; M.S., & Ed.D., The Pennsylvania State University; Professor.

John K. Coster, B.S., Purdue University; M.A., Yale University; Ph.D., Yale University; Adjunct Professor.

Willie T. Ellis, B.S., M.S., North Carolina A&T State University; Ph.D., Cornell.

Larry D. Powers, B.S., M.S., Tuskegee University; Ph.D., Michigan State University; Assistant Professor.

Francis O. Watson, B.S., M.S., North Carolina A&T State University; Ed.D., Virginia Polytechnic and State University; Adjunct Assistant Professor.

## **Courses**

- 110-600 Youth Organization and Program Management
- 110-601 Adult Education in Vocational and Extension Education
- 110-603 Problem Teaching in Vocational and Extension Education
- 110-604 Public Relations in Agriculture
- 110-605 Guidance and Group Instruction in Vocational Education
- 110-606 Cooperative Work-Study Programs
- 110-607 Environmental Education
- 110-608 Agricultural Extension Organization and Methods
- 110-609 Community Analysis and Rural Life
- 110-664 Occupational Exploration for Middle Grades
- 110-665 Occupational Exploration in the Middle Grades—Agricultural Occupations
- 110-700 Seminar in Agricultural Education and Extension
- 110-702 Methods and Techniques of Public Relations
- 110-703 Scientific Methods in Research
- 110-704 History and Philosophy of Vocational Education
- 110-705 Recent Developments and Trends in Agricultural Education and Extension
- 110-706 Comparative Education in Agriculture
- 110-707 Issues in Community Development and Adult Education
- 110-750 Community Problems
- 110-752 Administration and Supervision
- 110-753 Program Planning
- 110-754 History of Agricultural Education
- 110-760 Thesis Research in Agricultural Education

**ANIMAL SCIENCE DEPARTMENT**  
**George A. Johnson, Chairperson**  
**Room 101, Animal Science Building**

*Courses offered for advanced undergraduate and graduate*

### **Animal Science**

- 120-611 Principles of Animal Nutrition
- 120-613 Livestock and Meat Evaluation
- 120-614 Animal Breeding
- 120-615 Selection of Meat and Meat Products
- 120-617 Physiology of Reproduction of Farm Animals
- 120-618 Seminar in Animal Science
- 120-619 Special Problems in Livestock Management
- 120-713 Advanced Livestock Production

### **Poultry Science**

- 120-657 Poultry Anatomy and Physiology
- 120-659 Special Problems in Poultry
- 120-750 Poultry Research

### **Laboratory Animal Science**

- 120-660 Special Problems in Specimen Preparation
- 120-661 Special Problems in Electron & Light Microscopy
- 120-662 Special Problems in Radiology
- 120-663 Special Problems in Tissue Culture & Histochemistry
- 120-664 Special Problems in Radio-Immunology, Radio-Isotopes and Tracer Techniques

## Dairy Science

120-604 Dairy Seminar I (Formerly Dairy Husb. 2374)

120-605 Dairy Seminar II

## ART

**LeRoy F. Holes, Chairperson**

**Office: Frazier Hall**

The Graduate School through the Department of Art prepares personnel at the graduate level by offering the Master's degree in Education with a concentration in art. Specifically the Department of Art seeks to prepare personnel by providing knowledge and competencies needed in planning, organizing, and supervising various aspects of the public school art program.

### Degrees Offered

Art, Secondary Education — M.S.

### General Program Requirements

The admission of students to the graduate program in the Department of Art is based upon general admission requirements of the University.

### Departmental Requirements

In addition to the general requirements specified in the description of the degree program in Education, a student wishing to be accepted as a candidate for the degree, Master of Science in Education with a concentration in art, must hold or be qualified to hold a "Class A" teaching certificate in art. The areas covered should be: painting, ceramics or sculpture, design, art history, and crafts. Each applicant for admission is required to submit a portfolio of his/her work.

A student who fails to meet these qualifications will be expected to satisfy these requirements by enrolling in appropriate undergraduate courses before beginning his/her graduate studies in art.

### Requirements For The M.S. Degree in Education (Concentration in Art)

Minimum requirements for the M.S. degree in Education with a concentration in art; 30 Semester Hours.

- I. *Education* — (6 Semester Hours)
  - A. Education 701 (Philosophy of Education): 3 Semester Hours
  - B. Education 722 (Curriculum in Secondary School): 3 Semester Hours
- II. *Art* — (9 Semester Hours)
  - A. Art 720 (Methods of Criticism): 3 Semester Hours
  - B. Art 721 (Research and Analysis): 3 Semester Hours
  - C. Art 722 (Seminar in Art Education): 3 Semester Hours
- III. *Other Requirements*
  - A. Electives (6 Semester Hours in Art, Education, or related fields)
  - B. Additional 9 Semester Hours from:
    1. Art 603 — Studio Techniques — 3 Semester Hours
    2. Art 604 — Ceramics Workshop — 3 Semester Hours
    3. Art 605 — Printmaking — 3 Semester Hours
    4. Art 606 — Sculpture — 3 Semester Hours
    5. Art 607 — Project Seminar — 2 Semester Hours
    6. Art 608 — Arts and Crafts — 3 Semester Hours

### Career Opportunities

The program offered by the Department of Art prepares competent personnel for

careers in the areas of teaching art, art research, creative productions, and various administrative positions in the visual arts.

### **Directory of Faculty and Courses**

LeRoy F. Holmes, Jr., A.B., Howard University; A.M., Harvard University; Associate Professor.

Theresa A. McGeady, A.B., Immaculata College; M.A., M.F.A., University of Notre Dame; Ph.D., Ohio University; Associate Professor.

James E. McCoy, B.S., North Carolina College; M.A., Columbia University; Assistant Professor.

Stephanie A. Santmyers, B.F.A., Alfred University; M.A., Illinois State University; M.F.A., University of North Carolina, Greensboro; Assistant Professor.

Henry E. Sumpter, B.S., North Carolina Agricultural and Technical State University; M.F.A., University of North Carolina at Greensboro; Assistant Professor.

### **Courses**

211-600 Public School Art

211-602 Seminar in Art History

211-603 Studio Techniques

211-604 Ceramics Workshops

211-605 Printmaking

211-606 Sculpture

211-607 Project Seminar

211-608 Arts and Crafts

211-720 Methods of Criticism, Interpretation, and Research

211-721 Research and Analysis

211-722 Seminar in Art Education

## **BIOLOGY**

**Alfred Hill, Acting Chairperson**

**Office: 102 Barnes Hall**

The Department of Biology's program is designed to produce investigators and teachers who can define, experimentally research, and communicate fundamental problems associated with the development of biological systems. Further, the program of study leading to the Master's degree is designed to broaden the studies of biology majors who intend to pursue additional study at the graduate level.

### **Degree Offered**

Biology — M.S.

Biology — M.S., Secondary Education

### **General Program Requirements**

The admission of students to the graduate degree programs in the Department of Biology is based upon the general admission requirements of the University.

### **Departmental Requirements — Biology Major**

In addition to the general requirements specified below, a student wishing to be accepted as a candidate for the degree, Master of Science in Biology, must have completed, on the undergraduate level, chemistry through organic, calculus, or at least a math course containing some calculus, one year of physics, and a course in cellular or molecular biology. Some graduate students may be accepted with the provision that they complete some or all of these courses before acceptance to candidacy. The student is *advised to read the Graduate Catalog very carefully for any additional Graduate School or departmental requirements.*

**Required Courses** (30 semester hours, including thesis research)

Biology	663 Cytology (3)
	860 Parasitology (3)
	669 Recent Advanced in Cell Biology (3)
	743 Developmental Plant Morphology (3)
Chemistry	651 General Biochemistry (5)
Biology	701 Biology Seminar (1)
	702 Biology Seminar (1)
	862 Research in Botany (6)
	or
	863 Research in Zoology (6)

Hours needed to complete the 30 semester hours required may be taken from the following courses:

Biology	666 Experimental Embryology (3)
	742 Physiology of Vascular Plants (3)
	700 Environmental Biology (3)
	769 Cellular Physiology (4)
	861 Advanced Genetics (3)
	703 Experimental Methods in Biology (3)

NOTE: *On some occasions substitutions may be made in the second half of this list in order to meet specific needs and/or interests of the graduate student or department (reference full course list).*

**Other Requirements**

1. Filing for and completion of Qualifying Essay — (a requirement of the Graduate School)
2. GRE (Aptitude Test and Advanced Test in Biology) Scores must be submitted to the Graduate School Office before admission to the final examination can be granted.
3. Satisfactory completion of an examination in a foreign language
4. One academic year of residence at A & T
5. 3.0 grade point average for all graduate courses
6. Participation in the Departmental Seminar Series
7. Final comprehensive examination in Biology
8. Satisfactory presentation and defense of thesis

### SUGGESTED CURRICULUM GUIDE FOR A MAJOR IN BIOLOGY (Pre-professional)

**FIRST YEAR**

First Semester	Second Semester
Bio. 669 Recent Adv. in Cell Biology (3)	Bio. 663 Cytology (3)
Bio. 743 Dev. Plant Morphology (3)	Bio. 860 Parasitology (3)
Bio. 701 Bio. Seminar (1)	Bio. 702 Bio. Seminar (1)
Bio. 703 Exp. Methods in Biology (3)	Chem. 651 General Biochem. (5)
Elective	
10 (+ elective)	12

**SECOND YEAR**

Summer or First Semester	First Semester or Second Semester
Bio. 862 Research in Botany (3)	Bio. 862 Research in Botany (3)
or	or
Bio. 863 Research in Zoology (3)	Bio. 863 Research in Zoology (3)
Elective (Optional)	Elective (Optional)
3 (+ elective)	3 (+ elective)

### Teaching Major in Biology

In addition to the general requirements specified below, a student wishing to be accepted as a candidate for the degree, Master of Science in Education with concentration in Biology must have completed, on the undergraduate level, chemistry through organic, a math course which includes some calculus and one year of college physics.

#### Required Courses, M.S. in Education, Concentration in Biology

##### Required Courses in Biology: *Non-thesis Option (30 semester hours)*

Biology	661 Mammalian Biology (3)
	662 Biology of Sex (3)
	663 Cytology (3)
	700 Environmental Biology (3)
	765 Introductory Experimental Zoology (3)
	766 Invertebrate Biology/Elementary and Secondary School Teachers (3)

NOTE: 760 Projects in Biology (3) and  
701/702 Seminar in Biology (2) may be substituted for Biology 766  
Six semester hours of electives in education, biology, or subjects related to biology.

##### Required Courses in Biology: *Thesis Option (20 Semester Hours)*

Biology	661 Mammalian Biology (3)
	662 Biology of Sex (3)
	663 Cytology (3)
	700 Environmental Biology (3)
	765 Introductory Experimental Zoology (3)
	862 Research in Botany (3) or
	863 Research in Zoology (3)

Three hours of electives in Education, Biology, or related fields  
Thesis

##### Required Courses in Education: *Non-thesis Option (30 Semester Hours)*

1. Research
2. The Nature of the Learner and the Learning Process
3. Current Critical Issues in American Education
4. Historical, Philosophical and Sociological Foundations of Education
5. Curriculum, Supervision, etc.

#### Other Requirements

1. Students in a non-thesis program may take either Education 790 (Seminar) or a seminar in the area of concentration. Students in a thesis program may take Education 791 (Thesis) or a thesis research course offered in the area of concentration. In all instances, the decision is to be made in consultation with the advisor.
2. Graduate Record Examination (Aptitude Test and Advanced Test in area of concentration).
3. 3.0 grade point average for all graduate courses
4. Final comprehensive examination in Education and area of concentration
5. Must hold or be qualified to hold a Class A teaching certificate in Biology

## SUGGESTED CURRICULUM GUIDE FOR A TEACHING MAJOR IN BIOLOGY

### Non-Thesis FIRST YEAR

First Semester		Second Semester	
Bio. 661 Mammalian Bio.	(3)	Bio. 663 Cytology	(3)
Bio. 662 Biology of Sex	(3)	Bio. 765 Intro. Experiment. Zoo	(3)
Bio. 700 Environmental Bio.	(3)	Bio. 766 Invert. Bio. For Teach.	(3)
Bio. 701 Bio. Seminar	(1)	Bio. 702 Bio. Seminar	(1)
Education	(3)	Education	(3)
	13		13

### Summer

Bio. Elective  
 Education Elective  
 Education 790 (3) (if required)

### Thesis FIRST YEAR

First Semester		Second Semester	
Bio. 661 Mammalian Bio.	(3)	Bio. 663 Cytology	(3)
Bio. 662 Bio. of Sex	(3)	Bio. 765 Intro. Exp. Zoology	(3)
Bio. 700 Environ. Bio.	(3)	Education or	(3)
Bio. 701 Bio. Sem.	(1)	Biology Elective	(3)
	10		9

### SECOND YEAR

#### Summer or First Semester

Bio. 862 Research in Botany (3)  
 or  
 Bio. 863 Research in Biology (3)  
 Elective (Optional)  
 3 (+ elective)

#### Directory of Faculty and Courses

David W. Aldridge, B.S., M.S., University of Texas, Arlington; Ph.D., Syracuse University; Assistant Professor  
 Jerry Bennett, B.S., Tougaloo College; M.S., Atlanta University; Ph.D., Iowa State University; Associate Professor  
 A. James Hicks, B.S., Tougaloo College; Ph.D., University of Illinois, Urbana; St. Louis; Professor  
 Alfred Hill, Jr., B.S., Prairie View College; M.S., Colorado State University; Ph.D., Kansas State University; Professor  
 Thomas L. Jordan, B.A., Rockhurst College; M.S., Ph.D., University of Wisconsin, Madison; Washington-Seattle; Assistant Professor  
 Theodora Joan Robinson, B.S., Federal City College/UDC.; M.S., Ph.D., Howard University; and National Institutes of Health; Assistant Professor  
 Alphonso R. Vick, A.B., Johnson C. Smith University; M.S., North Carolina Central University; M.A., University of Michigan; Ph.D., Syracuse University; Professor  
 Joseph J. White, B.S., M.S., North Carolina College at Durham; Ph.D., University of Illinois, Urbana; Professor  
 James A. Williams, A.B., Talladega College; M.S., Atlanta University; Ph.D., Brown University; Professor

**CHEMISTRY**  
**Walter G. Wright, Chairperson**  
**Office: Room 116, Hines Hall**

The objectives of the Graduate Division in Chemistry are to provide the theoretical and experimental training experiences which are necessary for those students who are pursuing a Master of Science degree in Chemistry. The Department also offers special courses which may be used for teacher renewal certificates.

**Degrees Offered**

1. Master of Science Degree in Chemistry
2. Master of Science in Education with concentration in chemistry

**General Requirements**

Admission to the Graduate School under one of the following options:

1. Unconditional admission
2. Provisional admission
3. Special student

**Departmental Requirements**

Admission to a degree program requires the following:

1. Baccalaureate degree from an accredited undergraduate institution
2. An undergraduate major in chemistry which includes one year of physical chemistry and one year of differential and integral calculus.

**Requirements for a Degree**

The Master of Science degree in Chemistry has two options:

1. Thirty semester hours including a thesis
2. Non-thesis option requires thirty semester hours of course work.

Master of Science degree in Education requires the following courses: Chemistry 611, 722, 743, 732 and 701.

In addition, five semester hours in chemistry are required including a special problems course in analytical, inorganic, organic or Physical chemistry, and two semester hours of electives.

A thesis in Chemistry or Education is also required.

**Directory of Faculty**

Walter G. Wright, B.S., M.S., North Carolina Central University; Ph.D., New York University; Professor, Chairman

Evans Booker, B.S., Saint Augustine College; M.S., Tuskegee Institute; Associate Professor

Naiter Chopra, B.Sc., Hons., M.Sc. Hons., Ph.D., University of Dublin; Professor  
Etta Gravely, B.S., Howard University; M.S., North Carolina A&T State University; Ed.D., UNC-Greensboro; Assistant Professor

Vallie Guthrie, B.S., North Carolina A&T State University; M.A., Fisk University; Ed.D., American University; Associate Professor

Claude N. Lamb, B.S., Mount Union College; M.S., North Carolina Central University; Ph.D., Howard University; Assistant Professor

Arthur Stevens, B.S., Langston University; M.S., Oklahoma University; Associate Professor

Alex Williams, B.S., Jackson State; Ph.D., University of Illinois; Assistant Professor  
Jothi Ramasamy Kumar, B.Sc., Annamalai University, Cdm., India; Ph.D., Kansas State University; Assistant Professor

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

Course	Description	Credit
223-610	Inorganic Synthesis	2
223-611	Advanced Inorganic	4
223-621	Intermediate Organic Chemistry	3
223-624	Qualitative Organic Chemistry	3
223-631	Electroanalytical Chemistry	3
223-641	Radiochemistry	3
223-642	Radioisotope Techniques and Application	2
223-643	Introduction to Quantum Mechanics	4
223-651	General Biochemistry	5

### Graduate Students Only

(Inorganic)

223-711	Structural Inorganic Chemistry	2
223-716	Selected Topics in Inorganic Chemistry	2

(Organic)

223-721	Elements of Organic Chemistry	3
223-722	Advanced Organic Chemistry	4
223-723	Organic Chemistry	2
223-726	Selected Topics in Organic Chemistry	
223-727	Organic Preparations	1-2

(Biochemistry)

223-756	Selected Topics in Biochemistry	2
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(Analytical Chemistry)

223-731	Modern Analytical Chemistry	
223-732	Advanced Analytical Chemistry	4
223-736	Selected Topics in Analytical Chemistry	2

(Physical Chemistry)

223-741	Principles of Physical Chemistry I	4
223-742	Principles of Physical Chemistry II	4
223-743	Chemical Thermodynamics	4
223-744	Chemical Spectroscopy	3
223-746	Selected Topics in Physical Chemistry	2
223-748	Collaid Chemistry	2
223-749	Chemical Kinetics	2

### Research and Special Topics

223-701	Seminar	1
223-702	Chemical Research	2-5
223-715	Special Problems in Inorganic Chemistry	2-4
223-725	Special Problems in Organic Chemistry	2-4
223-735	Special Problems in Analytical Chemistry	2-4
223-745	Special Problems in Physical Chemistry	2-4
223-755	Special Problems in Biochemistry	2-4

### Chemical Instructions

223-763	Selected Topics in Chemistry INSTRUCTION I	6
223-764	Selected Topics in Chemistry INSTRUCTION II	6
223-765	Special Problems in Chemistry INSTRUCTION I	3
223-766	Special Problems in Chemistry INSTRUCTION II	3
223-767	Special Problems in Chemistry INSTRUCTION III	3
223-768	Special Problems in Chemistry IV	3

### Thesis Research

223-799	Thesis Research	3
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**CURRICULUM AND INSTRUCTION**  
**Charles L. Hayes, Chairperson**  
**Office: 201 Hodgkin Hall**

**Objectives**

The Department of Curriculum and Instruction provides the professional studies component for the preparation of teachers and other school personnel at the master's degree level. The department cooperates with the various academic departments of the University for teacher education preparation. In addition, the department offers concentrations in: Early Childhood Education, Educational Media, Elementary Education (general), Intermediate Education and Reading Education.

**Degrees Offered**

- Master of Science in Education — Early Childhood
- Master of Science in Education — Educational Media
- Master of Science in Education — Elementary (general)
- Master of Science in Education — Intermediate
- Master of Science in Education — Reading

**State Certification**

Reading

**General Program Requirements**

Early Childhood Education, Elementary Education, Intermediate Education, and Reading Education students must follow the general admission requirements for graduate studies. They must meet professional education requirements for a Class A teaching certificate, and must also meet the requirements for admission to candidacy for a degree as stated in "Admission and Other Information."

Educational Media: Admission to the Graduate School of the University is prerequisite to admission to Educational Media.

**Department Requirement**

EARLY CHILDHOOD EDUCATION, INTERMEDIATE EDUCATION, ELEMENTARY EDUCATION AND READING EDUCATION — Generally, the majors require 30 semester hours of graduate-level courses for a graduate degree and at least 18 semester hours for certification in reading.

An overall grade point average of 3.0 must be maintained for the degree programs and for certification in reading.

EDUCATIONAL MEDIA — The major requires a minimum of 30 semester hours. Eighteen to 21 of these hours are to be completed in Educational Media. Majors seeking the Graduate Certificate approval by the North Carolina State Department of Public Instruction are to select twelve hours of course work at the 700 level in the area of: behavioral and humanities studies, relevant theory, and research. All majors complete the 700 level Internship and Seminar in Educational Media.

**Accreditation**

All Teacher Education Programs are accredited by the National Council for Accreditation of Teacher Education and approved by the North Carolina State Department of Public Instruction.

**Career Opportunities**

In addition to preparing teachers for K-4, intermediate, elementary and reading education (K-12), a degree in these fields also provides for career opportunities in

allied fields such as health, social service, child/family relations, communication arts and other diversified areas.

The media program provides a variety of activities in preparing professional media agencies and services. Students have the opportunity to meet in-service media specialists who provide Media Seminars and share experiences and prospects for employment. Professional workshops that bring new ideas, technology, and personalities to the campus support the institutional program and enhance the students' potentials for employment.

In North Carolina, public schools, health service agencies, public communication agencies, personal training programs, junior and senior colleges and universities are among the many potential employers for media specialists.

### **Reading Education Curriculum: 30 Semester Hours Required (Minimum)**

The Reading Education Curriculum has two distinct approaches to certification, namely Option I and Option II. Option I is for those students who wish to complete Class A or graduate level certification, while Option II is for those students desiring to complete a degree program in Reading. All courses listed below are 3 semester hours unless otherwise noted.

#### **A. Option I: Requires 18 semester hours from the following.**

Reading — 15 semester hours

- 311-620 Foundations in Reading
- 311-621 Word Recognition/Identification Skills
- 311-622 Reading Through the Primary Years
- 311-623 Reading in the Elementary Grades
- 311-624 Reading in the Secondary School
- 311-629 Classroom Diagnosis in Reading
- 311-630 Reading Practicum
- 311-631 Reading for the Atypical Learner
- 311-726 Reading in the Content Areas

The following courses shown in the list above are required for State Certification in reading, Class A: Education 620, 622, 623 or 624, 629, 726.

Cognate Areas — 3 semester hours

- 311-717 Media in Special Education and Reading
- 212-626 Children's Literature
- 212-710 Language Arts for Elementary Teachers
- 212-754 History and Structure of the English Language

Other Requirements

- Overall grade point average of 3.0 on all graduate courses
- Comprehensive Examination

#### **B. Option II: A minimum of 30 semester hours is required. This program leads to the Master of Science in Reading.**

Reading: 18 semester hours

- 311-620 Foundations in Reading
- 311-621 Word Recognition/Identification Skills
- 311-622 Reading Through the Primary Years
- 311-623 Reading in the Elementary Grades
- 311-629 Diagnosis in Reading
- 311-630 Reading Practicum
- 311-631 Reading for the Atypical Learner
- 311-726 Reading in the Content Areas
- 311-731 Advantaged Diagnosis
- 311-732 Organization and Administration of Reading Programs
- 311-733 Advanced Practicum
- 311-734 Seminar and Research in Reading

Foundations of Education Courses — 6 semester hours required

- 311-701 Philosophy of Education (or)
- 311-703 Educational Sociology
- 311-625 Theory of American Public Education
- 311-720 Curriculum Development (or)
- 311-721 Curriculum in the Elementary School (or)
- 311-722 Curriculum in the Secondary School
- 320-726 Educational Psychology (or)
- 320-727 Child Growth and Development
- 311-711 Educational Statistics

Cognate Areas — 6 semester hours required

- 311-717 Media in Special Education and Reading
- 212-710 Language Arts for Elementary Teachers
- 212-710 Language Arts for Elementary Teachers
- 212-754 History and Structure of the English Language

If a student has already earned 18 semester hours in Reading at the Class A level for state certification purposes then he/she may elect additional hours necessary to complete requirements from the following courses with academic advisement.

Required Reading Courses for the M.S. Degree in Reading

- 311-620 Foundations in Reading (or)
- 311-730 Problems in the Improvement of Reading
- 311-622 Reading Through the Primary Years (or)
- 311-623 Reading in the Elementary Grades
- 311-629 Classroom Diagnosis in Reading (or)
- 311-731 Advanced Diagnosis in Reading
- 311-726 Reading in the Content Areas
- 311-732 Organization and Administration of Reading Programs
- 311-734 Seminar and Research in Reading

Cognate Areas

- 311-717 Media in Special Education and Reading
- 212-710 Language Arts for Elementary Teachers
- 212-754 History and Structure of the English Language

When one has no background in reading, 30 semester hours of the Master's degree program would be in reading and closely related study. In addition six semester hours of course work are prescribed by the Graduate School making a total of 36 semester hours for the Master's degree.

**Elementary Education Curriculum (General): 30 Semester Hours Required**

A. Non-Thesis Option

1. Courses Required

- a. 311-790 Seminar in Educational Problems (after completion of 24 graduate semester hours)
- b. Three (3) semester hours are to be chosen from each of the following areas, making a total of 9 semester hours from those listed below:
  - (1) The nature of the learner and the learning process
    - 320-726 Education Psychology
    - 320-727 Child Growth and Development
    - 311-711 Educational Statistics
  - (2) Theoretical, historical, sociological and philosophic bases for educational practices
    - 311-625 Theory of American Public Education
    - 311-626 History of American Education
    - 311-627 The Afro-American Experience in American Education
    - 311-628 Seminar and Practicum in Urban Education
    - 311-701 Philosophy of Education
    - 311-703 Educational Sociology

- 311-780 Comparative Education
- 311-781 Issues in Elementary Education
- (3) Curriculum Development
  - 311-720 Curriculum Development
  - 311-721 Curriculum in the Elementary School

c. Eighteen hours taken from English, reading, fine arts, health and physical education, mathematics, science, special education, and social studies, with emphasis on instructional areas most appropriate for general elementary education.

#### B. Thesis Option

##### 1. Courses Required

The program requirements for the thesis option are the same as those outlined above under Non-Thesis Option with the exception that the student pursuing the thesis program must take 311-791: Thesis Research instead of 311-790.

##### 2. Other Requirements

- a. Qualifying Examination
- b. Graduate Record Examination
- c. 3.0 Grade point average for all graduate courses
- d. Master's Comprehensive Examination in Education
- e. Thesis Examination

### **Early Childhood Education Curriculum (Grades K-4): 30 Semester Hours Required**

#### A. Non-Thesis Option

##### 1. Courses Required

a. 311-790 Seminar in Educational Problems (after completion of 24 graduate semester hours)

b. Three (3) semester hours should be chosen from each of the following areas, making a total of 9 semester hours from those listed below:

(1) The nature of the learner and the learning process

320-726 Educational Psychology

320-727 Child Growth and Development

311-711 Educational Statistics

(2) Theoretical, historical, sociological, and philosophic bases for educational practices

311-625 Theory of American Public Education

311-626 History of American Education

311-627 The Afro-American Experience in American Education

311-628 Seminar and Practicum in Urban Education

311-701 Philosophy of Education

311-703 Educational Sociology

311-780 Comparative Education

311-781 Issues in Elementary Education

(3) Curriculum Development

311-683 Curriculum in Early Childhood Education

311-721 Curriculum in the Elementary School

c. Twelve hours taken from English, reading, fine arts, health and physical education, mathematics, science, special education, and social studies, with emphasis on instructional areas most appropriate for early childhood education.

d. Six hours of electives

##### 2. Other Requirements

- a. Qualifying Examination
- b. Graduate Record Examination
- c. 3.0 grade point average for all graduate courses
- d. Master's Comprehensive Examination in Education

## B. Thesis Option

### 1. Courses Required

Program requirements for the thesis option are the same as those listed above under Non-Thesis Option with the exception that the thesis program must include 311-791: Thesis Research instead of 311-790.

### 2. Other Requirements

- a. Qualifying Examination
- b. Graduate Record Examination
- c. 3.0 grade point average for all graduate courses
- d. Master's Comprehensive Examination in Education
- c. Thesis Examination

## **Intermediate Education Curriculum (Grades 4-9): 30 Semester Hours Required**

### A. Non-Thesis Option

#### 1. Courses Required

a. 311-790 Seminar in Educational Problems (after completion of 24 graduate semester hours)

b. Three (3) semester hours are to be chosen from each of the following areas, making a total of 9 semester hours from those listed below:

(1) The nature of the learner and the learning process

320-726 Educational Psychology

320-727 Child Growth and Development

311-711 Educational Statistics

(2) Theoretical, historical, sociological, and philosophic bases for educational practices

311-625 Theory of American Public Education

311-626 History of American Education

311-627 The Afro-American Experience in American Education

311-628 Seminar and Practicum in Urban Education

311-701 Philosophy of Education

311-703 Educational Sociology

311-780 Comparative Education

311-781 Issues in Elementary Education

(3) Curriculum Development

311-720 Curriculum Development

311-721 Curriculum in the Elementary School

c. Eighteen hours should be chosen from the areas of English, reading, fine arts, health and physical education, mathematics, science, special education, and social studies, with emphasis on courses which apply most directly to the elementary school. It is suggested that the student select a concentration in not more than two of the instructional areas of the elementary school curriculum.

#### 2. Other Requirements

- a. Qualifying Examination
- b. Graduate Record Examination
- c. Maintain a 3.0 grade point average for all graduate courses
- d. Master's Comprehensive Examination in Education

### B. Thesis Option

#### 1. Courses Required

The student pursuing the thesis program should meet the same course requirements as those listed above under Non-Thesis Option except that he/she should take 311-791: Thesis Research instead of 311-790: Seminar in Educational Problems.

#### 2. Other Requirements

- a. Qualifying Examination
- b. Graduate Record Examination

- c. Maintain a 3.0 grade point average for all graduate courses
- d. Master's Comprehensive Examination in Education
- e. Thesis Examination

**Course Description**

311-620	Foundations in Reading	
311-621	Word Recognition/Identification Skills	
311-622	Teaching Reading Through the Primary Years	
311-623	Methods and Materials in Teaching Reading in the Elementary School	
311-624	Teaching Reading in the Secondary School	
311-629	Classroom Diagnosis in Reading Instruction	
311-630	Reading Practicum	
311-631	Reading for the Atypical Learner	
320-660	Introduction to Exceptional Children	
320-661	Psychology of the Exceptional Child	
320-662	Mental Deficiency	
320-663	Measurement and Evaluation in Special Education	
320-664	Materials, Methods and Problems in Teaching Mentally Retarded Children	
320-665	Practicum in Special Education	
311-683	Curriculum in Early Childhood	
311-684	Methods in Early Childhood	
311-721	Curriculum in the Elementary School	
311-726	Reading in the Content Areas	
311-730	Problems in the Improvement of Reading	
311-731	Advanced Diagnosis in Reading Instruction	
311-732	Organization and Administration of Reading Programs	
311-733	Advanced Practicum in Reading	
311-734	Seminar and Research in Reading	
311-780	Comparative Education	Credit 3(3-0)
311-781	Issues in Elementary Education	
311-783	Current Research in Elementary Education	
311-775	Independent Readings in Education I	
311-776	Independent Readings in Education II	
311-777	Independent Readings in Education III	
311-S-790	Seminar in Educational Problems	Credit 3(1-4)
311-S-791	Thesis Research	Credit 3

**SUGGESTED CURRICULUM FOR MEDIA MAJOR (MEDIA COORDINATOR)  
One Year Curriculum**

**Fall**

311-611	Utilization of Educational Media	3
311-603	Production of Instructional Materials	3
311-601	Reference Materials and Methods	3
†	Media elective optional	
		(9)

**Spring**

311-600	Organization of Media Collections	3
311-604	Administration of Education Media	3
311-607	Book Selection and Related Materials for Young People	3
	or	
311-606	Developmental Media for Children	3
†	Media elective optional	
		(9)

### Summer I

‡311-701	Philosophy of Education	3
§	Cognate Course	3
		(6)

### Summer II

‡311-755	Supervision of Instruction	3
311-703	Educational Media Internship and Seminar	3
		(6)

† Media elective option. It is recommended that Media Majors elect courses in the area of instructional development and educational computing to support the media preparation.

‡ Courses to satisfy behavioral and humanities studies may be taken from a range of offerings.

§ This cognate course may be selected from a discipline relevant to the student's needs and interest.

### Department of Curriculum and Instruction Faculty

Dorothy Prince Barnett, A.B., Oberlin College; M.A., Syracuse University; Ed.D., Indiana University; Professor

Gladys F. Blue, B.M., Willamette University; M.M., Eastman School of Music, University of Rochester; Ph.D., University of Akron; Associate Professor

Vivian E. Harding, B.A., N. C. Central University; M.Ed., Howard University; Ph.D., University of Maryland; Assistant Professor

Estell Harper, B.S., M.S., N.C. A&T State University; Assistant Professor

Charles L. Hayes, A.B., Leland College; Ed.M., Loyola University (Illinois); Ed.D., University of Northern Colorado; Professor and Chairperson

Pamela I. Hunter, B.A., Livingstone College; M.Ed., University of N.C. at Greensboro; Ph.D., Ohio State; Assistant Professor

Frissel Jones, B.S., Hampton Institute; M.Ed., D.Ed., Pennsylvania State University; Professor (Part-time)

Valena Lee, B.A., St. Augustine's College; M.S., M.L.S., Indiana University; Assistant Professor

Barbra W. Mosley, B.S., M.S., N.C. A&T State University; Media Specialist

Barbara Saunders, B.S., Central State University; M.S., Indiana State University; Ph.D., Ohio State University; Associate Professor

Albert Spruill, B.S., N.C. A&T State University; M.S., Iowa State University; Ed.D., Cornell University; Professor and Dean of Graduate School

Marian Lee Vick, B.S., Fayetteville State University; M.A., University of Michigan; C.A.G.S., Syracuse University; Ed.D., Duke University; Professor

Albert L. Walker, B.S., Lincoln University; M.A., Bradley University; Ed.D., Indiana University; (Joint Appointment)

### Advanced Undergraduate and Graduate Courses

311-603	Production of Instructional Materials
311-611	Utilization of Educational Media Concentration
311-600	Organization of Media Collections
311-601	Reference Materials
311-604	Administration of Educational Media
311-612	Systems Approach and Curriculum
311-613	Developmental Media for Children (Children's Literature)
311-614	Book Selection and Related Materials for Young People
311-615	Programming for Instructional Radio and Television
311-609	Production for Instructional Radio and Television
311-610	Broadcasting for Instructional Radio and Television

### **Graduate Courses**

311-705	Programmed Instruction
311-706	Media Retrieval Systems
311-707	Workshop in Educational Media
311-708	Research in Educational Media and Internship
311-717	Media in Special Education and Reading
311-712	Advanced Information Services
311-713	Computers in Education
311-715	Advanced Production in Instructional Radio and Television
311-717	Media Services to Business and Industry

### **ECONOMICS**

**Basil Coley, Chairperson**

**Office: 325 Merrick**

### **COURSES OFFERED TO ADVANCED UNDERGRADUATES AND GRADUATES**

<b>Course</b>	<b>Description</b>	<b>Credit</b>
531-601	Economic Understanding	3
531-602	Manpower Problems and Prospects	3
531-603	Manpower Planning	3
531-604	Economic Evaluation Methods	3
531-610	Consumer Economics	3
531-615	Economic Political and Social Aspects of the Black Experience	3

### **COURSES OFFERED TO GRADUATE STUDENTS**

531-701	Labor and Industrial Relations	3
531-705	Government Economic Problems	3
531-710	Economic Development and Resource Use	3
531-720	Development of Economic Systems	3

### **DEPARTMENT OF EDUCATIONAL LEADERSHIP AND POLICY**

**Henry T. Cameron, Chairperson**

**Room 112, Hodgkin Hall**

The objectives of the Department of Educational Leadership and Policy are to offer graduate level programs of preparation in Administration, Adult Education and Supervision. The Master's degree programs in Administration and Supervision are teacher education programs and they are consistent with the state adopted competency-based guidelines. These programs of study lead to North Carolina Certification at the Administrator I and Curriculum Instructional-Specialist I levels. The Master of Science in the Adult Education program is not considered as a teacher education program but it is developed and implemented on competency-based guidelines. The Department also offers programs of certification in Administration and Supervision for those students who already hold a Master's degree in education with certification in other professional areas. The graduate programs in the department are designed to prepare students for positions in public school administration, adult education, supervision of instruction in public schools and teaching or administration primarily at the Community College/Technical Institute levels.

## Degrees Offered

Education — Administration — M.S.

Education — Adult Education — M.S.

Education — Supervision — M.S.

Certification in Administration — Certificate

Certification in Supervision (Curriculum Instructional-Specialist)

## General Program Requirements

Requirements for admission to the degree programs in the Department of Educational Leadership and Policy are as follows:

1. Educational Administration and Supervision
  - a. Baccalaureate degree from an accredited undergraduate institution
  - b. Class "A" Certificate in area of concentration
  - c. Satisfactory completion of all graduate school requirements for admission to candidacy for a degree program
2. Adult Education

The admission of students to the graduate program in Adult Education is based upon the general admission requirements of the Graduate School.
3. Under policies of the Graduate School, candidacy for a degree requires the following:
  - a. The Qualifying Essay (after completing nine (9) semester hours)
  - b. The Graduate Record Examination (Aptitude and Advanced Test in Education)
4. Requirements for Unconditional Admission:
  - a. Baccalaureate degree from an accredited institution
  - b. Overall grade point average of 2.6 in undergraduate studies
  - c. Class "A" Certificate (or qualification for such certificate)
  - d. Failure to meet any of these criteria may cause rejection of the applicant or may require additional undergraduate work to satisfy the requirements.

## Departmental Requirements

The major in both Administration and Supervision (Curriculum Instructional-Specialist) must complete thirty-one semester hours of University work for the graduate degree and must maintain an overall grade point average of 3.0.

Students who already hold a Master's degree and seek Certification only must meet all program requirements for Certification, including a minimum of twelve semester hours in the department and the departmental comprehensive examination in the discipline for which he/she is seeking Certification.

Before enrolling in a degree or certification program, each student is required to meet with the departmental chairperson and to be assigned a faculty advisor who will be responsible for approval of the student's program of study. The student who holds a Master's degree and seeks Certification only must submit a transcript of his/her graduate studies to the departmental chairperson prior to, or at the time of, the initial conference.

The major in Adult Education is required to complete a minimum of 30 graduate semester hours with thesis of 33 hours without the thesis and must maintain an overall grade point average of 3.0. At least 50% of the courses counted toward the graduate degree must be of courses offered to graduate students only i.e., courses numbered 700-799. Each graduate student must satisfactorily complete an adult teaching practicum under supervision.

## Accreditation

The graduate degree programs in administration and supervision are approved by the North Carolina State Department of Public Instruction, National Council for Accreditation of Teacher Education (NCATE) and the Commission on College of the Southern Association of Colleges and Schools.

## **Career Opportunities**

Graduate degree and certification programs qualify the student for the principalship and/or supervisory positions at the elementary and secondary school levels. The program in postsecondary education is designed to meet the needs of administrative, supervisory and teaching personnel at the community college and technical institute levels.

Students who earn the degree in Adult Education may look forward to careers in such endeavors as Agricultural Extension, Adult Basic Education, Community College Education, Religious Education, Law Enforcement, Continuing Education, Nursing, and Community School Education.

## **CURRICULUM GUIDE**

### **Administration: 31 Semester Hours Required**

This program is designed for students who are interested in qualifying for State Certification as Administrator I (the principal's certificate). Completion of this program does not qualify one for the graduate teaching certificate.

Education 761, Organization and Administration of Schools, is a prerequisite for all other professional courses in the specific areas Administration and/or Supervision.

Students seeking the Master's degree and/or Certification in Curriculum Instructional-Specialist I (Supervision) must meet the requirements for a "G" Certificate in a teaching specialist.

#### **1. Courses**

- a. Foundations in Education - 3 hours  
320-726 Educational Psychology or  
311-701 Philosophy of Education
- b. Organization and Administration — 6 hours selected from:  
312-760 The Junior High School  
312-761 Organization and Administration of Schools  
312-762 The Principalship
- c. Curriculum, Instruction and Supervision — 6 hours selected from:  
310-720 Curriculum Development  
312-755 Supervision of Instruction  
312-756 Supervision of Student Teachers
- d. Cognate Disciplines — 6 hours selected from:  
Economics  
Political Science  
Sociology  
Anthropology
- e. Internship — Administrative Field Experience — 3 hours  
312-769 Problems in Educational Administration
- f. Six (6) hours electives

#### **2. Other Requirements**

- a. GRE (aptitude and advanced tests in education)
- b. Master's Comprehensive in Education and Administration
- c. Overall grade point average of 3.0 for all graduate courses

### **Curriculum Instructional-Specialist: 31-34 Semester Hours Required**

For the Curriculum Instructional-Specialist's I (Master's degree) Certificate, the State of North Carolina requires five (5) years of teaching and/or supervisory or administrative experience within the past eight years. A student will not be recommended for the North Carolina Instructional-Specialist's Certificate without the minimum five (5) years of experience specified above.

## **Courses in Education and Psychology — 15 Semester Hours**

1. Supervision — 3 hours required
  - 312-755 Supervision of Instruction
  - 312-757 Problems in Supervision in the Elementary School
  - 312-758 Problems in High School Supervision
2. Curriculum — 3 hours required
  - 310-720 Curriculum Development
  - 310-721 Curriculum in the Elementary School
  - 310-722 Curriculum in the Secondary School
3. The Nature of Learning and the Learning Process — 3 hours required
  - 320-635 Educational Psychology and Learning
  - 320-726 Educational Psychology
  - 311-727 Child Growth and Development
4. Organization and Administration — 4 hours required
  - 312-761 Organization and Administration of Schools (Prerequisite)
5. Internship — Supervisory Field Experience — 3 hours
  - 312-770 Problems in Educational Supervision
6. Educational Research — 3 hours required
  - 312-790 Seminar in Education Problems

Required courses in subject matter to qualify for issuance of the graduate teacher's certificate — early childhood or intermediate, or secondary — 12-18 semester hours.

Electives — if 12 semester credit hours are used to satisfy the above, 3 hours may be used as electives to meet the particular needs of the student.

## **Other Requirements**

1. Qualifying Examination
2. Master's Comprehensive Examination in Education
3. Master's Comprehensive Examination in Academic Discipline
4. Overall grade point average of 3.0 in all graduate courses

Total number of hours required 31-34 (31 for those completing work for the supervisor's program at the Early Childhood Education level and the Intermediate Education level).

## **Faculty**

Charles E. Bailey, Jr., B.A., J.C. Smith University; M.S., N. C. A&T State University; Ph.D., University of Connecticut; Associate Professor

Marion R. Blair, B.S., A&T State College; M.A., Seton Hall University; Ed.D., Indiana University; Professor

Sampson Buie, B.S., N. C. A&T State University; M.S., The University of North Carolina at Greensboro; Ed.D., The University of North Carolina at Greensboro; Assistant Professor

Henry T. Cameron, B.S., South Carolina State College; M.A., Fairfield University; Ed.D., University of Massachusetts; Associate Professor and Department Chairperson

Edward B. Fort, B.S., M.S., Wayne State University; Ed.D., University of California, Berkeley; Professor and Chancellor

Benjamin W. Harris, B.S., North Carolina A&T State University; M.S., Pennsylvania State University; Ed.D., North Carolina State University; Professor

Winfred J. House, A.B., M.A., Ed.D., Duke University; Professor

Ronald O. Smith, B.S., Florida A&M University; M.A., Northeastern Illinois University; Ph.D., Purdue University; Associate Professor

Albert L. Walker, B.S., Lincoln University; M.A., M.A., M.A., Bradley University; Ed.D., Indiana University; Professor and Dean, School of Education

Sullivan Welborne, B.S., M.S., North Carolina A&T State University; Ed.D., The University of North Carolina at Greensboro; Assistant Professor

## Curriculum for Major in Adult Education

Course	Description	Credit
312-650	Special Problems in Adult Education	3
312-651	Introduction to Adult Education	3
312-652	Methods in Adult Education	3
312-653	Adult Development and Learning	3
312-654	Gerontology	3
312-690	The Community College and Post Secondary Education	3
312-700	History and Philosophy of Adult/Continuing Education	3
312-701	Organization, Administration and Supervision of Adult Education Programs	3
312-702	Practicum in Teaching Adults	3
312-703	Seminar on Contemporary Issues in Adult/Continuing Education	3
312-704	Independent Study	2
312-705	Thesis Research (Optional)	3
311-641	Teaching the Culturally Disadvantaged Learner	3
311-710	Methods and Techniques of Research	3
311-790	Seminar in Educational Problems	3
311-611	Utilization of Educational Media	3
110-601	Adult Education in Occupational Education	3
235-669	Small Groups	3

### Course Offerings

312-650	Special Problems in Adult Education
312-651	Introduction to Adult Education
312-652	Methods in Adult Education
312-653	Adult Development and Learning
312-654	Gerontology
312-689	Contemporary Issues in Administration
312-690	The Community College and Post Secondary Education
312-700	History and Philosophy of Adult/Continuing Education
312-701	Organization, Administration and Supervision of Adult Education Programs
312-702	Practicum in Teaching Adults
312-703	Seminar on Contemporary Issues in Adult/Continuing Education
312-704	Independent Study
312-705	Thesis Research (Optional)
312-755	Supervision of Instruction
312-757	Problems in Supervision in the Elementary School
312-758	Problems in High School Supervision
312-760	The Junior High School
312-761	Organization and Administration of Schools
312-762	The Principalship
312-763	Public School Administration
312-764	Pupil Personnel Administration
312-765	School Community Relations and Communication
312-766	School Planning
312-767	Public School Finance
312-768	Principles of School Law
312-769	Problems in Educational Administration (Internship)
312-770	Problems in Educational Supervision (Internship)
312-771	Program Development: Community Education
312-772	Program Management: Community Education
312-776	Principles of College Teaching
312-777	Seminar in Postsecondary Education

## ARCHITECTURAL ENGINEERING DEPARTMENT

Peter Rojeski, Jr., Ph.D., P.E., Chairman

Office: 448 McNair Hall

### Objective

The objective of the graduate programs in Architectural Engineering is to provide advanced professional coursework in the areas of Structural Analysis and Design, Facilities Management, or Environmental Systems Analysis and Design.

### Degrees Offered

Master of Science in Architectural Engineering

### Program Requirements

The admission of students to the graduate degree program is based upon a baccalaureate degree in Architectural Engineering, Civil Engineering, Mechanical Engineering, Industrial Engineering or Architecture. A grade point average of 3.0 out of 4.0 is required for unconditional admission to the program. Provisional admission may be granted to a candidate with a grade point average of at least 2.6 out of 4.0 if that individual's record indicates outstanding performance in his(her) major courses or related professional work experience since the baccalaureate degree. Provisional admission may require successful completion of one or more undergraduate prerequisite courses.

### Departmental Requirements

In order to graduate, students are required to maintain a grade point average of 3.0 in all graduate (600 and 700) level coursework. A total of 30 class credit hours is required for those students electing the thesis option. A total of 33 credit hours is required for non-thesis option students. These students will either take all classwork which may include a 3 credit hour project.

### Directory of Architectural Engineering Graduate Faculty

Elias G. Abu-Saba, P.E., Associate Professor of Architectural Engineering; B.S.M.E., American University of Beirut, M.S.M.E., Ph.D., Virginia Polytechnic Institute

Peter Rojeski, Jr., P.E., Associate Professor and Chairman of Architectural Engineering; B.S.C.E., Clarkson University; M.S.C.E., Cornell University; Ph.D., Cornell University

Harmohindar Singh, P.E., Associate Professor of Architectural Engineering; M.S.M.E., Punjab University; M.S.M.E., Ph.D., Wayne State University

### Summary of Course Offerings

Courses numbered 600-699 are open to qualified seniors and graduate students. Graduate credit is available to graduate students. Courses numbered 700 and above are only open to qualified graduate students.

Course	Description	Credit (Lec.-Lab)
410-601	Advanced Reinforced Concrete	3(3-0)
410-602	Advanced Structural Analysis	3(3-0)
410-603	Foundation Engineering	3(3-0)
410-610	Airside System Design Concepts	3(3-0)
410-611	Hydronic Systems Design	3(3-0)
410-612	HVAC Controls, Operation & Maintenance	3(2-2)
410-613	Design of Energy Conservation Systems	3(3-0)
410-620	Architectural Design IV	3(0-6)
410-621	Advanced Architectural Design	4(1-6)

410-622	City Planning & Urban Design	3(1-4)
410-656	HVAC Systems Analysis and Simulation	3(3-0)
410-658	Value Analysis in Design and Construction	3(3-0)
410-644	Matrix Analysis of Structures	3(2-2)
410-660	Selected Topics in Engineering	Var. (1-3)
410-666	Special Projects	Var. (1-3)
410-700	Advanced Reinforced Concrete Design II	3(2-2)
410-701	Advanced Structural Analysis II	3(3-0)
410-719	Design of Buildings for Extreme Wind and Earthquake Forces	3(3-0)
410-720	Finite Element Analysis	3(3-0)
410-759	Advanced Foundation Engineering	3(3-0)
410-773	Energy Management Planning	3(3-0)
410-774	Facility Planning and Site Analysis	3(3-0)
410-775	Computer-Aided Project Management	3(3-0)
410-776	Professional Practice and Labor Relations	3(3-0)
410-777	Thesis	Var. (1-6)
410-799	Advanced Structural Steel Design	3(2-2)
410-788	Research	Var. (1-3)
410-789	Special Topics	Var. (1-3)
410-784	Advanced HVAC System Design	3(3-0)

## MASTER OF SCIENCE IN ARCHITECTURAL ENGINEERING

### Environmental Systems Program

<b>Core Courses (18 Hours Required)</b>		<b>Credits</b>
410-773	Energy Management Planning	3
410-613	Design of Energy Conservation Systems	3
410-784	Advanced HVAC Systems Design	3
410-656	HVAC Systems Analysis & Simulation	3
440-733	Radiation Heat Transfer	3
440-618	Numerical Analysis for Engineers	3
		18

### **Elective Courses**

410-666	Project	3
410-777	Thesis	6
410-610	Airside System Design	3
410-611	Hydronic Systems Design	3
410-612	Controls, Operation & Maintenance	3
440-731	Conduction Heat Transfer	3
440-732	Convection Heat Transfer	3
Approved Graduate Electives in Engineering, Mathematics or Computer Science		6

A total of 30 credit hours is required for those students electing the thesis option. A total of 33 credit hours is required for non-thesis option students.

## MASTER OF SCIENCE IN ARCHITECTURAL ENGINEERING

### Structural Analysis & Design Program

<b>Core Courses (15 Hours Required)</b>		<b>Credits</b>
410-700	Advanced Reinforced Concrete Design II	3
410-701	Advanced Structural Analysis II	3
410-779	Advanced Structural Steel Design	3
225-651	Applied Mathematics I	3
225-652	Applied Mathematics II	3
		<hr/>
		15

#### **Elective Courses**

410-666	Project	3
410-777	Thesis	6
410-644	Matrix Analysis of Structures	3
410-719	Design of Buildings for Extreme Winds and Earthquake Forces	3
410-720	Finite Element Analysis	3
410-759	Advanced Foundation Engineering	3
410-789	Special Topics	3
Approved Graduate Electives in Engineering or Math		6

A total of 30 credit hours is required for those students electing the thesis option. A total of 33 credit hours is required of non-thesis option students.

## MASTER OF SCIENCE IN ARCHITECTURAL ENGINEERING

### Facilities Management Program

<b>Core Courses (18 Hours Required)</b>		<b>Credits</b>
410-775	Computer-Aided Project Management	3
410-774	Facility Planning & Site Analysis	3
410-776	Professional Practice & Labor Relations	3
430-658	Project Management & Scheduling	3
430-625	Information Systems	3
430-621	Engineering Cost Control & Analysis	3
		<hr/>
		18

#### **Elective Courses**

410-666	Project	3
410-777	Thesis	6
410-622	City and Urban Design	3
410-658	Value Analysis in Design & Construction	3
410-773	Energy Management Planning	3
Approved Graduate Electives in Engineering, Mathematics, Business or Computer Science		9

A total of 30 credit hours is required for those students electing the thesis option. A total of 33 credit hours is required for non-thesis option students.

<b>Course</b>	<b>Description</b>	<b>Credit (lec.-lab)</b>
400-628	Foundation Engineering	3 (2-2)
400-635	Structural Steel Design	3 (3-0)
400-644	Matrix Analysis of Structures	3 (2-2)
400-652	Theory of Plates and Shells	3 (3-0)
400-660	Selected Topics in Engineering	Variable
400-666	Special Projects	Variable
400-700	Advanced Reinforced Concrete Design	3 (2-2)
400-701	Advance Structural Analysis	3 (3-0)

[For additional courses see graduate offerings of Electrical, Industrial and Mechanical Engineering]

## **ELECTRICAL ENGINEERING DEPARTMENT**

### **Harold L. Martin, Chairman**

#### **Objective**

The objective of the Electrical Engineering Department is to emphasize advance studies in solid state electronics, microelectronics, computer engineering, communications and power systems. The program is designed to provide graduate level education for advanced professional practice or further graduate study.

#### **Degree Offered**

Master of Science in Electrical Engineering

#### **General Program Requirements**

The admission of students to the graduate degree program in the Department of Electrical Engineering is based upon a baccalaureate degree in Electrical Engineering from an accredited institution. A grade point average of 3.0 out of 4.0 is required for unconditional admission to the M.S.E.E. program. Provisional admission may be granted to a candidate who possesses an accredited undergraduate degree in engineering or in a closely related discipline with an overall grade point of at least 2.6 out of 4.0, and has no background deficiencies requiring more than twelve semester hours at the undergraduate level.

#### **Departmental Requirements**

Two options are offered in the Master of Science in Electrical Engineering program. A minimum of 30 semester hours, including 6 hours of thesis are required for the "thesis option," and a minimum of 33 hours, including 3 hours of special projects, are required for the "project option."

In order to graduate, students are required to maintain a grade point average of 3.0 in all graduate (600 and 700) level course work. A minimum of 50% of these courses must be at the 700 level.

#### **Directory of Electrical Engineering Graduate Faculty**

Ali Abul-Fadl, Associate Professor of Electrical Engineering; B.S., M.S., Ph.D., University of Idaho

Ward J. Collis, Associate Professor of Electrical Engineering; B.S., M.S., Northwestern University; Ph.D., Ohio State University

Elham B. Makram, Assistant Professor of Electrical Engineering; B.S., Assiut University, Egypt; M.S., Ph.D., Iowa State University

Hashim M. Anwari, Adjunct Instructor of Electrical Engineering; B.S., Tri-State University; M.S., North Carolina A&T State University

## **ENGINEERING**

**William J. Craft**

Acting Dean of the School of Engineering

**Peter Rojeski**

Chairman, Architectural Engineering Department

**Franklin King**

Chairman, Chemical Engineering Department

**Kenneth Murray**

Chairman, Civil Engineering Department

**Harold Martin, Sr.**

Chairman, Electrical Engineering Department

**Arup K. Mallik**

Chairman, Industrial Engineering Department

**Tony C. Min**

Chairman, Mechanical Engineering Department

The School of Graduate Studies offers a program of study leading to the Master of Science in Engineering that involves all engineering areas. Students may obtain the M.S.E. degree with thesis, project, or course work options. Because the departments of Architectural Engineering, Electrical Engineering, Industrial Engineering, and Mechanical Engineering have departmental Master of Science programs, it is likely that the M.S.E. will be of interest to 1) graduates of our undergraduate engineering curricula whose host departments do not have their own graduate programs, 2) students who wish to study subject matter that might better be accommodated through the expertise and resources of more than one department, or 3) students whose interests may otherwise fall outside other engineering graduate programs.

### **Degree Offered**

Master of Science in Engineering

### **General Requirements**

Regular admission to the Master of Science in Engineering program is granted to graduates of ABET/EAC accredited engineering schools and who have attained a minimum grade point average of 3.0 on a 4.0 scale in their overall undergraduate program of study.

Three other categories of admission may also be invoked on a case-by-case basis. Persons may be admitted provisionally to the M.S.E. program if any of the following conditions apply:

1. The undergraduate degree is not from an ABET accredited program in engineering
2. The undergraduate degree is not in engineering but is in a closely related curriculum with a substantial engineering content. In this case, any deficiencies revealed in the undergraduate transcript may be removed by the inclusion of no more than 12 semester credit hours of appropriate undergraduate course content not for graduate credit.
3. The grade point average is below 3.0, but there is other substantial evidence supporting the applicants ability to complete the degree.

Any provisionally admitted student must earn a minimum grade point average of 3.0 on his graduate work through the semester that his ninth semester graduate course credit occurs. In addition, a "B" grade point average must be earned on all non-credit undergraduate courses if any were required as a condition of admission. In addition to these provisions, other conditions may be imposed on a case-by-case basis as approved by the Graduate School.

Students who hold an undergraduate degree but suffer from course deficiencies exceeding 12 semester credits can be considered for special student status—undergraduate. Persons with massive undergraduate engineering and related deficiencies even though they hold an undergraduate degree are asked to apply as transfer students to the appropriate undergraduate engineering curriculum.

Upon admission to graduate study, the Dean of the Graduate School and program coordinator assign an initial academic advisor. The course of study planned with the approval of the academic advisor is designed to be consistent with the student's engineering interests.

Regulations that are option dependent follow:

### **Course Work**

This option requires 33 credits of course work approved by the advisor. No formal advisory committee is needed. Students wishing to receive advanced training without an interest in solving a publishable problem or in authorizing a technical report will be attracted to this option. A written comprehensive examination of six hours duration arranged by the advisor is a requirement. The examination follows the general course material of the student set by 3 or more examiners out of which one may be the advisor. The student must satisfy the majority of examiners to pass the comprehensive examination. The examination is given during the student's final semester.

### **Project**

This option requires 30 credits of course work and 3 credits of project work (Special Topics)—see Courses (approved by the advisor.) The advisor and student select a suitable project of mutual interest to both.

The project option may interest those who wish to investigate a specific problem and write a technical report. Project option students follow the same rules for a final comprehensive examination as do course work option students.

### **Thesis**

This option requires 14 hours of courses and 6 hours of thesis specifically designed for students who wish to investigate a problem in depth and product original publishable findings under the academic advisor's direction.

The thesis option is a good preparation for students planning to enter Ph.D. programs. For that reason, and because the thesis can be very time consuming, it is a very demanding option. In this option, as in others, the advisor and student plan the program of study. Unlike the others, this option requires a formal committee chaired by the advisor. A minimum of 2 additional faculty members are selected by the advisor to serve. This committee must formally judge the thesis content and quality, and the thesis defense. In addition, the Graduate Dean requires that the thesis follow a specific format established by the Graduate School.

### **Accreditation**

The Master of Science in Engineering degree program is supported by the engineering administration and faculty of the undergraduate departments. Undergraduate engineering degree programs in Architectural, Electrical Engineering, Industrial Engineering and Mechanical Engineering, are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

### **Career Opportunities**

The holder of the Master of Science in Engineering degree is typically employed in an engineering or management position within government and industry. The M.S.E. degree, in particular the thesis option, is a good background for persons wishing to complete a Ph.D. program.

### Suggested Curriculum Guide

The curriculum is determined by the student and his/her advisor according to interest and degree requirements. The courses that follow address only Chemical, Civil and Engineering because topics and courses in other program areas are already listed under Architectural, Electrical, Industrial, and Mechanical Engineering. Those courses may also be part of an M.S.E. program.

### COURSES

<b>Course</b>	<b>Course Title</b>	<b>Credit (lec.-lab)</b>
400-660	Selected Topics in Engineering	Variable (1-3)
400-666	Special Projects	Variable (1-3)
400-710	Advanced Transport Phenomena	(3-0)
400-720	Advanced Chemical Reaction Engineering	3(3-0)
400-730	Advanced Biochemical Engineering	3(3-0)
400-750	Separation Processes	3(3-0)
400-760	Topics in Molecular Thermodynamics	3(3-0)
400-777	Thesis	Variable (1-6)
400-789	Special Topics	Variable (1-3)

(For additional courses, see offerings of Architectural, Electrical, Industrial, and Mechanical Engineering.)

### CHEMICAL ENGINEERING

Franklin G. King, Chairman

#### Objective

The objective of the graduate program in Chemical Engineering is to provide advanced level study in chemical engineering. The program will serve as preparation for further advanced study at the doctoral level or for advanced chemical engineering practice in industry.

#### Degree Offered

Master of Science in Engineering with Chemical Engineering option. (MSE - ChE option).

#### General and Departmental Requirements

The general requirements for the Master of Science in Engineering program are presented with the write up on that program. The MSE-ChE option program has the same requirements as the general MSE program with the following exception: the MSE-ChE option program provides only the thesis option which requires 24 semester hours of course work and 6 hours of thesis culminating in the preparation of a thesis on a scholarly research topic. Unconditional admission to the program is granted only to students with a BS degree in chemical engineering from an ABET/EAC accredited program and with a minimum GPA of 3.0. Admission requirements for provisional admission or special student status are outlined in the MSE program.

#### Directory of Faculty

Tevfik Bardakci, Associate Professor, Ph.D., University of Maryland  
Vinayak N. Kabadi, Assistant Professor; Ph.D., Pennsylvania State University  
Franklin G. King, Professor; D.Sc., Stevens Institute of Technology  
Li Ting, Assistant Professor; Ph.D., Illinois Institute of Technology

### **Advanced Undergraduate/Graduate Courses**

<b>Course*</b>	<b>Description</b>	<b>Credit</b>
470-600	Advanced Process Control	3 (3-0)
470-605	Biochemical Engineering	3 (3-0)
470-610	Advanced Chemical Engineering Thermodynamics	3 (3-0)
470-620	Advanced Chemical Engineering Analysis	3 (3-0)
470-630	Transport Phenomena	3 (3-0)
470-650	Interfacial Transport Phenomena	3 (3-0)

\*Graduate only or 700 level courses in chemical engineering are listed under MSE program.

### **INDUSTRIAL ENGINEERING DEPARTMENT**

**Arup Mallik, Chairperson**  
**Office: 419 McNair Building**

#### **Objectives**

The Master of Science Program in Industrial Engineering is designed to meet the need for technical and/or managerial specialists in the Industrial Engineering area of concentration. Four areas of concentration (Production and Manufacturing, Systems Analysis and Design, Operations Research and Human Factors) are being offered.

#### **Degree Offered**

Master of Science in Industrial Engineering

#### **General Program Requirements**

The program is open to students with a bachelor's degree in a scientific discipline from an institution of recognized standing. Students desiring to enter the program who do not possess a bachelor's degree in a scientific discipline are required to complete with at least a "B" average a significant number of background courses in mathematics, physics and engineering science prior to admission to the graduate program. Students entering the program without a bachelor's degree in Industrial Engineering from an accredited department are required to remove all deficiencies in general professional prerequisites.

#### **Program Options and Degree Requirements**

The Master of Science in Industrial Engineering program consists of two distinct options—Thesis and Project. With the Thesis Option, 24 semester hours of course work is required. The other six hours must consist of thesis work. These hours must be at the 600 and 700 level and a minimum of 9 of these credit hours must be at the 700 level. A minimum of 12 credit hours of these courses must be at the 700 level. Student should submit a written thesis/project proposal before completion of 21 graduate credit hours. Before submitting the proposal, the student should form an advisory committee in consultation with the permanent advisor. In order to graduate, students are required to maintain a grade average of 3.0 in all graduate level course work.

## Typical Plans of Study

### Production and Manufacturing

		Credit
430-615	Industrial Simulation	3(3-0)
430-624	Production Systems	3(2-1)
430-650	Operations Research II	3(3-0)
430-665	Man/Machine Systems	3(3-0)
430-716	Engineering Statistics II	3(3-0)
430-632	Robotic Systems and Applications	3(2-1)
430-740	Decision Support Systems	3(3-0)
430-745	Manufacturing Automation	3(3-0)
430-777	Thesis or 430-788 Project and	Credit Variable (1-6)
	430-712 Work Measurement Theory	3(3-0)
	430-718 Advanced Quality Control	3(3-0)

### System Analysis and Design

430-615	Industrial Simulation	3(3-0)
430-624	Production Systems	3(2-1)
430-650	Operations Research II	3(3-0)
430-665	Man/Machine Systems	3(3-0)
430-716	Engineering Statistics II	3(3-0)
430-625	Information Systems	3(3-0)
430-740	Decision Support Systems	3(3-0)
430-745	Manufacturing Automation	3(3-0)
430-777	Thesis or 430-788 Project and	(1-6)
	430-621 Engineering Cost Control and Analysis	3(3-0)
	430-718 Advanced Quality Control	3(3-0)

### Human Factors

430-615	Industrial Simulation	3(3-0)
430-624	Production Systems	3(2-1)
430-650	Operations Research II	3(3-0)
430-665	Man/Machine Systems	3(3-0)
430-716	Engineering Statistics II	3(3-0)
430-658	Project Management and Scheduling	3(3-0)
430-733	Advanced Operations Research	3(3-0)
430-740	Decision Support/System	3(3-0)
430-777	Thesis or 430-788 Project and	(1-6)
	430-625 Information Systems	3(3-0)
	430-718 Advanced Quality Control	3(3-0)

### Industrial Engineering, Directory of Faculty and Courses

Arup K. Mallik, B.S., Jadapur University, Calcutta; M.S., North Carolina State University; Ph.D., Professor

Eshan Asoudegi, B.S., Aryamehr University of Technology, Iran; M.S., University of Michigan; Ph.D., West Virginia University

Balasubramanian Ram, B.S., M.S., Indian Institute of Technology; Ph.D., State University of New York at Buffalo; Assistant Professor

Chin-Sheng Chen, B.S., M.S., National Taiwan Normal University; Ph.D., Virginia Polytechnic Institute and State University

Eui H. Park, B.S., Yonsei University, Korea; M.S., Ph.D., Mississippi State University; Assistant Professor

Celestine A. Ntuen, B.S., M.S., Ph.D., West Virginia University; Assistant Professor

Sanjiv Sarin, B.S., M.S., Indian Institute of Technology; Ph.D., State University of New York at Buffalo; Assistant Professor

<b>Courses</b>	<b>Credit</b>
430-615 Industrial Simulation	3(3-0)
430-621 Engineering Cost Control and Analysis	3(3-0)
430-624 Production Systems	3(2-1)
430-625 Information Systems	3(3-0)
430-626 Systems Analysis and Design	3(3-0)
430-632 Robotic Systems and Applications	3(2-1)
430-640 Intermediate Engineering Economy	3(3-0)
430-649 A Survey of Operations Research Methodologies	3(3-0)
430-650 Operations Research II	3(3-0)
430-658 Project Management and Scheduling	3(3-0)
430-660 Selected Topics in Engineering	Credit Variable (1-3)
430-662 Reliability	3(3-0)
430-664 Safety Engineering	3(3-0)
430-665 Man/Machine Systems	3(3-0)
430-666 Special Projects	Credit Variable (1-3)
430-678 Engineering Management	3(3-0)
430-712 Work Measurement Theory	3(3-0)
430-716 Applied Regression Analysis	3(3-0)
430-718 Advanced Quality Control	3(3-0)
430-730 Industrial Dynamics	3(3-0)
430-733 Advanced Operations Research	3(3-0)
430-735 Human-Computer Interface	3(3-0)
430-740 Decision Support Systems	3(3-0)
430-745 Manufacturing Automation	3(3-0)
430-749 Inventory Systems Analysis and Design	3(3-0)
430-777 Thesis	Credit Variable (1-6)
430-778 Research	Credit Variable (1-3)
430-789 Special Topics	

## **MECHANICAL ENGINEERING**

**W. J. Craft, Chairperson**

**Office: 108 Graham Hall**

### **Objectives for Industrial Engineering Programs:**

The objective of the Master of Science in Mechanical Engineering Program is to provide advanced level study in mechanical engineering in three distinct areas of specialization as preparation for further advanced study at the doctoral level or for advanced mechanical engineering practice in industry, consulting or government service. The three areas of specialization are solid mechanics, thermal sciences and manufacturing and materials.

### **Degree Offered**

Master of Science in Mechanical Engineering

### **General Program Requirements**

Unconditional admission to the Master of Science in Mechanical Engineering Program requires a B.S. degree in Mechanical Engineering from an ABET accredited program with a minimum 3.0 grade point average on a 4.0 system. Conditional admission may be granted to holders of B.S.M.E. degree from non-ABET accredited programs, to individuals with less than a 3.0 average and to individuals with a B.S. degree in another area of engineering or a closely related field with no more than twelve semester hours of deficiencies in required undergraduate courses. A minimum grade point average of 2.6 in undergraduate work is required for conditional admission.

## Departmental Requirements

Three degree options are available: *Thesis, Project, and Course Work Only*. The thesis option requires 24 semester hours of course work and 6 hours of thesis culminating in the preparation of a thesis on a scholarly research topic. The project option requires 30 semester hours of course work and 3 hours of special project culminating in a written and oral project report. The course work only option requires 33 semester hours of course work. A minimum of 50% of all course work must be at the 700 level. To graduate, a student must maintain a 3.0 grade point average.

## SUGGESTED PLANS OF STUDY

### Solid Mechanics

- 225-651 Methods in Applied Mathematics I
- 225-652 Methods in Applied Mathematics II or
- 400-648 Numerical Analysis for Engineers
- 400-602 Advanced Strength of Materials
- 400-624 Mechanical Vibrations or
- 400-778 Theory of Vibrations
- 400-672 Theory of Elasticity or
- 400-748 Advanced Theory of Elasticity
- One course in the thermal science or manufacturing materials area
- 400-777 Thesis (6 hrs.) plus 6 additional hours of course work or 12 additional hours of course work plus 3 hours of special project or 15 additional hours of course work.

### Thermal Sciences

- 225-651 Methods in Applied Mathematics I
- 225-652 Methods in Applied Mathematics II or
- 400-648 Numerical Analysis for Engineers
- 400-609 Advanced Fluid Mechanics
- 400-735 Heat Transfer I — Conduction
- 400-762 Advanced Thermodynamics and Mass Transport
- One course in the solid mechanics or manufacturing/materials area
- 400-777 Thesis (6 hrs.) plus 6 additional hours of course work or 12 additional hours of course work plus 3 hours of special project or 15 additional hours of course work.

### Manufacturing and Materials

- 225-631 Linear and Non-Linear Programming
- 225-651 Methods in Applied Mathematics I or
- 225-652 Methods in Applied Mathematics II
- 400-675 Theories of Machining Processes
- 400-681 Numerical Control in Manufacturing or
- 400-682 Materials Forming
- 400-757 Physical Metallurgy of Industrial Alloys
- One course in the solid mechanics or thermal science/area
- 400-777 Thesis (6 hrs.) plus 6 additional hours of course work or 12 additional hours of course work plus 3 hours of special project or 15 hours of additional course work.

### Directory of Faculty

- Tony C. Min, P.E., B.S., Chiao Tung University; M.S., Ph.D., University of Tennessee; Professor and Chairman
- William J. Craft, P.E., B.S., North Carolina State University; M.S., Ph.D., Clemson University; Professor and Associate Dean

V. Sarma Avva, B.S., Saugor University; D.M.I.T., Madras Institute of Technology; M.S., Oklahoma State University; Professor

Botros M. Botros, P.E., B.S., Alexandria University; M.Engrg., Ph.D., Sheffield University; Professor

Rajinder S. Chauhan, B.S., G.N. Engineering College; M.Tech., Indian Institute of Technology; Ph.D., Auburn University; Assistant Professor

George J. Filatovs, B.S., Washington University at St. Louis; Ph.D., University of Missouri at Rolla; Professor

D. Yogi Goswami, P.E., B.S., Delhi University; M.S., Ph.D., Auburn University; Associate Professor

David E. Klett, P.E., B.S., Michigan State University; M.S., Ph.D., University of Florida; Professor

Hsin-Yi Lai, B.S., National Cheng-Kung University; M.S., State University of New York at Buffalo; Ph.D., University of Wisconsin at Madison; Assistant Professor

Chih Hwa Li, B.S., Chiao Tung University; M.S., University of Michigan; Associate Professor

Samuel P. Owusu-Ofori, B.S., University of Science and Technology-Kumasi, Shana; M.S., Bradley University; Ph.D., University of Wisconsin-Madison; Assistant Professor

Hemen Ray, B.S., University of Calcutta; M.S., University of Wisconsin-Madison; Ph.D., University of Wisconsin-Madison; Assistant Professor

Jagannathan Sankar, B.E., University of Madras; M.E., Concordia University, Canada; Ph.D., Lehigh University; Assistant Professor

Lonnie Sharpe, Jr., B.S., North Carolina A&T State University; M.S., North Carolina State University; Ph.D., University of Illinois-Urbana/Champaign; Assistant Professor

Horn-Sen Tzou, B.S., National Taiwan University; M.S., Ph.D., Purdue University; Assistant Professor

### **Courses**

440-602 Advanced Strength of Materials

440-604 Intermediate Dynamics

440-606 Mechanical Vibrations

440-608 Experimental Stress Analysis

440-610 Theory of Elasticity

440-612 Modern Composite Materials

440-614 Mechanics of Engineering Modeling

440-616 Design by Finite Element Methods

440-618 Numerical Analysis for Engineers

440-619 Computer-Aided Graphics and Design

440-626 Advanced Fluid Dynamics

440-636 Design of Thermal Systems

440-640 Materials Forming

440-642 Materials Joining

440-644 Theories of Machining Processes

440-649 Introduction to Robot Manipulators

440-650 Mechanical Properties and Structure of Solids

440-654 Strengthening Mechanisms in Commercial Materials

440-660 Selected Topics in Engineering

440-666 Special Projects

440-702 Continuum Mechanics

440-704 Advanced Dynamics

440-706 Theory of Vibrations

440-707 Real Time Analysis of Dynamic Systems

440-708 Energy Methods in Applied Mechanics

- 440-710 Advanced Theory of Elasticity
- 440-712 Theory of Elastic Stability
- 440-714 Mathematical Theory of Plasticity
- 440-719 Advanced Computer-Aided Design
- 440-720 Advanced Classical Thermodynamics
- 440-722 Statistical Thermodynamics
- 440-724 Irreversible Thermodynamics
- 440-726 Boundary Layer Theory
- 440-731 Conduction Heat Transfer
- 440-732 Convection Heat Transfer
- 440-733 Radiation Heat Transfer
- 440-734 Special Topics in Applied Heat Transfer
- 440-738 Solar Thermal Energy Systems
- 440-740 Machine Tool Design
- 440-742 Tools, Jigs and Fixtures
- 440-746 Statistical Analysis of Manufacturing Systems
- 440-748 Numerical Control in Manufacturing
- 440-750 Phase Equilibria
- 440-752 Mechanical Properties and Theories of Failure
- 440-754 Deformation Analysis in Metal Processing
- 440-756 Physical Metallurgy of Industrial Alloys
- 440-758 Mechanical Metallurgy
- 440-766 Advanced Special Projects
- 440-777 Thesis
- 440-788 Research
- 440-789 Special Topics

## ENGLISH

**Jimmy L. Williams, Chairperson**  
**Office: 202 Crosby Hall**

### **Objectives**

The objectives of the English Department are to provide in-depth training in English-Education, English and Afro-American literature, folklore and language.

### **Degrees Offered**

English and Afro-American Literature — M.A.  
 English Education — M.S.

### **Requirements for Admission to the M.A. Program in English and Afro-American Literature and the M.S. Program in English Education**

All applicants to the M.A. program must have earned a bachelor's degree from a four-year college. Applicants must also have completed a minimum of twenty-four (24) undergraduate hours in English. The hours must include at least three semester hours of Shakespeare, three of American literature, three of English literature, three of world literature of contemporary literature, and three of advanced grammar and composition.

A student who fails to meet these qualifications will be expected to satisfy the requirements by enrolling in undergraduate courses before beginning graduate studies in English.

Application forms may be obtained from the office of the Graduate School or the English Department and must be completed and returned to the Graduate Office. Two (2) official transcripts of previous undergraduate or graduate records and three

(3) letters of recommendation must be forwarded to the Graduate Office before action can be taken on the application. An applicant may be admitted to the program unconditionally, provisionally, or as a special student.

*Unconditional Admission.* To qualify for unconditional admission to the M.A. program, an applicant must have earned an overall average of 3.00 on a four-point system (or 2.00 on a three-point system) in undergraduate studies.

*Provisional Admission.* An applicant may be admitted to graduate studies on a provisional basis if (1) the record of undergraduate preparation reveals deficiencies that can be removed near the beginning of graduate study or (2) lacking the required grade point average for unconditional admission, the applicant may become eligible by successfully completing the first nine (9) hours of course work with a 3.00 or better average. A student provisionally admitted may also be required to pass examinations to demonstrate his knowledge in certain areas or to take special undergraduate courses to improve his background.

*Special Students.* Students not seeking the M.A. degree may be admitted in order to take courses for self-improvement or for renewal of teaching certificates. If the student subsequently wishes to pursue the M.A. program, he or she must request an evaluation of the work. Under no circumstances may the student apply toward a degree program more than twelve (12) hours earned as a special student.

### **M.A. and M.S. Degree Requirements**

Except for the foreign language requirement, the program requirements are the same for the M.S. in Education-English as they are for the M.A. in English and Afro-American Literature. A reading knowledge of French, German, or Spanish is required for the M.A. degree.

*Total Hours Required.* The M.A. and M.S. programs consist of two distinct and parallel elements. The student may elect to take twenty-seven (27) hours of course work and write a thesis for three (3) hours credit in order to satisfy the thirty-hour minimum requirement. The student may also elect not to write a thesis and take an additional three (3) hours of course work in order to satisfy the thirty-hour minimum requirement. Three courses are required: English 754 — History and Structure of the English Language, English 753 — Literary Research and Bibliography, and English 700 — Literary Analysis and Criticism. The student must take a minimum of twelve (12) hours and no more than a maximum of fifteen (15) hours in Afro-American Literature.

Approximately fifty percent of the courses offered each semester will be open only to graduate students. These courses are on the 700 level. All 600 level courses will be open to both undergraduate and graduate students.

*Grades Required.* Students in the M.A. program must maintain a 3.00 average in order to satisfy the grade requirements of the program. If a student receives a C or lower in more than two (2) courses, he or she will be dropped from the program.

*Amount of Credit Accepted for Transfer.* The Graduate School will accept six (6) semester hours of transfer credit from another institution for those students enrolled in degree programs.

*Other Requirements (Comprehensive and Thesis Examinations).* For the M.A. and M.S. degrees, students must pass a three (3) hour written comprehensive examination administered by the English Department. The comprehensive examination will cover only material to which the student has been exposed in course work at A. and T. The comprehensive may be taken twice. An additional comprehensive examination in education is required of persons pursuing the M.S. degree. Those students who elect to write a thesis must meet the deadlines projected by the Graduate School in addition to standing a one-hour oral examination which constitutes a defense of the thesis. The defense may be attempted twice.

## **Career Opportunities**

Both the M.A. and M.S. degrees prepare students to pursue graduate study for the doctorate in English and related fields. The M.S. prepares one to teach on the secondary and college levels. The M.A. degree is designed primarily to prepare one for college teaching and for admission to doctoral programs.

## **Curriculum Guide for M.A. Degree**

*Non-Thesis Option:* 30 semester hours required

1. Required: English 700, 753, 754
2. Twelve (12) hrs. from: English 650, 652, 654, 656, 658, 660, 760, 762, 764, 766
3. Nine (9) hrs. from: English 603, 620, 628, 662, 702, 704, 720, 749, 750, 751, 752, 775, 770
4. Foreign Language: Demonstrated proficiency in French, Spanish, German or an approved substitute.

*Thesis Option:* 30 semester hours required

1. Required: English 700, 753, 754
2. Nine to twelve (9-12) hrs. from: English 650, 652, 654, 658, 660, 760, 762, 764, 766
3. Nine (9) hrs. from: English 603, 620, 628, 662, 702, 704, 720, 749, 750, 751, 752, 755, 770
4. Foreign Language: Demonstrated proficiency in French, Spanish, German or an approved substitute.
5. Thesis Research: English 775, 3 semester hours

## **Curriculum Guide for M.S. Degree**

*Non-Thesis Option:* 30 semester hours required

In addition to the course specified in the description of general requirements for a Master of Science in Education, the student must complete the following:

1. English 700, 753, 754
2. 15 semester hours selected from the following: English 603, 620, 628, 650, 652, 654, 656, 658, 660, 662, 702, 704, 749, 750, 751, 752, 755, 760, 762, 764, 766

*Thesis Option:* 30 semester hours required

In addition to the courses specified in the description of general requirements for a Master of Science in Education, the student must complete the following:

1. English 700, 753, 754
2. 12 semester hours selected from the following: 603, 620, 628, 650, 652, 654, 658, 660, 662, 702, 704, 720, 749, 750, 751, 752, 755, 760, 762, 764, 766, 770
3. Thesis Research: English 755, 3 semester hours

## **Directory of Faculty and Courses**

Jimmy L. Williams, B.A., Clark College; M.A., Washington University; Ph.D., Indiana University; Professor

Brian Benson, A.B., Guilford College; M.A., University of North Carolina at Greensboro; Ph.D., University of South Carolina; Professor

John Crawford, B.S., North Carolina A. and T. State University; M.S., University of Iowa; Ph.D., University of Colorado; Professor

Norman Jarrard, A.B., Salem College; M.A., University of North Carolina at Chapel Hill; Ph.D., University of Texas; Professor

Irma Cunningham, B.A., LeMoyne-Owen College; M.A., Indiana University; Ph.D., The University of Michigan; Associate Professor

Michael Greene, B.A., Duke University; M.A., Ph.D., Indiana University; Associate Professor

Robert Levine, B.A., Queens College of the City University of New York; M.A., Ph.D., Cornell University; Professor

Ethel Taylor, A.B., Spelman College; M.A., Atlanta University; Ph.D., Indiana University; Professor  
Sandra Alexander, B.S., North Carolina A. and T. State University; M.A., Harvard University; Ph.D., University of Pittsburgh; Associate Professor  
SallyAnn Ferguson, B.A., Norfolk State University; M.A., Ph.D., Ohio State University; Assistant Professor  
Elon Kulii, B.A., Winston-Salem State University; M.S., North Carolina A. and T. State University; Ph.D., Indiana University; Assistant Professor

**Courses For Advanced Undergraduates and Graduates**

212-600 Language Variations in American English  
212-603 Introduction to Folklore  
212-620 Elizabethan Drama  
212-626 Children's Literature  
212-627 Literature for Adolescents  
212-628 The American Novel  
212-650 Afro-American Folklore  
212-652 Afro-American Drama  
212-654 Afro-American Novel I  
212-656 Afro-American Novel II  
212-658 Afro-American Poetry I  
212-660 Afro-American Poetry II  
212-662 History of American Ideas  
212-672 Independent Study in English

**Graduate Courses, open only to graduate students**

212-700 Literary Analysis and Criticism  
212-702 Milton  
212-704 Eighteenth Century English Literature  
212-710 Language Arts for Elementary Teachers I  
212-711 Language Arts for Elementary Teachers II  
212-720 Studies in American Literature  
212-749 Romantic Prose and Poetry of England  
212-750 Victorian Literature  
212-751 Modern British and Continental Fiction  
212-752 Restoration and 18th Century Drama  
212-753 Literary Research and Bibliography  
212-754 History and Structure of the English Language  
212-755 Contemporary Practices in Grammar and Rhetoric  
212-760 Non-Fiction by Afro-American Writers  
212-762 Short Fiction by Afro-American Writers  
212-764 Black Aesthetics  
212-766 Seminar in Afro-American Literature and Language  
212-770 Seminar  
212-775 Thesis Research

**FOREIGN LANGUAGES**  
**Helen Disher, Chairperson**  
**Office: 301 Crosby Hall**

**Objectives**

The Department of Foreign Languages offers graduate work leading to the Master of Science degree with a concentration in French. The program is designed for persons desirous of post-baccalaureate training and experiences in French teaching, language and literature.

**Degree Offered**

Master of Science Degree in French—M.S.

**Requirements for Admission to the Program: M.S. Program in French**

An applicant must satisfy the general requirements for admission to the Graduate School. An applicant must have earned a minimum of twenty-four (24) hours in French on the undergraduate level.

In order to qualify for unconditional admission to the program in French, an applicant must have earned an overall grade point average of 3.00 on a four-point system in undergraduate studies.

An applicant may be admitted to the program on a provisional basis as stated in the Graduate School's Bulletin under **Provisional Admission** and with the consent of the Department of Foreign Languages.

Persons not seeking the M.S. degree in French may be admitted as a Special Student in order to take courses for self-improvement in French.

**Requirements for a Degree in French**

*Thesis Option:* 30 s.h. required

In addition to the courses specified in the description of general requirements for a Master of Science in Education, the student must complete the following:

1. French 720 and 724.
2. 12 additional s.h. in graduate-level courses in French.
3. 3 hours of electives.
4. Thesis Research.

*Non-Thesis Option:* 30 s.h. required

In addition to the courses specified in the description of general requirements for a Master of Science in Education, the student must complete the following:

1. French 720 and 724.
2. 12 additional s.h. in graduate-level French courses.
3. 3 hours of electives in education, French, or courses related to French.

**FRENCH**

**Courses Offered For Advanced Undergraduates and Graduates**

- |         |   |
|---------|---|
| 217-602 | Problems and Trends in Foreign Languages (Formerly French 501, 2571)      |
| 217-603 | Oral Course for Teachers of Foreign Languages (Formerly French 502)       |
| 217-606 | Research in the Teaching of Foreign Languages (Formerly French 503, 2573) |
| 217-607 | French Literature of the Seventeenth Century (Formerly French 302, 2574)  |
| 217-608 | French Literature in the Eighteenth Century (Formerly French 303, 2575)   |

- 217-609 French Literature of the Nineteenth Century (Formerly French 304, 2576)  
 217-610 The French Theatre (Formerly French 504, 2577)  
 217-612 The French Novel (Formerly French 505, 2578)  
 217-614 French Syntax (Formerly French 506, 2579)  
 217-616 Contemporary French Literature (Formerly French 305 and 2542, 2580)

**Graduate Courses, open only to graduate students**

- 217-720 Advanced Reading and Composition (Formerly 601 and 2580, 2585)  
 217-722 Romantic Movement in France (1820-1848) (Formerly 602 and 2581, 2856)  
 217-724 Seminar in Foreign Languages (Formerly 603 and 2582, 2587)  
 217-726 Contemporary Literary Criticism (Formerly 604 and 2583, 2588)  
 217-728 Independent Study in Foreign Languages (Formerly 258, 2589)

**Directory of Faculty**

Helen Disher, B.A., Talladega College; M.A., University of Illinois; Ph.D., University of Minnesota; Professor  
 Carl Henderson, B.A., Morehouse College; M.A., Case Western Reserve University; Ph.D., Case Western Reserve University; Associate Professor; Coordinator of Graduate Studies in French

**HEALTH, PHYSICAL EDUCATION and RECREATION**

**Deborah J. Callaway, Chairperson**  
**Office: Corbett Gymnasium**

**Objective**

The objective of the Department of Health, Physical Education and Recreation is to provide an opportunity for professionals in the discipline to pursue post baccalaureate experiences/degree.

**Degree Offered**

The Department offers a Master of Science degree in Education with a concentration in Health and Physical Education.

**General Program Requirements**

The admission of students to the graduate degree program of Physical Education is based upon the general admission requirements of the University.

**Departmental Requirements**

*Non-Thesis Option:* 30 semester hours required

In addition to the courses specified in the description of general requirements for a Master of Science in Education, the student must complete the following:

1. Physical Education 785, 786, and 798
2. 9 semester hours in Physical Education courses
3. 6 semester hours in electives

*Thesis Option:* 30 semester hours

In addition to the courses specified in the description of general requirements for a Master of Science in Education, the student must complete the following:

1. Physical Education 785, 786, 798, and 799
2. 6 additional semester hours in Physical Education courses
3. 6 semester hours in electives

## Career Opportunities

A degree in this field provides content for students preparing for careers or who are already in the field of Health and Physical Education.

### For Advanced Undergraduates and Graduates

	<i>Credits</i>
<i>Health Education</i>	
330-651 Personal, School and Community Health Problems	3
330-652 Methods and Material in Health Ed. for Elem. Sch. Teachers	3
<i>Physical Education</i>	
330-655 Current Problems and Trends in Physical Education	3
330-656 Administration of Interscholastic and Intramural Athletics	3
330-657 Community Recreation	3
330-658 Current Theories and Practices of Teaching Sports	3
330-669 Physiology of Exercise	3
330-679 Prescribed Methods of Rehabilitating the Physically Handicapped	
<i>For Graduates Only</i>	
330-780 Organization and Administration of Health, Physical Education and Recreation in Elementary Schools	3
330-785 Research in Health, Physical Education and Recreation (Prerequisites: Successful completion of 330-785 and 330-786)	3
330-786 Scientific Foundations of Physical Education	3
330-787 Scientific Foundations of Physical Fitness	3
330-798 Seminar	3
330-799 Thesis	

### Directory of Faculty and Courses

Dorothy J. Alston, B.S., North Carolina A. and T. State University; M.A., North Carolina Central University; Ed.D., University of North Carolina at Greensboro; Professor

Leonard Dudka, B.S., M.A., California State Polytechnic College; Ph.D., University of Illinois-Urbana; Professor

Eleanor W. Gwynn, B.S., Tennessee State A. and I. University; M.F.A., University of N.C. at Greensboro; Ph.D., University of Wisconsin-Madison; Assistant Professor

Joseph Williams, B.S., North Carolina A. and T. State University; M.S., University of Michigan; Assistant Professor

Tova Rubin, B.F.A., University of the Arts; M.A., Adelphi; Ph.D., Temple University; Assistant Professor

### Courses

330-651	Personal, School and Community Health Problems	
330-652	Methods and Materials in Health Education for Elementary School Teachers	
330-655	Current Problems and Trends in Physical Education	
330-656	Administration of Interscholastic and Intramural Athletics	
330-657	Community Recreation	
330-658	Current Theories and Practices of Teaching Sports	
330-669	Physiology of Exercise	
330-679	Prescribed Methods of Rehabilitating the Physically Handicapped	
330-780	Organization and Administration of Health, Physical Education and Recreation in Elementary Schools	
330-785	Research in Health, Physical Education and Recreation (Prerequisites: Successful completion of 330-785 and 330-786)	
330-786	Scientific Foundations of Physical Education	
330-787	Scientific Foundations of Physical Fitness	
330-798	Seminar	
330-799	Thesis	

**DEPARTMENT OF HISTORY**  
**Peter V. Meyers, Chairperson**  
**Office: 324 Gibbs Hall**

The Department of History offers students a knowledge of the past which enables them to better understand today's world and to prepare for the future. The Department also helps students develop skills in research, analysis, decision-making, and communication. These skills prepare students for successful careers, constructive participation in civic affairs, and life-long learning. In short, the Department of History emphasizes the personal development of each student.

The objectives of the Graduate programs of the History Department are: 1) to give historical content and professional skills to students preparing for careers in fields such as education, law, religion, international affairs, social service, journalism, history, or government; 2) to offer a course of study leading to the Master of Science Degree in Education with a concentration in either History or Social Science; and, 3) to provide instruction for students preparing for doctoral programs.

### **Degrees Offered**

History, Secondary Education — M.S.

Social Science, Secondary Education — M.S.

### **General Program Requirements**

In addition to the general requirements specified in the description of the degree program in Education, a student wishing to be accepted as a candidate for the degree of Master of Science in Education with a concentration in History or Social Science must hold or be qualified to hold a Class A teaching certificate in History or Social Science. If a person does not qualify for certification, appropriate undergraduate or graduate courses may be taken to correct this deficiency. All graduate students must complete a graduate course in methods of teaching the social sciences.

### **Career Opportunities**

The skills and knowledge learned in history and social science courses can lead to careers in journalism, business, archives and museums, international affairs, and government service, among others. The M.S. Degree Programs in History and Social Science prepare students for classroom teaching in secondary schools. Businesses also find that teacher education graduates make good human relations specialists, personnel directors, technical writers, sales managers, directors of training programs, and administrators.

### **Departmental Requirements**

To complete the requirements for the degree of Master of Science in Education with a concentration in History or Social Science, the student may elect the thesis option or the non-thesis option. A comprehensive examination is required in History or the Social Sciences as well as in Education. Students must maintain a grade point average of 3.00.

### **History, Non-Thesis Option**

Thirty semester hours required in courses at the 600 level or above.

1. 21 semester hours in history (Political Science 645 and 730 are accepted for history credit).
2. 6 semester hours in education (including Education 725, and Education 701 or 625 or 703 or 720 or 722 or Educational Psychology 726).
3. 3 semester hours in electives

### **History, Thesis Option**

Thirty semester hours required in courses at the 600 level or above including the thesis.

1. 15 semester hours in history.
2. 6 semester hours in education (including Education 725, and Education 701 or 625 or 703 or 722 or Educational Psychology 726).
3. 6 semester hours thesis.
4. 3 semester hours in electives.

### **Social Science, Non-Thesis Option**

Thirty semester hours required in courses at the 600 level or above.

1. 21 semester hours in social science courses.
2. 6 semester hours in education (including Education 725, and Education 701 or 703 or 625 or 720 or 722 or Educational Psychology 726).
3. 3 semester hours in electives.

### **Social Science, Thesis Option**

Thirty semester hours required in courses at the 600 level or above including the thesis.

1. 15 semester hours in social science courses.
2. 6 semester hours in education (including Education 725, and Education 701 or 625 or 703 or 720 or 722 or Educational Psychology 726).
3. 6 semester hours thesis.
4. 3 semester hours in electives.

### **Directory of Faculty and Courses**

Frenise A. Logan, A.B., Fisk University; M.A., Ph.D., Case Western Reserve University; Professor

Dorothy S. Mason, A.B., University of North Carolina at Greensboro; M.A., University of Georgia; Ph.D., University of North Carolina at Chapel Hill; Professor

James G. Nutsch, B.S., Kansas State University; M.A., Ph.D., University of Kansas; Professor

Peter V. Meyers, B.A., Wesleyan University; M.A., Ph.D., Rutgers University; Professor

### **Courses**

- 233-600 The British Colonies and the American Revolution
- 233-603 The Civil War and Reconstruction
- 233-605 Seminar on the Soviet Union
- 233-606 United States History, 1900-1932
- 233-607 United States History, 1932-Present
- 233-615 Seminar in the History of Black America
- 233-616 Seminar in African History
- 233-617 Readings in African History
- 233-620 Seminar in Asian History
- 233-625 Seminar in Historiography and Historical Method
- 233-626 Revolutions in the Modern World
- 233-630 Seminar in European History, 1815-1914
- 233-631 Studies in Twentieth Century Europe, 1914 to the Present
- 233-633 Independent Study in History
- \*237-645 American Foreign Policy — 1945 to Present

## Geography

- 233-640 Topics in Geography of the United States and Canada  
233-641 Topics in World Geography

## History

- 233-701 Recent United States Diplomatic History  
233-712 The Black American in the Twentieth Century  
233-730 Seminar in History  
233-740 History, Social Science, and Contemporary World Problems  
233-750 Thesis in History  
‡237-730 Constitutional Development Since 1865  
‡311-725 Problems and Trends in Teaching the Social Sciences

\*Political Science 645 is accepted for history credit.

†Political Science 730 is accepted for history credit.

‡Education 725 is require for graduate students.

## DEPARTMENT OF HOME ECONOMICS

Harold E. Mazyck, Chairperson

Office: Benbow Hall - Room 102

## Objectives

The objectives of the graduate program in Food and Nutrition are:

1. To develop the basic knowledge and skills necessary to undertake research in the Food and Nutritional Sciences and other related areas.
2. To develop the competencies to work as nutrition specialists in Agricultural Extension or with other community nutrition agencies, and food industries.
3. To obtain the theoretical and experimental competencies necessary to pursue additional graduate studies or obtain professional degrees.

## Degree Offered

Food and Nutrition — M.S.

## General Program Requirements

For admission, students in the graduate program in Food and Nutrition must have an earned baccalaureate degree in Food and Nutrition from an accredited undergraduate institution and have an overall grade point average of 2.6. Non-food and nutrition majors are encouraged to apply if the required course deficiencies are cleared. A *minimum* of six (6) hours or more of Food and Nutrition courses is required to clear these deficiencies. TOFEL (foreign students) and GRE are required.

**Option A** is an experimental research and thesis oriented plan, with emphasis on Food or Nutritional Sciences. Applicants who have majored in Food and Nutrition, Food Science, Chemistry, Biochemistry, Biology, Animal and Plant Sciences, Physiology, or other related science disciplines will be admitted.

The **Option B** plan consists of both thesis and non-thesis programs with an emphasis on applied human nutrition. Students who have an interest in community nutrition or related community health services and have majored in one or more of the following areas: Food and Nutrition, Dietetics, Home Economics Education, Child Development, Physical Education, Sociology, Anthropology, Education and other related disciplines may enter this program.

**Option B** has the flexibility for students to write a thesis or choose extra course work (minimum six (6) credit hours) in addition to a required practicum. Choice of the thesis or non-thesis depends on the student's interests, specialization and career goals.

## Other Requirements

All applicants are required to take a **Qualifying Examination** in Food and Nutrition to evaluate their strengths and weaknesses. The test must be taken preferably prior to the registration for graduate courses or at the most by the end of the first semester of the graduate work. Admission to candidacy for the M.S. in Food and Nutrition requires the satisfactory completion of the Qualifying Examination in Food and Nutrition, and the **Qualifying English Essay Examination** required by the Graduate School.

A final **Comprehensive Examination** in Food and Nutrition can be taken only if a student has completed all course work and maintained a 3.0 grade point average in the Graduate courses at the 600 level or above. At least fifty percent of the courses counted in the work towards the Master's degree must be those open only to graduate students.

The student must have already completed the Departmental Qualifying Examination, the English Essay Examination, the Comprehensive Examination, satisfactory presentation and defense of the thesis (thesis option) and submission to the graduate office or completion of practicum (non-thesis) in order to be approved for graduation.

## Career Opportunities

A degree in this area prepares students to enter careers in research, quality control, college and junior college teaching, food industry, community nutrition, dietetics, extension service and public service.

For further information contact the Chairperson, Home Economics Department, North Carolina A. and T. State University, Greensboro, NC 27411.

## A. Suggested Curriculum Guide for Option A — Food and Nutrition (30)

### Requirements:

- Twelve (12) semester hours of Food and Nutrition courses.

Home Economics 730 - Nutrition and Disease	3 credits
(prerequisite Home Economics 630 - Advanced Nutrition)	
Home Economics 735 - Experimental Foods	3 credits
(prerequisite Home Economics 236 - Introduction to Food Science)	
Home Economics 736 - Research Methods Food and Nutrition	4 credits
(prerequisite Home Economics 635 - Introduction to Research Methods)	
Home Economics 744 - Seminar in Food and Nutrition	2 credits
- In addition to the above core courses three (3) hours of statistics numbered 600 or above is required.
- Six (6) semester hours in Food and Nutrition and related areas is required.

Food and Nutrition related courses:

Home Economics 679	Nutrition Education
Home Economics 733	Nutrition During the Life Cycle
Home Economics 638	Sensory Evaluation
Home Economics 641	Current Trends in Food Science
Home Economics 650	International Nutrition
Home Economics 632	Maternal and Developmental Nutrition
Home Economics 640	Geriatric Nutrition
Home Economics 648	Community Nutrition
Home Economics 715	Trace Elements and Nutrition
- Six (6) semester hours of suggested electives.

Suggested electives:

Chemistry	651	Biochemistry
Biology	769	Cellular Physiology

Poultry Science 657	Poultry Anatomy and Physiology	
Animal Science 615	Selection of Meat and Meat Products	
Computer Science 690	Advanced Topics in Computer Science	
5. Home Economics 739	Thesis Research	3 credits

**B. Suggested Curriculum Guide for Option B (Applied Nutrition) — Thesis and Non-Thesis (32)**

**Requirements: (Thesis Option)**

- Fourteen (14) hours of required courses
 

Sociology 671	or equivalent	3 credits
Home Economics 730	Nutrition and Disease	3 credits
Home Economics 742	Food Culture: Nutritional Anthropology	3 credits
Home Economics 648	Community Nutrition	3 credits
Home Economics 744	Seminar in Food and Nutrition	2 credits
- In addition to the above core courses three (3) hours of Statistics numbered 600 or above is required.
- Six (6) hours of Food and Nutrition related courses.
 

Home Economics 650	International Nutrition	3 credits
Home Economics 733	Nutrition During Life Cycle	3 credits
Home Economics 679	Nutrition Education	3 credits
Home Economics 638	Sensory Evaluation	3 credits
Home Economics 641	Current Trends in Food Science	3 credits
Home Economics 632	Maternal and Development Nutrition	3 credits
Home Economics 640	Geriatric Nutrition	3 credits
Home Economics 715	Trace Elements and Nutrition	3 credits
- Six (6) hours to be selected across interdisciplinary areas for electives.
  - Computer Science
  - Journalism
  - Agricultural Education
  - Other Related Areas (with permission of Advisor)
- Home Economics 739 Thesis Research 3 credits

**Requirements: (Non-Thesis Option) (38)**

Students will complete the requirements as listed in 1 and 2 of the **Thesis Option B**. Instead of a thesis, the student will take a **Practicum** and a minimum of six (6) semester hours of additional academic courses in the area of Food and Nutrition.

- Fourteen (14) hours of required courses  
(As listed in Thesis Option B)
- Six (6) semester hours in Food and Nutrition and related areas  
(As listed in Thesis Option B)
- Practicum three (3) semester hours
 

Home Economics 745 - Practicum in Food and Nutrition	3 credits
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- Six (6) hours of additional course work in Food and Nutrition
- Nine (9) hours to be selected across interdisciplinary areas for electives.
  - Computer Science
  - Journalism
  - Agricultural Education
  - Statistics
  - Other Related Areas (with permission of Advisor)

### **Directory of Faculty and Courses**

Harold Mazyck, B.S., South Carolina State College; M.A., New York University; Ph.D., The University of North Carolina at Greensboro; Professor  
Seetha Ganapathy, B.S., University of Mysore; Ph.D., University of Bombay; Professor  
Eva E. Moore, B.S., West Virginia State College; M.S., University of Illinois; Ph.D., The University of North Carolina at Greensboro; Professor  
Rosa Purcell, B.S., North Carolina A&T State University; M.Ed., Ed.D., University of Illinois; Adjunct Assistant Professor  
Chung Woon Seo, B.S., M.S., Korea University; Ph.D., Florida State University; Professor

### **Courses - Food and Nutrition and Related Areas**

170-630 Advanced Nutrition  
170-631 Food Chemistry  
170-632 Maternal and Developmental Nutrition  
170-635 Introduction to Research Methods in Food and Nutrition  
170-636 Food Promotion  
170-637 Special Problem in Food, Nutrition or Food Science  
170-638 Sensory Evaluation  
170-640 Geriatric Nutrition  
170-641 Current Trends in Food Science  
170-643 Food Preservation  
170-648 Community Nutrition  
170-650 International Nutrition  
170-679 Nutrition Education  
170-715 Trace Elements and Nutrition  
170-730 Nutrition and Disease  
170-733 Nutrition During Life Cycle  
170-735 Experimental Foods  
170-736 Research Methods in Food and Nutrition  
170-739 Thesis Research  
170-742 Food Culture: Nutrition Anthropology  
170-744 Seminar in Food and Nutrition  
170-745 Practicum in Food and Nutrition

### **Other Related Courses**

170-606 Cooperative Extension  
170-607 Cooperative Extension Field Experience  
170-608 Teaching Adults and Youth in Out-of-School Settings  
170-614 An Integrative Approach to Home Economics  
120-615 Selection of Meat and Meat Products  
120-617 Physiology of Reproduction of Farm Animals  
221-769 Cellular Physiology  
223-651 Biochemistry, General  
225-690 Advanced Topics in Computer Science  
235-671 Sociology Research Methods II

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- 312-778 Student Personnel Services
- 312-779 Technical Education in Community Junior Colleges
- 312-781 Internship (Community College/Technical Institute)
- 312-785-A Independent Readings in Education I
- 312-786-A Independent Readings in Education II
- 312-787-A Independent Readings in Education III
- 312-790-A Seminar in Education Problems
- 312-791-A Thesis Research

## **DEPARTMENT OF HUMAN DEVELOPMENT AND SERVICES**

**Wyatt D. Kirk, Chairperson**

**Office: 212 Hodgkin Hall**

The objective of the Department of Human Development and Services is to prepare individuals for positions in counseling and human development in both educational and non-educational settings and to strengthen and improve the practitioner's professional skills in the area of human services. The program includes courses in theories and procedures, theoretical and practical examination of human development and changes, technique oriented courses, and a heavy emphasis in supervised practice. Graduates of the program are prepared to work in a variety of counseling settings, middle and secondary schools, junior colleges, and private agencies.

### **Degrees Offered**

Counselor Education — M.S.

Student Personnel Worker or Agency Counselor — M.S.

Human Resource Concentration — M.S.

### **General Program Requirements**

Following acceptance by the School of Graduate Studies, the Department of Human Development and Services will accept students once they have completed nine hours of course work, at which time they will be evaluated, also, based upon their undergraduate grade point average, and the Department Faculty recommendation process.

Also, after acceptance by the Graduate School (not the department), each student indicating an interest in Human Development and Services will be assigned an advisor who will assist in constructing a degree program consistent with the student's vocational goal and educational interest. Program development must be completed before evaluation for departmental acceptance at the end of the nine hours.

### **Department Requirements**

Counselor Education majors — the major in the Counselor Education Curriculum must complete 60\* hours of graduate work. The prerequisites for admission to the program are: 1) Internship in Guidance and/or its equivalency, 2) a course in Tests and Measurements, and 3) Introduction to Guidance. A Minimum grade of "B" must be achieved in the curriculum. This program is designed for the individual who seeks a School Counselor's Certificate and the Master's degree.

Student Personnel Worker or Agency Counselor — the major in Student Personnel Worker, Agency Curriculum must complete 60\* hours of graduate work. The prerequisites for admission to the program are: 1) Tests and Measurements, 2) Introduction to Guidance, and 3) Personnel Management. A minimum grade of "B" must be achieved in the curriculum. This program is designed for the individual who seeks a Non-School Counselor's Master's degree. Also, this program is for students who are interested in a non-certification program and/or interested in professional counseling career in an agency setting or post-secondary student personnel worker.

Human Resources Concentration — the major in the human Resources concentration must complete 60\* hours of graduate work. The prerequisites for admission to the program are: 1) Tests and Measurements, 2) Industrial Psychology, and 3) Personnel Management.

\*New program requirements are effective as of Fall, 1987.

## SEQUENTIAL (SUGGESTED) CURRICULUM ORDER FOR HUMAN DEVELOPMENT AND SERVICE MAJORS

### COUNSELOR OF EDUCATION MASTER OF SCIENCE

#### FIRST YEAR

1st Semester	Credit
320-600 Introduction to Guidance	3
Technical Core	3
320-623 Personality Development	3
320-714 Internship in Guidance	3
Total Credits	12

2nd Semester	Credit
311-436 Test and Measurements	3
Technical Core	3
320-706 Organization Administration Guidance Services	3
320-707 Research Seminar	3
Total Credits	12

#### SECOND YEAR

3rd Semester	Credit
Elective Core	3
320-717 Educational Occupation Information	3
320-718 Introduction to Counseling	3
320-720 Theories of Counseling	3
Total Credits	12

4th Semester	Credit
320-716 Techniques of Individual Analysis	3
Elective Core	3
320-720 Theories of Counseling	3
320-733 Cross-Cultural Perspective	3
320-734 Counseling Special Population	3
Total Credits	15

5th Semester*	Credit
320-726 Educational Psychology	3
320-730 Counseling Practicum I	3
320-731 Group Practicum	3
320-732 Counseling Practicum II	3
Total Credits	12

\*Comprehensive Examination in the 5th Semester

**SEQUENTIAL (SUGGESTED) CURRICULUM ORDER FOR  
HUMAN DEVELOPMENT AND SERVICE MAJORS**

**STUDENT PERSONNEL WORKER OR AGENCY COUNSELOR  
MASTER OF SCIENCE**

**FIRST YEAR**

<b>1st Semester</b>		<b>Credit</b>
311-436	Test and Measurements	3
320-600	Introduction to Guidance	3
	Technical Core	3
320-522	Personnel Management	3
	<b>Total Credits</b>	<u>12</u>

<b>2nd Semester</b>		<b>Credit</b>
320-623	Personality Development	3
320-707	Research Seminar	3
320-716	Techniques of Individual Analysis	3
	Technical Core	3
	<b>Total Credits</b>	<u>12</u>

<b>3rd Semester</b>		<b>Credit</b>
320-717	Educational Occupation Information	3
320-718	Introduction to Counseling	3
320-720	Theories of Counseling	3
	Elective Core	3
	<b>Total Credits</b>	<u>12</u>

<b>4th Semester</b>		<b>Credit</b>
	Technical Core	3
	Elective Core	3
320-733	Cross-Cultural Perspective	3
320-734	Counseling Special Population	3
	<b>Total Credits</b>	<u>12</u>

<b>5th Semester*</b>		<b>Credit</b>
320-730	Counseling Practicum I	3
320-731	Group Practicum	3
320-732	Counseling Practicum II	3
	Elective Core	3
	<b>Total Credits</b>	<u>12</u>

\*Comprehensive Examination in the 5th Semester

**SEQUENTIAL (SUGGESTED) CURRICULUM ORDER FOR  
HUMAN DEVELOPMENT AND SERVICE MAJORS**

**HUMAN RESOURCE CONCENTRATION  
MASTER OF SCIENCE**

**FIRST YEAR**

<b>1st Semester</b>		<b>Credit</b>
311-436	Test and Measurements	3
445	Industrial Psychology	3
320-600	Introduction to Guidance	3
602	Technical Core	<u>3</u>
Total Credits		12

<b>2nd Semester</b>		<b>Credit</b>
522	Business Administration	3
603	Technical Core	3
320-623	Personality Development	3
701	Labor and Industrial Relations	<u>3</u>
Total Credits		12

<b>3rd Semester</b>		<b>Credit</b>
320-707	Research Seminar	3
320-717	Educational Occupation Information	3
320-718	Introduction to Counseling	3
320-720	Theories of Counseling	<u>3</u>
Total Credits		12

<b>4th Semester</b>		<b>Credit</b>
320-730	Counseling Practicum I	3
320-731	Group Practicum	3
320-732	Counseling Practicum II	3
	Elective Core	<u>3</u>
Total Credits		12

<b>5th Semester*</b>		<b>Credit</b>
320-733	Cross-Cultural Perspective	3
320-734	Counseling Special Population	3
	Elective Core	3
	Elective Core	<u>3</u>
Total Credits		12

\*Comprehensive Examination in the 5th semester

## Directory of Faculty and Courses

Wyatt D. Kirk, B.S., M.S., Ed.D., Western Michigan University; Associate Professor and Chairperson

Harold L. Lanier, B.S., M.S., North Carolina A&T State University; Instructor

Aurelia C. Mazyck, B.S., Howard University; M.S., New York University; Ph.D., The University of North Carolina at Greensboro; Associate Professor

Patricia D. Bethea, B.A., North Carolina Central University; M.Ed., University of North Carolina at Chapel Hill; Ed.D., University of North Carolina at Greensboro

Morris C. Peterkin, B.S., Cheyney State College; M.S., Governor's State College; M.Ed. Certificate, Temple University; Ph.D., University of Pittsburgh; Associate Professor

Myrtle B. Sampson, B.S., M.L.S., North Carolina Central University; M.A., University of Michigan at Ann Arbor; M.Ed., Ed.D., University of North Carolina at Greensboro; Ph.D., Heed University; Associate Professor

## Course Listings

Courses	Credits
435 Educational Psychology	3
600 Introduction to Guidance	3
623 Personality Development	3
660 Introduction to Exceptional Children	3
661 Psychology of the Exceptional Child	3
662 Mental Deficiency	3
663 Measurement and Evaluation in Special Education	3
664 Materials, Methods, and Problems in Teaching Mentally Retarded Children	3
665 Practicum in Special Education	3
706 Organization and Administration Guidance Services	3
707 Research Seminar	3
714 Internship in Guidance	3
715 Measurement for Guidance	3
716 Techniques of Individual Analysis	3
717 Educational/Occupational Information	3
718 Introduction to Counseling	3
719 Case Studies in Counseling	3
720 Theories of Counseling	3
721 Independent Studies	3
722 Career Education and Vocational Development Theories	3
723 Student Personnel Services in Post-Secondary Education	3
724 Advanced Counseling Theories, Strategies and Techniques	3
725 Human Resources Internship	3
726 Educational Psychology	3
727 Child Growth and Development	3
728 Measurement and Evaluation	3
729 Mental Hygiene for Teachers	3
730 Counseling Practicum	3
731 Group Practicum	3
732 Counseling II	3
733 Cross Cultural Perspectives in Counseling	3
734 Counseling Special Populations	3

## MATHEMATICS AND COMPUTER SCIENCE

Wendell P. Jones, Chairperson

Office: Marteena Hall 102

The Graduate School through the Department of Mathematics and Computer Science offers two curricula leading to the Master of Science in Education. One is intended primarily for individuals who teach mathematics at the middle school or high school level and the other is intended for individuals who teach mathematics at the high school or two-year college level. In addition, it offers a program of studies leading to the M.S. degree in Applied Mathematics.

### Degrees Offered

Mathematics, Secondary Education — M.S.

Applied Mathematics — M.S.

### General Degree Requirements

Mathematics Education and Applied Mathematics students must follow the general admission requirements for graduate studies; Mathematics Education students must also meet professional education requirements for a Class A Teaching Certificate.

### Departmental Requirements

In addition to meeting general requirements specified above, a student seeking admission to a graduate program in the Department of Mathematics and Computer Science must have earned thirty (30) semester hours in mathematics including differential and integral calculus, linear algebra and differential equations. A student who fails to meet these requirements will be expected to enroll in appropriate undergraduate courses before beginning his graduate studies in mathematics.

A student may not receive graduate credit for a course which is equivalent to one for which he received a grade of "C" or above as an undergraduate.

### Middle School-High School Curriculum

*Non-Thesis Option:* 30 semester hours required

In addition to the courses specified in the description of general requirements for a Master of Science in Education, the student must complete the following:

1. At least one mathematics course numbered higher than 690.
2. Fifteen additional hours from the following: Mathematics 601, 602, 603, 604, 607, 620, 623, 624, 625, 626, 631, 632, 651, 652, 660, 665, 670, 675, 680, 690, 700, 710, 711, 715, 717, 720.
3. An elective of 3 semester hours in education or mathematics or in an area related to mathematics.

*Thesis Option:* 30 semester hours required

In addition to the courses specified in the description of general requirements for a Master of Science in Education, a student must complete the following:

1. At least one mathematics course numbered higher than 690.
2. Fifteen additional semester hours in mathematics from the following: Mathematics 601, 602, 603, 604, 607, 620, 623, 624, 625, 626, 631, 632, 651, 652, 660, 665, 670, 675, 680, 690, 700, 701, 710, 711, 715, 717, 720.
3. A thesis focused on research in mathematics or in the teaching of mathematics.

### High School-2-Year College Curriculum

*Non-Thesis Option:* 30 semester hours required

In addition to the courses specified in the description of general requirements for a Master of Science in Education, a student must complete the following:

1. Nine semester hours in mathematics courses numbered higher than 690.

2. Nine additional hours from the following: Mathematics 601, 602, 603, 604, 607, 620, 623, 624, 631, 632, 651, 652, 660, 665, 670, 675, 680, 690, 700, 701, 710, 711, 715, 717, 720.
3. An elective of three semester hours in education or mathematics or courses related to mathematics.

*Thesis Option:* 30 semester hours required

In addition to the courses specified in the description of general requirements for a Master of Science in Education, a student must complete the following:

1. Nine semester hours in mathematics courses numbered higher than 690.
2. Nine additional hours from the following: Mathematics 601, 602, 603, 604, 607, 620, 623, 624, 631, 632, 651, 652, 660, 665, 670, 675, 680, 690, 700, 701, 710, 711, 715, 717, 720.
3. A thesis or an investigative study in mathematics or in the teaching of mathematics.

### **Applied Mathematics Curriculum**

A student seeking the Master of Science in Applied Mathematics must complete the following:

1. At least fifteen semester hours of 700-level courses in either mathematics or an applications area of mathematics.
2. A minimum of eighteen semester hours of credit in the Department of Mathematics and Computer Science.
3. A thesis or a project.
4. A minimum of thirty semester hours of graduate credit.

### **Directory of Faculty and Courses**

Bolindra N. Borah, B.S., Cotton College, India; M.S., Ph.D., Oregon State University; Professor

J. Octavio Diaz, Doctorate in Mathematics and Physics, University of Havana; Associate Professor

Joseph R. Gruendler, B.S., M.S., Ph.D., University of Wisconsin; Ph.D., University of North Carolina at Chapel Hill; Associate Professor

Wendell P. Jones, B.S., A. & T. College; M.S., Ph.D., University of Iowa; Professor  
Wilbur L. Smith, B.S., A. & T. College; M.A., Ph.D., The Pennsylvania State University; Professor

Richard R. Tucker, B.S., University of Washington; M.S., Ph.D., Oregon State University; Professor

### **Courses**

225-600	Introduction to Modern Mathematics for Secondary School Teachers
225-601	Algebraic Equations for Secondary School Teachers
225-602	Modern Algebra for Secondary School Teachers
225-603	Modern Analysis for Secondary School Teachers
225-604	Modern Geometry for Secondary School Teachers
225-606	Mathematics for Chemists
225-607	Theory of Numbers
225-608	Mathematics of Life Insurance
225-620	Elements of Set Theory and Topology
225-623	Advanced Probability and Statistics
225-624	Methods of Applied Statistics
225-625	Mathematics for Elementary School Teachers I
225-626	Mathematics for Elementary School Teachers II
225-631	Linear and Non-Linear Programming
225-632	Games and Queuing Theory
225-651	Methods in Applied Mathematics I

225-652	Methods in Applied Mathematics II
225-660	Computer Science for Secondary School Teachers
225-665	Principles of Optimization
225-670	Simulation Concepts and Languages
225-675	Graph Theory
225-680	Systems Analysis Techniques
225-690	Advanced Topics in Computer Science
225-700	Theory of Functions of a Real Variable I
225-701	Theory of Functions of a Real Variable II
225-710	Theory of Functions of a Complex Variable I
225-711	Theory of Functions of a Complex Variable II
225-715	Projective Geometry
225-717	Special Topics in Algebra
225-720	Special Topics in Analysis
225-723	Special Topics in Applied Mathematics
225-725	Graduate Design Project
225-730	Thesis Research in Mathematics
225-731	Advanced Numerical Methods

### **MUSIC**

**Clifford E. Watkins, Chairperson**  
**Office: Frazier Hall**

#### **Courses Offered for Advanced Undergraduate and Graduate**

219-609	Music in Early Childhood
219-610	Music in Elementary Schools Today
219-611	Music in the Secondary Schools Today
219-614	Choral Conducting of School Music Groups
219-616	Instrumental Conducting of School Music Groups
219-618	Psychology of Music
219-620	Advanced Music Appreciation

### **PHYSICS**

**Jason Gilchrist, Chairperson**  
**Office: 109 Cherry Hall**

#### **For Graduate Students Only**

227-705	General Physics for Science Teachers I (Formerly Physics 3885)
227-706	General Physics for Science Teachers II (Formerly Physics 3886)
227-707	Electricity for Science Teachers (Formerly Physics 3887)
227-708	Modern Physics for Science Teachers I (Formerly Physics 3888)
227-709	Modern Physics for Science Teachers II (Formerly Physics 3880)

### **DEPARTMENT OF PLANT SCIENCE AND TECHNOLOGY**

**Samuel J. Dunn, Chairperson**  
**Office: 238 Carver Hall**

The Department of Plant Science and Technology offers a program leading to the Master of Science degree in Plant and Soil Science. Students may select any concentration in Soil Biology, Soil Classification and Landuse, Soil Fertility, and Soil and Water Conservation. The objective of the program is to prepare students with the expertise needed to assume technical, teaching, research, and extension positions in universities, industries, and state/federal governments.

## Degree Offered

Plant and Soil Science — M.S.

## General Program Requirements

The admission of students to the graduate degree program in the Department of Plant Science and Technology is concurrent with the general admission requirements of the University.

## Departmental Requirements

Candidate should have a Baccalaureate degree from an accredited undergraduate institution. Also, the candidate should meet the credit hour requirements of Chemistry (16), biology (12), math and calculus (14), physics (8), and soil and plant science (7). Some graduate students may be accepted with the provision that they complete the deficient courses required for admission while pursuing the graduate program.

The student pursuing the Master of Science degree in Plant and Soil Science is required to complete a common core of courses consisting of 16 hours of the following courses:

Chem. 441 or 651	Physical Chemistry or General Biochemistry	5 Semester Hours
Plant Sci. 607	Research Design and Analysis	3 Semester Hours
Plant Sci. 717	Methodology or in Soil, Plant, and Water Analysis	3 Semester Hours
Biol. 861	Advanced Genetics	3 Semester Hours
Plant Sci. 720	Graduate Seminar	2 Semester Hours
Math 624	Methods of Applied Statistics	3 Semester Hours
Math 690	Advanced Topics in Computer Science	3 Semester Hours

Students pursuing the M.S. in Soil and Plant Science are required to spend a minimum of two years to complete course work and a problem in applied research. In addition, the following courses are required by area of concentration as specified:

## Soil Biology

Courses	Description	Credit
130-622	Environmental Sanitation and Waste Management	3 (2-2)
223-765	Selected Topics in Biochemistry (Chemistry)	3 (3-0)
130-718	Applied Environmental Microbiology	3 (2-2)
130-727	Soil Fertility and Plant Nutrition	3 (3-0)
130-721	Soil Microbiology	3 (2-2)
221-669	Recent Advanced in Cell Biology (Biology)	3 (3-0)
	Plant Science Graduate Electives	6
130-799	Thesis	6 (6-0)

## Soil Fertility

Courses	Description	Credit
130-727	Soil Fertility and Plant Nutrition	3 (3-0)
223-731	Modern Analytical Chemistry (Chemistry)	3 (2-3)
130-710	Soils of North Carolina	3 (3-0)
130-604	Crop Ecology	3 (3-0)
130-622	Environmental Sanitation and Waste Management	3 (2-2)
130-715	Soil Mineralogy	3 (2-2)
130-721	Soil Microbiology	4 (3-2)
225-623	Adv. Prob. and Statistics (Math)	3 (3-0)
130-799	Thesis	6 (6-0)

**Soil Classification and Landuse**

<b>Courses</b>	<b>Description</b>	<b>Credit</b>
130-622	Environmental Sanitation and Waste Management	3 (2-2)
130-627	Strategies of Conservation	3 (2-2)
130-710	Soil of North Carolina	3 (2-2)
130-715	Soil Mineralogy	3 (3-0)
130-727	Soil Fertility and Plant Nutrition	3 (3-0)
130-718	Applied Environmental Microbiology	3 (2-2)
130-799	Thesis	6 (6-0)

**Soil and Water Conservation**

<b>Courses</b>	<b>Description</b>	<b>Credit</b>
130-600	Soil and Water Conservation Engineering I	3 (3-0)
130-604	Crop Ecology	3 (3-0)
130-619	Instrumentation and Measurement	3 (2-2)
130-622	Environmental Sanitation and Waste Management	3 (2-2)
225-624	Method of Applied Statistics	3 (3-0)
223-741	Principles of Physical Chemistry I (Chemistry)	4 (3-3)
130-627	Strategies of Conservation	3 (2-2)
130-701	Soil and Water Conservation Engineering II	3 (3-0)
130-708	Conservation of Natural Resources	3 (3-0)
130-710	Soils of North Carolina	3 (3-0)
130-727	Soil Fertility and Plant Nutrition	3 (3-0)
130-799	Thesis	6 (6-0)

**Courses in Plant and Soil Science**

<b>Course</b>	<b>Description</b>	<b>Credits</b>
130-600	Soil and Water Conservation Engineering I	3
130-601	Advanced Farm Shop	3
130-602	Special Problems in Agricultural Engineering	3
130-603	Plant Materials	3
130-604	Crop Ecology	3
130-605	Breeding of Crop Plants	3
130-606	Special Problems in Crops	3
130-607	Research Design and Analysis	3
130-608	Special Problems in Horticulture	3
130-609	Special Problems in Soils	3
130-610	Commercial Greenhouse Production I	3
130-611	Commercial Greenhouse Production II	3
130-612	Plant Materials and Landscape Maintenance	3
130-613	Plant Materials and Planning Design	3
130-614	Applied Hydrology	3
130-615	Soil Mineralogy	3
130-616	Environmental Planning & Natural Resources Management	3
130-617	Methodology in Soil & Plant Material Analysis	3
130-618	General Forestry	3
130-619	Instrumentation and Measurement	3
130-620	Graduate Seminar in Plant Science	1
130-622	Environmental Sanitation and Waste Management	3
130-624	Earth Science, Geomorphology	3
130-625	Earth Resources	3
130-626	Aquaculture	3
130-627	Strategies of Conservation	3
130-701	Soil and Water Conservation Engineering II	3
130-702	Grass Land Ecology	3
130-704	Problem Solving in Earth Science	3

130-705	The Physical Universe	3
130-706	Physical Geology	3
130-708	Conservation of Natural Resources	3
130-709	Seminar in Earth Science	3
130-710	Soils of North Carolina	3
130-714	Applied Hydrology	3
130-715	Soil Mineralogy	3
130-717	Methodology in Soil and Plant Material Analysis	3
130-718	Applied Environmental Microbiology	3
130-720	Graduate Seminar in Plant Science	1
130-721	Soil Microbiology	3
130-727	Soil Fertility and Plant Nutrition	3
130-777	Special Problems in Plant Science Graduate Studies	3
130-799	Graduate Thesis	6

### Courses in Landscape Architecture

Course	Description	Credits
100-601	Environmental Perception & Design Determinants	3
100-602	Qualitative Analysis in Landscape Planning	3
100-603	Land-Use Planning & Management	3
100-604	Factors of Physical Design	3

### Directory of Faculty

- S.J. Dunn, B.S., Hampton Institute; M.S., Michigan State University; Ph.D., Oregon State University; Professor and Chairman
- C.A. Fountain, B.S., Hampton Institute; M.L.A., University of California-Berkeley; M.S., Ph.D., Michigan State University; Professor
- G.A. Gayle, B.S., NC A&T State University; M.S., Ph.D., N.C. State University; Associate Professor
- M. Kamp-Glass, B.S., Texas Tech University; M.S., Ph.D., Texas A&M University; Associate Professor
- R.J. McCracken, B.A., Earlham College; M.S., Cornell University; Ph.D., Iowa State University; Adjunct Professor
- C.A. Panton, B.S., NC A&T State University; M.S., Purdue University; Ph.D., University of Lund, Sweden; Associate Professor
- C.E. Parker, B.A., Cornell University; M.S., University of North Carolina-Chapel Hill; Ph.D., University of North Carolina-Chapel Hill; Adjunct Professor
- G.B. Reddy, B.S., M.S., A.P.A.U. (India); Ph.D., University of Georgia; Associate Professor
- M.R. Reddy, B.S., Osmania University; M.S., A.P.A.U. (India); Ph.D., University of Georgia; Associate Professor
- J. Robinson, A.A., Junior College of Albany, New York; B.L.A., Louisiana State University; M.L.A., Harvard University; Associate Professor
- A. Shahbazi, B.S., University of Tabriz; M.S., University of California, Davis; Ph.D., Pennsylvania State University; Assistant Professor
- G.A. Uzochukwu, B.S., M.S., Oklahoma State University; Ph.D., University of Nebraska; Assistant Professor
- B.C. Webb, B.S., NC A&T State University; M.S., University of Illinois; Ph.D., Michigan State University; Professor and Dean
- R. Williamson, B.S., Howard University; M.S., Howard University; Ph.D., University of Massachusetts; Associate Professor

**POLITICAL SCIENCE**  
**Amarjit Singh, Chairperson**  
**Office: 223 Gibbs Social Sciences Building**

**Courses Offered for Advanced Undergraduates and Graduates**

- 237-640 Federal Government
- 237-641 State Government
- 237-642 Modern Political Theory
- 237-643 Urban Politics and Government
- 237-644 International Law
- 237-645 American Foreign Policy — 1945 to Present
- 237-646 The Politics of Developing Nations
- 237-647 Research and Current Problems
- 237-653 Urban Problems

**For Graduate Students Only**

- 237-730 Constitutional Development Since 1865
- 237-741 Comparative Government
- 237-742 Research and Current Problems
- 237-743 Readings in Political Science

**SPEECH AND DRAMA**  
**Mary Tuggle, Chairperson**  
**Office: 304 Crosby Hall**

**Courses Offered for Advanced Undergraduate and Graduate**

- 215-610 Phonetics
- 215-620 Community and Creative Dramatics
- 215-633 Speech for Teachers
- 215-636 Persuasive Communication
- 215-637 Television Production
- 215-638 Television in Education
- 215-650 Theatre Workshop

**SOCIOLOGY AND SOCIAL WORK**  
**Sarah V. Kirk, Chairperson**  
**Office: 201 Gibbs Hall**

**Courses Offered for Advanced Undergraduate and Graduate**

- 235-600 Seminar in Social Planning
- 235-601 Seminar in Urban Studies
- 235-603 Introduction to Folklore
- 235-625 Sociology/Social Service Internship
- 235-650 Independent Study in Anthropology
- 235-651 Anthropological Experience
- 235-669 Small Groups
- 235-670 Law and Society
- 235-671 Research Methods II
- 235-672 Selected Issues in Sociology
- 235-673 Population Studies
- 235-674 Evaluation of Social Programs
- 235-701 Seminar in Cultural Factors in Communication

## TECHNOLOGY EDUCATION

Robert B. Pyle, Chairperson

Office: Price 206

### Objectives for Technology Education Programs:

1. To develop advanced competencies in organizing and utilizing technical education strategies and methodologies.
2. To further develop understandings and applications of objectives, principles, concepts, practices, and philosophies of Vocational-Technical and Safety and Driver Education.
3. To further develop competencies in organizing, directing, and evaluating Technical Education and Safety and Driver Education programs, courses, and teaching-learning activities.
4. To develop proficiencies in utilizing technological-educational problem solving and research techniques in Industrial, Vocational, Technical and Safety and Driver Education programs.
5. To further develop depth and/or breadth in technological competencies in the various field of Technology Education.

### Degrees Offered

Industrial Arts/Technology Education — M.S.

Vocational-Industrial Education — M.S.

Safety and Driver Education — M.S.

### General Program Requirements

#### A. Unconditional Admission for "G" Certificate in Technology Education

1. Baccalaureate degree from accredited undergraduate institution.
2. Class A certificate in Industrial Arts/Technology Education, Vocational-Industrial Education or Safety and Driver Education.  
\*(See exception below for post-secondary and private industry majors in Technical Education.)
3. Satisfactory completion of all Graduate School requirements for admission to candidacy for a degree.
4. Failure to meet any of these criteria may necessitate rejection of the application or the requirement of additional undergraduate work.

#### B. Provisional Admission for "G" Certificate

Applicants who enter the Technology Education and desire a "G" certificate must hold or be qualified to possess the Class A Certificate in the appropriate Technology Education Option. Students are advised of graduate and undergraduate course requirements necessary to qualify for specific North Carolina "A" and "G" teaching or director certificates in Technology Education.

### Departmental Requirements

A. INDUSTRIAL ARTS/TECHNOLOGY EDUCATION MAJOR. Masters degree candidates must complete a minimum of 30 semester hours of graduate level courses, which include a 12 semester hour concentration of Technology Education courses leading to "G" certification in Industrial Arts/Technology Education teaching. Other course requirements must include 3 semester hours of each: Research Techniques, Curriculum, Student Evaluation, Research Seminar or Thesis, Education or Psychology, Electives. The grade point average in the graduate program must be 3.0 or better. (See certification note below.)

B. VOCATIONAL-INDUSTRIAL EDUCATION MAJOR. Masters degree candidates must complete a minimum of 30 semester hours of graduate level courses, which include a 12 semester hour concentration of Technology Education courses leading to "G" certification for either Trade and Industrial teachers or Local Directors of Vocational Education. Other course requirements must include 3 semester

hours or each: Research Techniques, Curriculum, Student or Program Evaluation, Research Seminar or Thesis, Education or Psychology, Electives. The grade point average in the graduate program must be 3.0 or better. (See certification note below.)

\*Persons with technical preparation and interest in post secondary education or technical training programs in private industry, which do not require teacher certification by the State of North Carolina, may pursue a masters degree in Vocational-Industrial Education Option III, but will not be qualified to receive either "A" or "G" teaching certificates.

NOTE: Candidates pursuing Masters degrees in either Industrial Arts/Technology Education or Vocational-Industrial Education may also qualify for North Carolina certification in Industrial Cooperative Training or Middle Grades Occupational Exploration.

C. SAFETY AND DRIVER EDUCATION MAJOR. Masters degree candidates in Safety and Driver Education must complete a minimum of 30 semester hours of course work at the graduate level, which include a 12 semester hour concentration in Safety and Driver Education courses leading to "G" certification in Safety and Driver Education. Other course requirements include three semester hours each of: Research Techniques, Curriculum, Evaluation, Education or Psychology, Thesis or Non-thesis, and Electives. The grade point average in the graduate program must be 3.0 or better.

**Career Opportunities:**

Excellent employment opportunities exist for persons holding advanced degrees in all areas of Technology Education. Public schools in North Carolina and elsewhere are in constant need of securing certified teachers, supervisors, and administrators for Technology programs.

Many career opportunities also exist for Technology Education specialists in occupations which do not require state teacher certification. These persons are employed as teachers, training directors, supervisors, and managers in post secondary schools and colleges or in the private sector of industry.

A degree in Safety and Driver Education prepares students for careers in such fields as Teaching, Research, State Agencies, Federal Agencies, Fleet Supervisors, and loss control specialists in the Insurance Industries.

**TECHNOLOGY EDUCATION CURRICULUM  
Thesis and Non-Thesis Programs**

**Required Courses, Industrial Arts/Technology Vocational-Industrial and Safety and Driver Education**

	Sem Hrs.
Curriculum .....	3
Technology Education 662                      Technology Education 766	
Technology Education 658	
Evaluation .....	3
Technology Education 765                      Technology Education 762	
Technology Education 656	
Education or Psychology .....	3
Curriculum and Instruction 625              Psychology 661	
Curriculum and Instruction 660              Psychology 726	
Curriculum and Instruction 701              Psychology 727	
Research Techniques .....	3
Technology Education 756                      Technology Education 767	

Research Seminar or Thesis .....	3
<i>Non-Thesis</i>	
Technology Education 768	
Technology Education 750	
<i>Thesis</i>	
Technology Education 769	
Technology Education 759	
	15
Elective .....	3

**Major Concentrations**

<b>Industrial Arts/Technology Education .....</b>	<b>12</b>
Technology Education 616	Technology Education 718
Technology Education 617	Technology Education 719
Technology Education 618	Technology Education 731
Technology Education 619	Technology Education 762
Technology Education 620	Technology Education 651
Technology Education 635	Technology Education 673
Technology Education 664	Technology Education 674
Technology Education 665	Technology Education 735
Technology Education 666	Guidance 717
Technology Education 715	

**VOCATIONAL-INDUSTRIAL EDUCATION .....** 12

**OPTION I: Trade and Industrial Education**

Technology Education 660	Technology Education 717
Technology Education 661	Technology Education 718
Technology Education 663	Technology Education 762
Technology Education 664	Technology Education 763
Technology Education 665	

**OPTION II: Vocational Education Director**

Technology Education 663	Technology Education 758
Technology Education 717	Technology Education 765
Technology Education 718	Technology Education 766
Technology Education 764	Technology Education 767
Technology Education 761	Technology Education 768
Technology Education 763	

**\*OPTION III: Technical Education**

Technology Education 663	Technology Education 762
Technology Education 717	Technology Education 763
Technology Education 718	Technology Education 764
Educational Media .....	(3 Semester Hours Maximum)
Curriculum Instruction 602	Curriculum Instruction 603

**Safety and Driver Education .....** 12

## **Courses**

Technology Education 651  
Technology Education 652  
Technology Education 653  
Technology Education 654  
Technology Education 655  
Technology Education 656  
Technology Education 657  
Technology Education 658  
Technology Education 659  
Technology Education 750  
Technology Education 751  
Technology Education 752  
Technology Education 755  
Technology Education 756  
Technology Education 757  
Technology Education 758  
Technology Education 759

## **Directory of Faculty**

Robert B. Pyle, B.A., M.A., Trenton State College; Ph.D., University of Pittsburgh;  
Professor and Chairperson  
Nancy G. Hinckley, B.S., Trenton State College; M.S., Ph.D., Michigan State Uni-  
versity; Assistant Professor  
Earl Yarbrough, B.A., Wichita State University; M.A., California State University-  
Los Angeles; Ph.D., Iowa State University; Professor and Dean  
Naomi Richmond, B.S., North Carolina A&T State University; M.Ed., University of  
North Carolina-Greensboro; Ed.D., University of Illinois-Urbana; Assistant  
Professor  
David Dillon, B.S., Northwestern State University of Louisiana; M.A., University of  
Louisiana; M.A., University of Northern Colorado; Ed.D., North Carolina State  
University; Assistant Professor

## COURSE DESCRIPTIONS

The following section identifies courses by department number, course number, course title, and a brief course description. Shown also are semester hours of credit of each course, and the number of actual lecture and laboratory hours required each week. For example — Credit 3(3-1), the 3 indicates that three semester hours of credit is given for satisfactory completion of the course. The (3-1) indicates that the course meets for three hours of lecture and one hour of laboratory work each week.

### Department of Agricultural Economics and Rural Sociology

#### *Advanced Undergraduate and Graduate*

**150-650. Human Resource Development** **Credit 3(3-0)**

Analysis of human resources in relation in increasing production rural areas. Prerequisite: Consent of instructor.

**150-656. Agricultural Price Analysis** **Credit 3(3-0)**

The use of price information in the decision-making process. The relation of supply and demand in determining agricultural prices and the relation of prices to grade, time, location, and stages of processing in the marketing system. The course includes advanced methods of price analysis, the concept of parity and the role of price support programs in agricultural decisions. Prerequisite: Consent of instructor.

#### *Graduate*

**150-705. Statistical Methods in Agricultural Economics** **Credit 3(3-0)**

Advanced topics on analysis of variance, regression, correlation, multistage sampling and experimental designs. Prerequisite: Ag. Econ. 646.

**150-708. Econometrics** **Credit 3(3-0)**

Application of econometric techniques to agricultural economic problems; theory and estimation of structural economic parameters. Prerequisite: Ag. Econ. 705.

**150-710. Micro Economics** **Credit 3(3-0)**

Price theory and the theory of the firm. The decision-making units in our economy and their market relationship.

**150-720. Macro Economics** **Credit 3(3-0)**

A continuation of aggregate economics, with emphasis upon measurement, growth and fluctuation of national income.

**150-725. Research Methods in Agricultural Economics** **Credit 3(3-0)**

The philosophical bases for research methods used in agricultural economics are discussed. Alternative research methods are compared with respect to their dependence on the concepts of economic theory, mathematics and statistics. Alternative approaches to planning research projects are evaluated.

**150-730. Rural Development** **Credit 3(3-0)**

The application of economic theory, alternative growth models, requirements for growth, and quantitative techniques to problems concerning rural economic development and growth with emphasis on agriculture.

**150-732. Agricultural Policy** **Credit 3(3-0)**

Advanced analysis of role of agriculture in general economy and of economic, political and social forces which affect development of agricultural policy.

**150-734. Agricultural Marketing** **Credit 3(3-0)**

Basic economics theory as applied to the marketing of agricultural products, including price, cost, and financial analysis. Current developments affecting market structure including effects of contractual arrangements, vertical integration, governmental policies and regulations.

**150-735. Economic Development** **Credit 3(3-0)**

Common problems, development theories, and policies related to less developed countries.

**150-736. Agricultural Marketing Problems and Issues** **Credit 3(3-0)**

Current complex problems in agricultural marketing and methods of developing solutions.

**150-738. International Economics** **Credit 3(3-0)**

Advanced theory, policies, and practices in international trade in agricultural products. Includes principal theories of trade and, agricultural trade policies of various countries.

**150-740. Production Economics** **Credit 3(3-0)**

Production economics theory in a quantitative framework. Technical and economic factor-product, factor-factor, and product-product relationships in single and multi-product firms under conditions of perfect and imperfect competition in both factor and product markets.

**150-750. Social Organization of Agriculture** **Credit 3(3-0)**

An analysis of the status and role of agriculture in rural societies from a sociological perspective. Emphasis will be placed on understanding the organizational structure of agriculture and the intended and unintended consequences of rapid technological change on agriculture.

**150-799. Thesis** **Credit 3(3-0)**

### **Department of Agricultural Education and Extension**

**110-600. Youth Organization and Program Management** **Credit 3(3-0)**

Principles, theories and practices involved in organizing, conducting, supervising and managing youth organizations and programs. Emphasis will be on the analysis of youth organization and programs in vocational and extension education.

**110-601. Adult Education in Vocational and Extension Education** **Credit 3(3-0)**

A study of the principles and problems of organizing and conducting programs for adults. Emphasis is given to the principles of conducting organized instruction in agricultural education, extension and related industries.

**110-603. Problems Teaching in Vocational and Extension Education** **Credit 3(3-0)**

Practices in setting up problems for teaching unit courses in vocational and extension education.

**110-604. Public Relations in Agriculture** **Credit 3(3-0)**

Principles and practices of organizing, developing, and implementing public relations for promoting local programs in vocational agriculture and agricultural extension.

**110-605. Guidance and Group Instruction in Vocational Education** **Credit 3(3-0)**

Guidance and group instruction applied to agricultural occupations and other problems of students in vocational education.

**110-606. Cooperative Work-Study** **Credit 3(3-0)**

Principles, theories, organizations, and administration of cooperative work experience programs.

**110-607. Environmental Education** **Credit 3(3-0)**

Principles and practices of understanding the environment and the interrelated complexities of the environment. The course will include a study of agricultural occupations related to the environment and materials that need to be developed for use by high school teachers of agriculture and other professional workers.

**110-608. Agricultural Extension Organization and Methods** **Credit 3(3-0)**

Principles, objectives, organization, program development, and methods in cooperative extension.

**110-609. Community Analysis and Rural Life** **Credit 3(3-0)**

Educational processes, structure and function of rural society, and the role which diverse organizations, agencies, and institutions play in the education and adjustment of rural people to the demands of modern society.

**110-664. Occupational Exploration of Middle Grades** **Credit 3(3-0)**

Designed for persons who teach or plan to teach middle grades occupational exploration in the curriculum, sources and uses of occupational information, approaches to middle grades teaching, and philosophy and concepts of occupational education. This course will be taught in cooperation with the Department of Business Education and Administrative Services, Home Economics, and Industrial Education.

**110-665. Occupational Exploration in the Middle Grades—  
Agricultural Occupations** **Credit 3(3-0)**

Emphasis will be placed on curriculum, methods and techniques of teaching, and resources and facilities for teaching in the agricultural environmental occupations cluster including Agribusiness and Natural Resources, Environmental Control, Hospitality and Recreation, and Marine Science.

*Graduate*

**110-700. Seminar in Agricultural Education** **Credit 1(1-0)**

A review of current problems and practices in the field of agricultural education and extension.

**110-702. Methods and Techniques of Public Relations** **Credit 3(3-0)**

A study of the means and methods of promoting and publicizing local community programs.

**110-703. Scientific Methods in Research** **Credit 3(3-0)**

Methods of procedures in investigation and experimentation in education, accompanied by critical examination of studies made in agricultural education and related fields. A research problem is developed under the supervision of the staff.

**110-704. History and Philosophy of Vocational Education** **Credit 3(3-0)**

This course deals with the underlying philosophy and basic principles of vocational education including history and development. Emphasis is placed upon the factors contributing to the nature, purpose, scope, organization, and administration of vocational education.

**110-705. Recent Developments and Trends in Agricultural  
Education and Extension** **Credit 3(3-0)**

The course includes an intensive treatment of the various subject matter fields to keep teachers and professional workers in related areas up-to-date technically as

well as professionally. It is designed to cover the developments and trends in agricultural education and extension.

**110-706. Comparative Education in Agriculture** **Credit 3(3-0)**

Emphasis will be placed on basic development concepts and principles. Various types of education and their implication to agriculture will be studied to develop an understanding of international developments in agriculture. Students may meet course requirements by studying and working in a developing country. (Enrollment by permission of department.)

**110-707. Issues in Community Development and Adult Education** **Credit 3(3-0)**

Analysis of major issues and problems confronting rural and/or urban education in the United States and other countries with implications for program planning and development. Special attention will be given to adult education and community development. Students may meet course requirements by studying and working in other countries. (Enrollment by permission of department.)

**110-750. Community Problems** **Credit 3(3-0)**

A study of the common problems of the community that relate to agriculture and related areas and of solutions for these problems.

**110-752. Administration and Supervision** **Credit 3(3-0)**

A study of administrative and supervisory problems; the practices and policies of local, state, and federal agencies dealing with administration and supervision of vocational and extension education.

**110-753. Program Planning** **Credit 3(3-0)**

Consideration is given to the community as a unit for program planning in agricultural education and extension. Special emphasis on collecting and interpreting basic data, formulating objectives, developing and evaluating community programs.

**110-754. History of Agricultural Education and Extension** **Credit 3(3-0)**

Historical development, social and philosophical foundations, and current status in relation to the total vocational education program. Special attention is given agricultural education and extension as it developed in the United States.

**110-760. Thesis Research in Agricultural Education and Extension** **Credit 3(3-0)**

**Department of Animal Science**

**120-611. Principles of Animal Nutrition** **Credit 4(3-3)**  
**(Formerly 601)**

Fundamentals of modern animal nutrition including classification of nutrients, their general metabolism and role in productive functions. Prerequisite: Animal Science 212. Offered in the Spring only.

**120-613. Livestock and Meat Evaluation** **Credit 2(1-2)**  
**(New course, replaces part of 302)**

Selection and evaluation of desirable animals in both market and breeding classes. Identification and evaluation of wholesale and retail cuts of meat. Prerequisite: Animal Science 312 and 313. Offered alternating Summers.

**120-614. Animal Breeding** **Credit 3(3-0)**  
**(Formerly 402)**

Application of genetic and breeding principles of livestock production and improvement. Phenotypic and genotypic effects of selection methods and systems of mating. Prerequisite: Animal Science 111 and 214. Offered in the Spring only.

- 120-615. Selection of Meat and Meat Products** **Credit 3(2-2)**  
**(Formerly 692)**

Identification, grading and cutting of meats. Offered in alternating summers.

- 120-617. Physiology of Reproduction of Farm Animals** **Credit 3(2-2)**  
**(Formerly 442)**

Study of reproductive processes including anatomy, physiology and endocrinology. Semen production, artificial insemination and hormonal studies. Prerequisite: Animal Science 111 and Zoology 160. Offered in the Fall only.

- 120-618. Seminar in Animal Science** **Credit 1(1-0)**  
**(Formerly Animal Science 602, Dairy Science 604, Poultry Science 608)**

A review and discussion of selected topics and recent advances in the fields of animal and food science. Prerequisite: Senior standing. Offered in the Spring only.

- 120-619. Special Problems in Livestock Management** **Credit 3(3-0)**  
**(Formerly 603)**

Special work in problems dealing with feeding, breeding and management in the production of beef cattle, sheep and swine. Prerequisite: Senior standing. Offered in the Fall only.

- 120-713. Advanced Livestock Production** **Credit 3(2-2)**  
**(Formerly 703)**

Review of research relating to various phases of livestock production; fitting the livestock enterprise into the whole farm system. Special attention to overall economic operation. Offered in the Fall only.

### **Dairy Science**

- 120-629. Special Problems in Dairy Management** **Credit 3(3-0)**  
**(Formerly 692)**

Special work in problems dealing with dairy production. Prerequisite: Senior standing. Offered in the Spring only.

### **Poultry Science**

- 120-657. Poultry Anatomy and Physiology** **Credit 3(2-2)**  
**(Formerly 609)**

A course which deals with the structure and function of tissues, organs, and systems of the domestic fowl. Prerequisite: Poultry Science 351. Offered in alternating Spring and Summers.

- 120-659. Special Problems in Poultry** **Credit 3(3-0)**  
**(Formerly 690)**

Assignment of work along special lines in which a student may be interested, given largely by project method for individuals in Poultry Science. Prerequisite: Three advanced courses in Poultry Science. Offered in the Fall only.

- 120-750. Poultry Research** **Credit 3(0-6)**  
**(Formerly 780)**

Offered in alternating Summers.

### **Laboratory Animal Science**

- 120-660. Special Problems in Specimen Preparation** **Credit 3(1-6)**

The preparation of animal models for classroom, museum, and special display purposes. Prerequisite: Senior standing. Fall.

- 120-661. Special Problems in Electron Microscopy** **Credit 3(1-6)**  
Theoretical and practical aspects of electron microscopy. Prerequisite: Senior standing. Summer.
- 120-662. Special Problems in Radiology** **Credit 3(1-6)**  
Theoretical and practical aspects of radiology. Prerequisite: Senior standing. Summer.
- 120-663. Special Problems in Tissue & Culture  
Histochemistry** **Credit 3(1-6)**  
Theoretical and practical aspects of Tissue Culture and Histochemistry. Prerequisite: Senior standing. Spring.
- 120-664. Special Problems in Immunological Techniques** **Credit 3(1-6)**  
Theoretical and practical aspects of Immunological Techniques including Radioisotopes and Tracer Techniques. Prerequisite: Senior standing.

## **Department of Art**

### *Advanced Undergraduate and Graduate*

- 211-600. Public School Art** **Credit 3(3-0)**  
**(Formerly Art 3270)**  
Study of materials, methods, and procedures in teaching art in public schools. Special emphasis is placed on selection and organization of materials, seasonal projects, lesson plan. (Fall Semester — Summer Session)
- 211-602. Seminar in Art History** **Credit 3(3-0)**  
**(Formerly Art 3273)**  
Investigation in depth of the background influences which condition stylistic changes in art forms by analyzing and interpreting works of representative personalities. (On request).
- 211-603. Studio Techniques** **Credit 3(3-0)**  
**(Formerly Art 3273)**  
Demonstrations that illustrate and emphasize the technical potentials of varied media. These techniques are analyzed and discussed as a point of departure for individual expression. (On request).
- 211-604. Ceramic Workshop** **Credit 2(0-2)**  
**(Formerly Art 3274)**  
Advanced studio problems and projects in ceramics with emphasis on independent creative work. The student is given opportunity for original research and is encouraged to work toward the development of a personal style in the perfection of technique. (On request).
- 211-605. Printmaking** **Credit 3(3-0)**  
**(Formerly Art 3275)**  
Investigation of traditional and experimental methods in printmaking. Advanced studio problems in woodcut etching, lithography, and serigraphy. (On request).
- 211-606. Sculpture** **Credit 3(3-0)**  
**(Formerly Art 3276)**  
Further study of sculpture with an expansion of techniques. Individual problems for advanced students.
- 211-607. Project Seminar** **Credit 2(0-4)**  
**(Formerly Art 3277)**  
Advanced specialized studies in creative painting, design, and sculpture. By

means of discussion and suggestions, this seminar intends to solve various problems which might arise in each work. Prerequisite: Consent of the instructor.

**211-608. Arts and Crafts** **Credit 3(3-0)**  
**(Formerly Art 3278)**

Creative experimentation with a variety of materials, tools, and processes: projects in wood, metal, jewelry making, wood and metal construction, fabric design, leather craft, puppet making, and paper sculpture. (Summer Session)

*Graduate*

**211-720. Methods of Criticism, Interpretation, and Research** **Credit 3(3-0)**  
**(Formerly Art 3285)**

Investigation on the theories of art, methods of criticism and their application. (On request)

**211-721. Research and Analysis** **Credit 3(2-2)**  
**(Formerly Art 3286)**

Individual projects relating to contemporary art in Europe and America. Two hours lecture and two hours studio or conference per week. (On request)

**211-722. Seminar in Art Education** **Credit 3(2-2)**  
**(Formerly Art 3287)**

Special problems in the teaching and supervision of art in the public schools; laboratory experiences in a variety of media; observations, readings, discussion and lectures. (On request)

**Department of Biology**

*Graduate*

**221-700. Environmental Biology** **Credit 3(2-2)**

Problems, concepts and interpretations of relations between organisms and the environment; an analysis of environmental factors on growth, reproduction, distribution, and competition between organisms.

**221-701. Biological Seminar** **Credit 1(1-)**

The presentation and defense of original research, consideration of special topics in biology and current literature.

**221-702. Biological Seminar** **Credit 1(1-0)**

A continuation of Biology 701.

**221-760. Projects in Biology** **Credit 3(2-2)**

Special projects in biology that relate to biological instruction or research in the student's area of concentration.

**221-761. Seminar in Biology** **Credit 1(1-0)**

A seminar on selected topics and recent advances in the field of plant and animal biology.

**221-703. Experimental Methods in Biology** **Credit 3(1-4)**

Laboratory techniques for androgenesis, parthenogenesis, transplantsations, grafting and other experimental techniques for recent biological research.

**221-704. Seminar in Biology** **Credit 3(2-2)**

Lectures, reports and laboratory procedures will be presented by student participants, staff and guest lectures on modern techniques and recent developments of selected biological problems. The nature and scope of the problem and the methods

employed to study them will be varied to suit the needs and background of the student.

**221-739. Radio-isotope Techniques and Radiotracer Methods Credit 4(2-4)**

The techniques employed in the handling and measurement of radio-isotopes and their use as tracer agents in biological investigations.

## **Botany**

### *Advanced Undergraduate and Graduate*

**221-640. Plant Biology Credit 3(2-2)**  
**(Formerly Bot. 1571)**

A presentation of fundamental botanical concepts to broaden the background of high school biology teachers. Bacteria, fungi, and other microscopic plants will be considered as well as certain higher forms of plants. The course will consist of lectures, laboratory projects, and field trips.

**221-642. Special Problems in Botany Credit 3(2-2)**  
**(Formerly Bot. 1573)**

Open to advanced students in botany for investigation of specific problems. Prerequisite: Biology 140 or 640.

### *Graduate*

**221-740. Essentials of Plant Anatomy Credit 3(2-2)**

A study of the growth, development and organization of roots, stems, leaves, and reproductive organs of higher plants. Lectures, discussions, field trips, and the laboratories are employed in the presentation of this course.

**221-741. Applied Plant Ecology Credit 3(2-3)**

A study of the relations of plants to their environment with emphasis on climate and soil factors influencing their structure, behavior and distribution. Prerequisite: Biology 640, 740, or equivalent.

**221-742. Physiology of Vascular Plants Credit 3(2-2)**

Selected topics on the physiology of higher plants. Relationships of light quality, intensity, and periodicity to plant growth and reproduction; photosynthesis, and photoperiodism. Chemical control of growth and reproduction, and the general aspect of plant metabolism. Lectures, conferences, laboratory work and field studies of higher plant ecology.

**221-743. Development Plant Morphology Credit 3(2-2)**

Growth and differentiation from a cellular viewpoint, with emphasis on quantitative description and experimental study of development phenomena.

**221-744. Plant Nutrition Credit 3(2-2)**

A study of the subcellular organization of plants, inorganic and organic metabolism and respiration.

**221-862. Research in Botany Credit 3**

## **General Science**

**221-600. General Science for Elementary Teachers Credit 3(3-0)**  
**(Formerly Gen. Sci. 1570)**

This course will consider some of the fundamental principles of the life and physical sciences in an integrated manner in the light of present society needs.

## Zoology

### *Advanced Undergraduate and Graduate*

- 221-660. Special Problems in Zoology** **Credit 3(2-2)**  
**Formerly Zool. 1574)**

Open to students qualified to do research in Zoology.

- 221-661. Mammalian Biology** **Credit 3(3-0)**  
**(Formerly Zool. 1575)**

Study of the evolutionary history, classification, adaptation and variation of representative mammals. Prerequisite: Biology 160.

- 221-662. Biology of Sex** **Credit 3(3-0)**  
**(Formerly Zool. 1576)**

Lectures on the origin and development of the germ cells and reproductive systems in selected animal forms. Prerequisites: Biology 140, 160, and 260.

- 221-663. Cytology** **Credit 3(3-0)**  
**(Formerly Zool. 1577)**

Study of the cell with lectures and periodic student reports on modern advances in cellular biology. Prerequisites: Biology 140, 160, and 260.

- 221-664. Histo-Chemical Technique** **Credit 3(1-4)**  
**(Formerly Zool. 1579)**

Designed to develop skills in the preparation of cells, tissues and organs for microscopic observation and study. Prerequisites: Biology 160 and 260.

- 221-665. Nature Study** **Credit 3(3-0)**  
**(Formerly Zool. 1579)**

A study of diversified organisms, their habits, life histories, defenses, sex relationships, periodic activities and economic values designed to acquaint the student with fundamental knowledge that should lead to fuller appreciation of nature.

- 221-666. Experimental Embryology** **Credit 3(1-4)**  
**(Formerly Zool. 1580)**

A comprehensive lecture-seminar course covering the more recent literature on experimental embryology and development physiology. Experimental studies treating with fish, amphibian, chick and rodent development are designed as laboratory projects. Prerequisite: Biology 561 or equivalent.

- 221-667. Animal Biology** **Credit 3(2-2)**  
**(Formerly Zool. 1581)**

A lecture-laboratory course stressing fundamental concepts and principles of biology with the aim of strengthening the background of high school teachers. Emphasis is placed on the principles of animal origin structure, function, development, and ecological relationships.

- 221-668. Animal Behavior** **Credit 3(3-0)**

A study of the qualitative and quantitative difference between behavioral characteristics at different evolutionary levels, adaptiveness of differences in behavior and the development of behavior will be emphasized. Prerequisites: Biology 260, 466 and 561.

- 221-669. Recent Advances in Cell Biology** **Credit 3(3-0)**

A course designed to meet the needs of advanced undergraduate and graduate students desirous of the more recent trends concerning functions of organized cellular and sub-cellular systems. Current research as it relates to the molecular and fine structure basis of cell function, replication, and differentiation will be discussed. Prerequisites: Biology 466, 562, credit or concurrent registration in Chemistry 224.

- 221-762. Applied Invertebrate Zoology** **Credit 3(2-2)**  
 A study of the lower groups of animals, especially insects, and their economic importance to the southeastern region. Lectures, field trips, and experimental work with local animals are stressed, as well as factors affecting growth, development and behavior. Prerequisite: Biology 667 or equivalent.
- 221-763. Fundamentals of Vertebrate Morphology** **Credit 3(2-2)**  
 A study of the morphological evolution of the chordate animals from a comparative aspect, with lecture-demonstrations of dissected organ systems of the frog and cat. Reference to man is made to give this course a human approach. Prerequisite: Biology 667 or equivalent.
- 221-764. Basic Protozoology** **Credit 3(2-2)**  
 A study of the biology of free-living and parasitic protozoa with special emphasis on structure, behavior, life histories, and classification. Special attention will be given to free-living forms from such local animals as fish, frogs, and wild rodents. Prerequisite: Biology 667.
- 221-765. Introductory Experimental Zoology** **Credit 3(2-2)**  
 Studies of fertilization, breeding habits, regeneration, growth and differentiation of certain invertebrates and vertebrates from the experimental approach. Emphasis will be placed on laboratory procedures on the frog and the chick.
- 221-766. Invertebrate Biology for Elementary and  
 Secondary School Teachers** **Credit 3(3-0)**  
 A study of representative invertebrate groups with emphasis on origin, structure, function, classification, and ecological relationships.
- 221-767. Genetics and Inheritance for the Secondary  
 School Teacher** **Credit 3(3-0)**  
 A study of mendelian and molecular genetics with emphasis on organic evolution, linkage, mutation of genes and chromosomes, population mechanics and the relation between genes and environment in development. Laboratory experiments with drosophila and maise.
- 221-768. Functional Invertebrate Zoology** **Credit 3(1-4)**  
 Special topics in Invertebrate Zoology to be selected for detailed study with laboratory observations made on certain forms.
- 221-769. Cellular Physiology** **Credit 4(2-4)**  
 The physio-chemical aspect of protoplasm including permeability of surface tension, cellular metabolism, and other measurable properties of living cells.
- 221-860. Parasitology** **Credit 3(2-2)**  
 The study of the theoretical and practical aspects of parasitism, taxonomy, physiology and immunology of animal parasites.
- 221-861. Advanced Genetics** **Credit 3(2-2)**  
 The effects of chemical agents in the environment upon inheritance. Reports from the literature chiefly upon chemical mutations. Laboratory experiments on the chemical induction of crossing over.
- 221-863. Research in Zoology.** **Credit 3**

## Department of Chemistry

### *Advanced Undergraduate and Graduate*

- 223-610. Inorganic Synthesis** **Credit 2(1-3)**  
(Formerly Chem. 1670)

Discussion of theoretical principles of synthesis and development of manipulative skills in the synthesis of inorganic substances. Prerequisites: One year of organic chemistry; one semester of quantitative analysis.

- 223-611. Advanced Inorganic Chemistry** **Credit 4(4-0)**  
(Formerly Chem. 1671)

A course in the theoretical approach to the systematization of inorganic chemistry. Prerequisite: Chemistry 442.

- 223-621. Intermediate Organic Chemistry** **Credit 3(3-0)**  
(Formerly Chem. 501)

An in depth examination of various organic mechanisms, reactions, structures, and kinetics. Prerequisite: Chemistry 222.

- 223-624. Qualitative Organic Chemistry\*** **Credit 5(3-6)**  
(Formerly 1776)

A course in the systematic identification of organic compounds. Prerequisite: One year of Organic Chemistry.

- 223-631. Electroanalytical Chemistry** **Credit 3(3-0)**  
(Formerly Chem. 1781)

A study of the theory and practice of polarography, chronopotentiometry, potential sweep chronoamperometry and electrodeposition. The theory of diffusion and electrode kinetics will also be discussed along with the factors which influence rate processes, the double layer, adsorption and catalytic reactions. Prerequisite: Chemistry 431 or equivalent.

- 223-641. Radiochemistry** **Credit 3(3-0)**  
(Formerly Chem. 1782)

A study of the fundamental concepts, processes, and applications of nuclear chemistry, including natural and artificial radioactivity, sources, and chemistry of the radioelements. Open to advanced majors and others with sufficient background in chemistry and physics. Prerequisites: Chemistry 442 or Physics 406.

- 223-642. Radioisotope Techniques and Applications** **Credit 2(1-3)**  
(Formerly Chem. 1783)

The techniques of measuring and handling radioisotopes and their use in chemistry, biology, and other fields. Open to major and non-majors. Prerequisite: Chemistry 102 or 105 or 107.

- 223-643. Introduction to Quantum Mechanics** **Credit 4(4-0)**  
(Formerly Chem. 1784)

Non-relativistic wave mechanics and its application to simple systems of means of the operator formulation. Prerequisites: Chemistry 442 and Physics 222. Corequisite: Mathematics 300.

- 223-651. General Biochemistry** **Credit 5(3-6)**  
(Formerly Chem. 1780)

A study of modern biochemistry. The Course emphasizes chemical kinetics and energetics associated with biological reactions and includes a study of carbohydrates, lipids, proteins, vitamins, nucleic acids, hormones, photosynthesis, and respiration. Prerequisites: Chemistry 431 and 442.

\*Students are required to purchase supplemental materials for this course.

## **Inorganic Chemistry**

### *Graduate*

- 223-771. Structural Inorganic Chemistry** **Credit 2(2-0)**  
(Formerly Chem. 1785)

A study of the stereochemistry of inorganic substances; the relationship of structure to properties; and a discussion of experimental methods. Prerequisites: Chemistry 611 and 643.

- 223-716. Selected Topics in Inorganic Chemistry** **Credit 2(2-0)**  
(Formerly Chem. 1686)

A lecture course on advanced topics of Inorganic Chemistry. Prerequisite: Chemistry 611 or permission of the instructor.

## **Organic Chemistry**

### *Graduate*

- 223-721. Elements of Organic Chemistry** **Credit 3(2-3)**  
(Formerly Chem. 1690)

A systematic study of the classes of aliphatic and aromatic compounds and individual examples of each. Structure, nomenclature, synthesis, and characteristic reactions will be considered. Illustration of the familiarity of organic substances in everyday life will be included. In the laboratory, preparation and characterization reactions will be performed.

- 223-722. Advanced Organic Chemistry** **Credit 4(4-0)**  
(Formerly Chem. 1691)

Recent developments in the areas of structural theory, stereochemistry, molecular rearrangement and mechanism of reactions of selected classes of organic compounds. Prerequisite: One year of Organic Chemistry or Chemistry 721.

- 223-723. Organic Chemistry** **Credit 2(2-0)**  
(Formerly Chem. 1692)

An advanced treatment of organic reactions designed to give the student a working knowledge of the scope and limitations of the important synthetic methods of Organic Chemistry. Prerequisite: Chemistry 772.

- 223-726. Selected Topics in Organic Chemistry** **Credit 2(2-0)**  
(Formerly Chem. 1693)

A lecture course on advanced topics in Organic Chemistry.

- 223-727. Organic Preparations** **Credit 1-2(0-2 to 4)**  
(Formerly Chem. 1694)

An advanced laboratory course. Emphasis is placed on the preparation and purification of more complex organic compounds. Prerequisite: One year of Organic Chemistry.

## **Biochemistry**

### *Graduate*

- 223-756. Selected Topics in Biochemistry** **Credit 2(2-0)**  
(Formerly Chem. 1695)

A lecture course on advanced topics in Biochemistry.

## Analytical Chemistry

### Graduate

- 223-731. **Modern Analytical Chemistry** Credit 3(2-3)  
(Formerly Chem. 1787)

The theoretical bases of Analytical Chemistry are presented in detail. In the laboratory, these principles together with a knowledge of chemical properties are used to identify substances and estimate quantities in unknown samples.

- 223-732. **Advanced Analytical Chemistry** Credit 4(4-0)  
(Formerly Chem. 1788)

A lecture course in which the theoretical bases of Analytical Chemistry and their application in analysis will be reviewed with greater depth than is possible in the customary undergraduate courses. Equilibrium processes, including proton and electron transfer reactions and matter-energy interactions, will be considered. Prerequisite: One year of Analytical Chemistry or Chemistry 731.

- 233-736. **Selected Topics in Analytical Chemistry** Credit 2(2-0)  
(Formerly Chem. 1786)

A lecture course on advanced topics in Analytical Chemistry.

## Physical Chemistry

### Graduate

- 223-741. **Principles of Physical Chemistry I** Credit 4(3-3)  
(Formerly Chem. 1789)

A review of the fundamental principles of Physical Chemistry, including the derivation of the more important equations and their application to the solution of problems. Prerequisite: Mathematics 606 or 222.

- 223-742. **Principles of Physical Chemistry II** Credit 4(3-3)  
(Formerly Chem. 1790)

A continuation of Chem. 741. May be taken concurrently with Chem. 741.

- 223-743. **Chemical Thermodynamics** Credit 4(4-0)  
(Formerly Chem. 1791)

An advanced course in which the laws of thermodynamics will be considered in their application to chemical processes. Prerequisite: Chemistry 442 or 742.

- 223-744. **Chemical Spectroscopy** Credit 3(2-3)  
(Formerly Chem. 1792)

An advanced course in which the principles and applications of spectroscopy will be considered. Prerequisite: Chemistry 442 or 742.

- 223-746. **Selected Topics in Physical Chemistry** Credit 2(2-0)  
(Formerly Chem. 1795)

A lecture course on advanced topics in Physical Chemistry. Prerequisite: Chemistry 442 or 742.

- 223-748. **Colloid Chemistry** Credit 2(2-0)  
(Formerly Chem. 1794)

A study of the types of colloidal systems and the fundamental principles governing their preparation and behavior. Prerequisite: Chemistry 442 or 742.

- 223-749. **Chemical Kinetics** Credit 4(4-0)  
(Formerly Chem. 1793)

A study of the theory of rate processes; application to the study of reaction mechanisms. Prerequisites: Mathematics 222 and Chemistry 442 or 742.

## Research and Special Problems

### Graduate

**223-701. Seminar** **Credit 1(1-0)**  
(Formerly Chem. 1098)

Presentation and discussion of library or laboratory research problems.

**223-702. Chemical Research** **Credit 2-5(0.6 to 15)**  
(Formerly Chem. 1085, 1806 and 1807)

A course designed to permit qualified students to do original research in chemistry under the supervision of a senior staff member. May be taken for credit more than once.

**223-715. Special Problems in Inorganic Chemistry** **Credit 2-4(0-6 to 12)**  
(Formerly Chem. 1088 and 1089)

A laboratory course designed to introduce the student to the techniques of chemical research by solving minor problems in Inorganic Chemistry. May be taken for credit more than once.

**223-725. Special Problems in Organic Chemistry** **Credit 2-4(0-6 to 12)**  
(Formerly Chem. 1090 and 1091)

A laboratory course designed to introduce the student to the techniques of chemical research by solving minor problems in Organic Chemistry. May be taken for credit more than once.

**223-735. Special Problems in Analytical Chemistry** **Credit 2-4(0-6 to 12)**  
(Formerly Chem. 1092 and 1093)

A laboratory course designed to introduce the student to the techniques of chemical research by solving minor problems in Analytical Chemistry. May be taken for credit more than once.

**223-745. Special Problems in Physical Chemistry** **Credit 2-4(0-6 to 12)**  
(Formerly Chem. 1094 and 1095)

A laboratory course designed to introduce the student to the techniques of chemical research by solving minor problems in Physical Chemistry. May be taken for credit more than once.

**223-755. Special Problems in Biochemistry** **Credit 2-4(0-6 to 12)**

A laboratory course designed to introduce the student to the techniques of chemical research by solving minor problems in Biochemistry. May be taken for credit more than once.

**Chemistry-763. Selected Topics in Chemistry Instruction I** **Credit 6(6-0)**

A study of the curriculum and educational materials developed for use in the Thirteen College Curriculum Program in Physical Science.

**Chemistry-764. Selected Topics in Chemistry Instruction II** **Credit 6(6-0)**

A continuation of Chemistry 763.

**Chemistry-765. Special Problems in Chemistry Instruction I** **Credit 3(3-0)**

A course designed to introduce students to techniques of Chemistry instruction at the college level.

**Chemistry-766. Special Problems in Chemistry Instruction II** **Credit 3(3-0)**

A continuation of Chemistry 765.

**Chemistry-767. Special Problems in Chemistry  
Instruction III** **Credit 3(3-0)**

A continuation of Chemistry 766.

## Department of Curriculum and Instruction

### *Advanced Undergraduate and Graduate*

- 311-600. Organization of Media Collections** **Credit 3(3-0)**  
**(Formerly Education Media 600)**

Basic course in techniques of book and non-book description, their organization for services in libraries through decimal classification and their subject representation in the public catalog. Practice in laboratory.

- 311-601. Reference Materials** **Credit 3(3-0)**  
**(Formerly Educational Media 601)**

The selection, evaluation, and use of basic reference materials with emphasis on the selection of materials, study of contents, methods of location, and practical application.

- 311-602. Extramural Studies II** **Credit 1-3**

Off-campus experiences with educational programs of agencies, organizations, institutions or businesses which gives first hand experiences with youth and adults and aspects of education. Project reports and evaluation by permission of department.

- 311-603. Production of Instructional Materials** **Credit 3(2-2)**  
**(Formerly Educational Media 603)**

The planning, designing, and production of opaque materials, charts, graphs, posters, transparencies, mounting, bulletin boards, displays, models, mock-ups, spectrums, chalkboards, scriptwriting, and recording techniques.

- 311-604. Administration of Educational Media** **Credit 3(3-0)**  
**(Formerly Educational Media 604)**

Planning, organizing, coordinating, and administering educational media programs. Developing criteria for selection, utilization care, and evaluation of the effectiveness of materials and equipment. Scientific arrangements of learning environments, space and space relations. The planning of facilities and budgeting for program and public relations activities.

- 311-605. Concepts of Career Education** **Credit 3(3-0)**

Career Education and manpower concepts in a changing society with emphasis on career awareness, career exploration, and career preparation for kindergarten through the postsecondary level. Development of career education models and evaluation schema.

- 311-606. Curricular Integration of Career Education** **Credit 3(3-0)**

Integration of Career Education within subject content areas. Special attention to mathematics, social science, science, humanities, and career-oriented programs.

- 311-607. Administration of Career Education Programs** **Credit 3(3-0)**

The organization and implementation of Career Education Programs. Includes methods and models for inservice training for teachers and conselors. Evaluation of Career Education Programs.

- 311-608. Seminar in Career Education** **Credit 3(3-0)**

Review of literature, research, issues and problems in Career Education.

- 311-609. Production for Instructional Radio and Television** **Credit 3(3-0)**  
**(Formerly Educational Media 609)**

Affords opportunities for the student to develop and utilize knowledge and skills in designing settings, lighting techniques, operation of controls, directing, camera operation and care, producing and caring for visuals, video tapes, audio tapes, duplicating of tapes, rear screen projections and sound effects, background music,

also producing multi-media mix programs for various situations such as: slide-tape, or multi-image programs through film, slide, and opaque chain. Special provisions for training in preventive maintenance and minor repairs of equipment will be provided.

**311-610. Broadcasting for Instructional Radio and Television Credit 3(3-0)**  
**(Formerly Educational Media 610)**

Presents and evaluates live broadcast programs for instruction within the framework of acceptable criteria supported by the profession. Presenting and evaluating the effectiveness of videotaped or video disc recorded programs as used for instructional situations. To develop guidelines for quality radio and television programs.

**311-611. Utilization of Educational Media Credit 3(2-2)**  
**(Formerly Education Media 602)**

Applies basic concept to problems in teaching and learning with school and adult audiences. Relates philosophical and psychological bases of communications to teaching. Discusses the role of communications in problem-solving, attitude formation, and teaching. Methods of selecting and using educational media materials effectively in teaching. Experience in operating equipment, basic techniques in media preparation. Practice in planning and presenting a session.

**311-612. Systems Approach and Curriculum Credit 3(3-0)**  
**(Formerly Educational Media 605)**

Analysis of subject content, learners, specifications, and evaluation of objectives, analysis and sequencing of tasks, design of stimulus materials, selecting and evaluating of materials. Planning instructional units.

**311-613. Developmental Media for Children Credit 3(3-0)**  
**(Children's Literature)**  
**(Formerly Educational Media 606)**

A study of children's literature with emphasis on aids and criteria for selection of books and other materials for preschool through late childhood ages, story-telling, and an investigation of reading interests.

**311-614. Book Selection and Related Materials for Young People Credit 3(3-0)**  
**(Formerly Educational Media 607)**

A consideration of literature, reading interests, and non-book materials for young people.

**311-615. Programming for Instructional Radio and Television Credit 3(3-0)**  
**(Formerly Education Media 608)**

Provides the student with the historical background of radio and television, principles and skills in utilizing the theory, language, signs and symbols, of radio and television. Emphasis will be focused on cooperative team teaching approach, experimentation, and innovation as strategies for programming instruction.

**311-620. Foundations in Reading Credit 3(3-0)**  
**(Formerly Elementary Education and Reading 630)**

Basic reading course; consideration of the broad field of reading—its goal and nature; factors affecting its growth; sequential development of skills, attitudes and interests, types of reading approaches, organization and materials in teaching the fundamentals of reading.

**311-621. Word Recognition/Identification Skills Credit 3(3-0)**  
**(Formerly Elementary Education and Reading 631)**

This course explores phonic (letter-sound correspondence), syntactic (grammar), semantic (meaning), morphemic (structure) and visual word identification techniques for word recognition in developmental, corrective and remedial reading

programs. Methods of teaching and materials for introducing and reinforcing the skills are included.

**311-622. Teaching Reading Through the Primary Years** Credit 3(3-0)  
**(Formerly Elementary Education and Reading 635)**

Methods, materials, and techniques used in reading instruction of pre-school through grade three. An examination of learning, the teaching of reading, and curriculum experiences and procedures for developing reading skills.

**311-623. Methods and Materials in Teaching Reading in the Elementary School** Credit 3(3-0)  
**(Formerly Elementary Education and Reading 636)**

The application of principles of learning and child development to the teaching of reading and the related language arts. Methods and approaches to the teaching of reading in the elementary school, including phonics, developmental measures, informal testing procedures, and the construction and utilization of instructional materials.

**311-624. Teaching Reading in the Secondary School** Credit 3(3-0)  
**(Formerly Elementary Education and Reading 637)**

Nature of a developmental reading program, initiating and organizing a high school reading program, the reading curriculum, including reading in the content subjects, critical reading, procedures and techniques, and corrective and remedial aspects.

**311-625. Theory of American Public Education** Credit 3(3-0)

An examination of the philosophical resources, objectives, historical influences, social organization, administration, support, and control of public education in the United States.

**311-626. History of American Education** Credit 3(3-0)

A study of the historical development of education in the United States, emphasizing educational concepts and practices as they relate to political, social and cultural developments in the growth of a system of public education.

**311-627. The Afro-American Experience in American Education** Credit 3(3-0)

Lectures, discussions, and research in the Afro-American in American education, including the struggle for literacy, contributions of Afro-Americans to theory, philosophy and practice of education in the public schools, private and higher education. Traces the development of school desegregation, its problems and plans.

**311-628. Seminar and Practicum in Urban Education** Credit 3(1-4)

A synthesis of practical experiences, ideas and issues pertinent to more effective teaching in urban areas.

**311-629. Classroom Diagnosis in Reading Instruction** Credit 3(3-0)  
**(Formerly Elementary Education and Reading 638)**

Methods, techniques and materials used in the diagnosis of reading problems in the kindergarten-primary area through the intermediate level. Attention upon the pupil and the interpretation of physiological, psychological, sociological, and educational factors affecting learning to read. Opportunity for identification, analysis, interpretation on, and strategies for fulfilling the reading needs of all pupils.

**311-630. Reading Practicum** Credit 3(3-0)  
**(Formerly Elementary Education and Reading 639)**

Application of methods, materials and professional practices relevant to teaching pupils. Provisions for participation in and teaching of reading. Designed to coordinate the student's background in reading, diagnosis, learning, and materials. Supervised student teaching. Prerequisite: 12 credit hours in reading.

**311-631. Reading for the Atypical Learner** **Credit 3(3-0)**  
**(Formerly Elementary Education and Reading 640)**

Attention to the gifted child, the able retarded, the slow learner, the disadvantaged, and the linguistically different child. Special interest groups will be formed for investigation reports.

**311-641. Teaching the Culturally Disadvantaged Learner** **Credit 3(3-0)**

Psychological and sociological influences on culturally deprived learners and their development; emphasis on the experiential lacks of the culturally deprived learner, and special teaching methods, materials and activities. A consideration of groups of American Indians, Negroes, Puerto Ricans, urban poor, rural poor, Mexican Americans, Mountain white, and migrant workers who may be culturally deprived.

**311-683. Curriculum in Early Childhood** **Credit 3(3-0)**  
**(Formerly Elementary Education and Reading 683)**

Curriculum experiences and program planning appropriate to nursery, kindergarten, and primary education. An examination of theoretical models, bases of curriculum, and objectives relevant to early childhood education.

**311-684. Methods in Early Childhood** **Credit 3(3-0)**  
**(Formerly Elementary Education and Reading 684)**

Administration, principles, practices, methods, and resources in the organization of preschool and primary programs. An interdisciplinary and team approach. Observation for teaching styles and strategies.

### *Graduate*

**311-700. Introduction to Graduate Study** **Credit 2(2-0)**

Methods of research, interpretation of printed research data, and use of bibliographical tools.

**311-701. Philosophy of Education** **Credit 3(3-0)**

A critical study of and a philosophic approach to educational problems. The nature and aims of education in a democratic society, relation of the individual to society, interests and disciplines, play and work, freedom and control, subject matter and method.

**311-702. Reading in Modern Philosophy of Education** **Credit 3(3-0)**

Study and analysis of selected topics in philosophy of education.

**311-703. Educational Sociology** **Credit 3(3-0)**

The school as a social institution, school-community relations, social control of education, and structure of school society.

**311-704. Professional Development of Media Personnel** **Credit 1(1-0)**  
**(Formerly Educational Media 704)**

A course designed to meet specific needs of the media practitioner to include critiques of problems, individualized projects in problem-solving; overview of current issues and trends in media.

**311-705. Programmed Instruction** **Credit 3(2-2)**  
**(Formerly Educational Media 700)**

Theory, principles, application, and evaluation of programmed instruction techniques, survey of programmed techniques, the selection, utilization, and evaluation of existing programs. Survey of commercial programs, sources and types of teaching machines. Practice in writing programmed instruction units.

**311-706. Media Retrieval System** **Credit 3(2-2)**  
**(Formerly Educational Media 701)**

A survey of various media classifications, storage and retrieval models as applied to information centers and their operation. Compares traditional models with the logic of manual, mechanical, and electronic retrieval systems. Writing models for independent study.

**311-707. Workshop in Education Media** **Credit 3(3-0)**  
**(Formerly Educational Media 702)**

An exploration of recent materials, methods, and techniques and the development of skills and competencies in audiovisual communications. Demonstrations and presentations by specialists, audiovisual representatives. Does not count toward degree unless specifically approved.

**311-708. Research in Educational Media and Intership** **Credit 3(1-4)**  
**(Formerly Education Media 703)**

This is a professional laboratory designed to provide the student with on-the-job training and direct experiences relating to his "needs" and interest in operating, organizing, and administering a well-rounded media program and the opportunity to develop research into an area related to the practical experiences.

**311-709. Introduction to Theories in Media Communication** **Credit 3(3-0)**  
**(Formerly Educational Media 709)**

Considers concepts, principles, and theoretical orientation from fields of social psychology, communication and general systems. Competencies to include identification of authors and contributions as related to role of various media communications and technologies in the process of learning and culture transmission.

**311-710. Methods and Techniques of Research** **Credit 3(3-0)**

Careful analysis and study of research problems; techniques and methods of approach.

**311-711. Educational Statistics** **Credit 3(3-0)**

The essential vocabulary, concepts, and techniques of descriptive statistics as applies to problems in education and psychology.

**311-712. Advanced Information Services** **Credit 3(3-0)**  
**(Formerly Educational Media 711)**

Analysis of print and non-print resources of specific interest to adult learners. Examination of tools of instruction, bibliographic resources; occupational literature, testing and measurement data, readers' advisory services and programs; self-paced and auto-tutorial study programs.

**311-713. Computers in Education** **Credit 3(3-0)**  
**(Formerly Educational Media 713)**

Review of the use of the computer in instruction and related communication. Examination of research on the area; use of various hardware and software configuration; programming language; methods of course and lesson development and production of teaching program utilizing the computer or related use of computer in communication in education.

**311-715. Advanced Production in Instructional  
Radio and Television** **Credit 3(0-6)**  
**(Formerly Educational Media 715)**

An in-depth study of advanced methods and techniques necessary to produce quality instructional radio and television programs. Experimentation, innovations, and research will be encouraged and high production standards in keeping with those of Commercial Stations. Student-produced programs may be broadcast on a cooperative basis over local radio and television facilities. Prerequisite: Curriculum and Instruction 609 or approval of instructor.

**311-716. Techniques in Multi-Media Design,  
Production and Presentation  
(Formerly Educational Media 716) Credit 3(3-0)**

Application of theories and practices in graphics and film production; utilization of equipment and practice in incorporating two or more media in slide-tape, film loop and/or comparable presentation.

**311-717. Media Services to Business and Industry  
(Formerly Educational Media 717) Credit 3(3-0)**

A corollary course offering that deals with the nature of needs in communication for specific complexes and audiences; design of messages; public relations, marketing and public persuasion, adult learner theories; multi-media production techniques and presentations. Designed for the media major and/or practitioner interested in options in broadening career fields.

**311-718. Media in Special Education and Reading Credit 3(3-0)**

This course is designed to provide personnel in special education reading programs with experiences that will enable them to develop competencies and skills in the operation, care, and utilization and production of instructional materials and equipment pertinent to the achievement of their instructional objectives.

**311-720. Curriculum Development Credit 3(3-0)**

Basic concepts and modern trends in curriculum development for grades K-12; the purposes, objectives, and programs of the school; the relationships of allied subject areas to curriculum development; the relationship of the community; and the contributions and interrelationships of administrative personnel, other personnel, and lay persons to curriculum development. This course has a required field experience.

**311-721. Curriculum in the Elementary School  
(Formerly Elementary Education and Reading 721) Credit 3(3-0)**

Basic concepts of curriculum and curriculum development with attention to curriculum issues and to desirable instructional practices in the elementary school.

**311-722. Curriculum in the Secondary School Credit 3(3-0)**

Curriculum development, functions of the secondary school, types of curricula; emphasis on trends, issues, and innovations.

**311-723. Principles of Teaching Credit 3(3-0)**

A study of the status of teaching as a profession in the United States; teacher obligations, responsibilities and opportunities for leadership in the classroom and community with special emphasis on principles of and procedures in teaching.

**311-724. Problems and Trends in Teaching Science Credit 3(3-0)**

Attention to major problems of the high school teacher of science. Lesson plans, assignments, tests, etc., constructed and administered by each student in class. Audiovisual materials, demonstration and laboratory techniques carried out.

**311-725. Problems and Trends in Teaching Social Sciences Credit 3(3-0)**

Survey of major problems in the broad field of social studies and consideration of improved ways in presentation and class economy, including lesson plans, assignments, audiovisual materials, and other means of facilitating learning.

**311-726. Reading in the Content Areas  
(Formerly Elementary Education and Reading 739) Credit 3(3-0)**

Attention on reading problems and procedures and materials for improving reading in the social studies, science, English, mathematics, foreign language, home economics, and other fields.

- 311-727. Workshop in Methods of Teaching Modern Mathematics for Junior and Senior High School Teachers** **Credit 3(3-0)**
- Model lesson plans, use of educational media, geometric and trigonometric devices, Truth Tables, and intuitive and formal logic in the teaching of modern mathematics in the junior and senior high school.
- 311-730. Problems in the Improvement of Reading** **Credit 3(3-0)**  
(Formerly Elementary Education and Reading 740)
- Study of current problems, issues, trends and approaches in the teaching of reading including investigations of underlying principles of reading improvement; coverage of appraisal techniques, materials and procedures, innovative and corrective measures; and application of research data and literature. Prerequisite: A previous graduate course in reading.
- 311-731. Advanced Diagnosis in Reading Instruction** **Credit 3(3-0)**  
(Formerly Elementary Education and Reading 741)
- The diagnosis and treatment of reading difficulties. Study and interpretation of selected tests useful in understanding and analyzing physiological, psychological, sociological and educational factors related to reading difficulties. Case studies and group diagnosis.
- 311-732. Organization and Administration of Reading Programs** **Credit 3(3-0)**  
(Formerly Elementary Education and Reading 742)
- Administrative acts requisite to the creation and guidance of a well-balanced, school-wide reading program. For all school personnel who are in a position to make administrative decisions regarding the school reading program.
- 311-733. Advanced Practicum in Reading** **Credit 3(3-0)**  
(Formerly Elementary Education and Reading 743)
- Actual experiences with youth and teachers in professional activities.
- 311-734. Seminar and Research in Reading** **Credit 3(3-0)**  
(Formerly Elementary Education and Reading 744)
- Evaluation of recent research concerning findings, approaches, innovations, and organization of reading instruction. Selected topics for reports and research projects. Independent study of selected topics of experimentation. Prerequisite: 24 semester credit hours in graduate courses.
- 311-775. Independent Reading in Education I** **Credit 3(3-0)**  
(Formerly Elementary Education and Reading 785)
- Individual study and selected readings in consultation with an instructor. Prerequisite: 24 hours of graduate credit.
- 311-776. Independent Reading in Education II** **Credit 3(3-0)**  
(Formerly Elementary Education and Reading 786)
- Individual study and selected reading in consultation with an instructor. Prerequisite: 24 hours of graduate credit.
- 311-777. Independent Reading in Education III** **Credit 3(3-0)**  
(Formerly Elementary Education and Reading 787)
- Individual study and selected reading in consultation with an instructor. Prerequisite: 24 hours of graduate credit.
- 311-780. Comparative Education** **Credit 3(3-0)**
- Historical and international factors influencing the development of national systems of education, recent changes in educational programs of various countries.

**311-781. Issues in Elementary Education** **Credit 3(3-0)**  
**(Formerly Elementary Education and Reading 781)**

A critical review of the background and functions of the elementary school as a social institution. Attention is given to increasing the ability to formulate the generalizations of development and learning into a meaningful framework for appraising current educational thinking and practice and predicting the direction in which these must move if elementary school programs are to continue to improve.

**311-782. Issues in Secondary Education** **Credit 3(3-0)**

An analysis of the role of the high school as an educational agency in a democracy. Attention is given to: (1) philosophical, psychological, and sociological bases for the selection of learning experiences; (2) contrasting approaches to curriculum construction; (3) teaching methods and materials; (4) evaluation procedures; and (5) school-community relationships.

**311-783. Current Research in Elementary Education** **Credit 3(3-0)**  
**(Formerly Elementary Education and Reading 783)**

A critical analysis of the current research in elementary education and the implications of such for elementary school educative experiences.

**311-784. Current Research in Secondary Education** **Credit 3(3-0)**

A critical analysis of the current research in secondary education and the implications of such for high school educative experiences.

**311-S-785. Independent Readings in Education I** **Credit 1(0-2)**

Individual study and selected reading in consultation with an instructor. Prerequisite: 24 hours of graduate credit.

**311-S-786. Independent Readings in Education II** **Credit 2(2-4)**

Individual study and selected readings in consultation with an instructor. Prerequisite: 24 hours of graduate credit.

**311-S-787. Independent Readings in Education III** **Credit 3(0-6)**

Individual study and selected reading in consultation with an instructor. Prerequisite: 24 hours of graduate credit.

**311-S-790. Seminar in Educational Problems** **Credit 3(1-4)**

Intensive study, investigation, or research in selected areas of education; reports and constructive criticism. Prerequisites: A minimum of 24 hours in prescribed graduate courses.

**311-S-791. Thesis Research** **Credit 3**

## **Department of Economics**

### *Advanced Undergraduate and Graduate*

**531-601. Economic Understanding** **Credit 3(3-0)**

An introduction to the principles of economics utilizing the macro approach. No credit towards a degree in economics.

**531-602. Manpower Problems and Prospects** **Credit 3(3-0)**

An analysis of manpower development problems and prospects, with particular reference to the problems of unemployment, underemployment and discrimination. The course will focus on problem measurement, evaluation of existing policy and prospects for achievement of all human resource development. The course will invite an interdisciplinary participation on the part of students and faculty. Prerequisites: Econ. 300 or 301; Econ. 305 or equivalent, or consent of the instructor.

**531-603. Manpower Planning****Credit 3(3-0)**

Manpower planning centers chiefly on the adjustment necessary to adapt labor resources to changing job requirements. This course is designed to prepare students to create plans which will facilitate this adjustment. This course will attempt to acquaint the student with labor force and labor market behavior such that he is able to make planning decisions relating to job creation (increasing demand) and education and training (increasing supply). Planning will be done at both the national (macro) and local (micro) levels, with special emphasis on the latter. We will further attempt to evaluate all planning decisions by use of Cost-Benefit Analysis or Multivariate Analysis. Prerequisites: Econ. 300 or 301; Econ. 305 or equivalent, or consent of the instructor.

**531-604. Economics Evaluation Methods****Credit 3(3-0)**

The course will cover needed tools of research design, statistical reporting, cost benefit analysis and other related techniques for internal and external evaluations of human resource development programs. The course is designed both for inservice personnel currently employed by agencies, and for the regular student enrolled in a degree-granting program.

**531-610. Consumer Economics****Credit 3(3-0)**

This course is designed to acquaint the student with the nature, scope and tools of consumer economics. It is particularly oriented to minority groups, thus focusing on the economic choices currently affecting groups with rising incomes and aspirations. This course will consider the economic choices faced by the consumers in maximizing satisfaction with limited means.

**531-615. Economics, Political and Social Aspects of the Black Experience****Credit 3(3-0)**

A study of the political, economic and social tools of current public policy treating the subject of race in America. This course will examine the economic and social conditions of income inequality and explore the national commitment to equal opportunity. Special emphasis will be placed on illustrations from North Carolina and adjacent states.

**531-626. Physical Distribution****Credit 3(3-0)**

Analysis of alternative sources of transportation for moving raw materials into the production facility and finished goods into the channels of distribution. Illustrates integration of transportation decisions with those of production, inventory, warehousing and marketing management. Uses quantitative and non-quantitative concepts for plant and warehouse location decisions.

**531-690. Special Topics in Economics****Credit 3(3-0)**

An in-depth examination of selected problems and analytical techniques in economics not covered in other courses. Course contents may vary from semester to semester. May not be repeated for credit.

***Graduate*****531-701. Labor and Industrial Relations****Credit 3(3-0)**

Two important sectors of the economy are examined — Labor and Management. Historical, public and governmental influences are studied.

**531-705. Government Economic Problems****Credit 3(3-0)**

This course will consider the growth of public expenditures and revenues, and debt of the United States; theories of taxation and tax incidence; and the effects of public expenditures and taxes on economic growth.

**531-710. Economic Development and Resource Use****Credit 3(3-0)**

This course deals with resource and economic development in the domestic econ-

omy. A comparison is drawn among developed, developing and undeveloped societies.

**531-720. Development of Economic Systems** **Credit 3(3-0)**

An analytical approach to the study of various economic systems, how these systems developed and how they are organized to carry on economic activity.

### **Transportation**

**531-650. Transportation Law** **Credit 3(3-0)**

A detailed review of the development of transportation law will be made. An analysis of the Interstate Commerce Act and its impact on surface carriers will be completed. This course will assist those students planning to take the bar exam for the Interstate Commerce Commission or those students studying for the Transportation Law exam in the American Society of Traffic and Transportation series. Prerequisite: Business Administration 461 — Legal Environment of Business or equivalent is recommended.

**531-660. National Transportation Policy** **Credit 3(3-0)**

A seminar on national transportation problems. This course will involve readings and research on several issues in transportation. Previous policy statements will be reviewed in light of current needs to determine what the current national transportation policy should be.

## **Department of Educational Leadership and Policy**

### *Advanced Undergraduate and Graduate*

**312-650. Special Problems in Adult Education** **Credit 3(3-0)**  
(Formerly Adult Education 650)

Special topics, individual and group study projects, research, workshops, seminars, summer institutes, travel study tours and organized visitations in areas of adult education worked out and agreed upon by participating students and the Department of Educational Leadership and Policy.

**312-651. Introduction to Adult Education** **Credit 3(3-0)**  
(Formerly Adult Education 651)

The purpose is to develop a view of Adult Education as a broad, diverse, and complex field of study, research and professional practice. Students will survey many institutions, forms, programs, and individual activities, for insight into the scope of Adult Education, its client group, and their reasons for becoming adult learners, and the range of methods and materials used to enable adults to learn.

**312-652. Methods in Adult Education** **Credit 3(3-0)**  
(Formerly Adult Education 761)

Methods of informal instruction, group leadership, conference planning and techniques in handling various issues of interest to adults. For persons preparing to conduct adult education programs as well as those preparing to serve as instructors or leaders in the public schools and/or in various agencies serving adults.

**312-653. Adult Development and Learning** **Credit 3(3-0)**  
(Formerly Adult Education 653)

The focus is on adult development psychology and learning theory. Adult development and learning is grounded in human developmental psychology, and enables students to investigate the life. From the research literature of adult life stages, students will be asked to read works of Freud, Havinghurst, Erickson, Gould, Levinson, Valliant, and Klemme.

**312-654. Gerontology** **Credit 3(3-0)**  
(Formerly Adult Education 654)

The basic purpose of this course is to study the process of aging. Attention will be given to the influence of cultural, sociological, and economic factors. An important phase of the course will deal with planning for retirement.

**312-688. School Law and the Teacher** **Credit 3(3-0)**

Study of statutory and case law relating to the teacher, the student and the teaching learning environment, with special emphasis on the rights and responsibilities of the teacher and the student.

**312-689. Contemporary Issues in Administration** **Credit 3(3-0)**

Familiarize students, managers, administrators and civic leaders with survival skills necessary for job effectiveness and efficiency.

**312-690. The Community College and Postsecondary Education** **Credit 3(3-0)**

Philosophy, organization and character of school programs needed to meet educational needs of individuals who desire to continue their education on the post-secondary level. Special attention is given to the trends in developing community colleges. Prerequisites: Education 727, or a graduate course in high school curriculum; Psychology 726, or graduate course in Human Development and Services, or three or more years of teaching experience.

### *Graduate*

**312-700. History and Philosophy of Continuing Education** **Credit 3(3-0)**  
(Formerly Adult Education 700)

A study of historical and philosophical foundations and thought which have influenced how adult needs have been met through learning. Consideration will be given to the thinking upon which teaching and learning were based during ancient times through the present time.

**312-701. Organization, Administration, and Supervision of Adult/Continuing Education Programs** **Credit 3(3-0)**  
(Formerly Adult Education 701)

An examination of theories, concepts, and practices as related to the functions planning, organizing, staffing, financing, motivating, decision making evaluating and delegating in an Adult Education organization.

**312-702. Practicum in Teaching Adults** **Credit 3(1-4)**  
(Formerly Adult Education 702)

Practical experience involving a group of adults in a teaching learning experience. Under supervision the practice teacher will have an opportunity to apply concepts, teaching methods, and instruction materials in a real life situation. Prerequisites: Educational Leadership Policy 651, 653, and 700.

**312-703. Seminar on Contemporary Issues in Adult Continuing Education** **Credit 1(1-0)**  
(Formerly Adult Education 703)

This course is integrative in nature, thereby offering the student an opportunity to synthesize concepts, theories, and methods of teaching learned in earlier courses. Students will be encouraged to further explore areas of special interest.

**312-704. Independent Study** **Credit 2(2-0)**  
(Formerly Adult Education 704)

This course permits a student to undertake an analysis of a problem through individual study outside the traditional classroom setting. The problem may be selected from either travel, hobby, or a related job experience. Prerequisite: Permission of the instructor.

- 312-705. Thesis Research in Adult Education**                      **Credit to be arranged**  
**(Formerly Adult Education 705)**
- 312-755. Supervision of Instruction**                                      **Credit 3(3-0)**  
 Modern concepts and techniques of supervision; the roles of the supervisor, principal, and consultant in curriculum development; and the procedures, problems, and materials of supervising and improving instruction in grades 1-12.
- 312-765. Supervision of Student Teachers**                              **Credit 3(3-0)**  
 A basic professional course for classroom teachers, principles, and supervisors who serve in an official capacity directing the field-laboratory experiences of student teachers.
- 312-757. Problems in Supervision of the Elementary School**      **Credit 3(3-0)**  
 The nature, theory, and practice of supervision, and the supervisor's role in improvement of instruction.
- 312-758. Problems in High School Supervision**                      **Credit 3(3-0)**  
 A study of problems, techniques, and materials in the improvement of instruction in secondary schools. A course for principals, heads of departments, and supervisors.
- 312-760. The Junior High School**    **Credit 3(3-0)**  
 The philosophy, organization, administration, curriculum and activities of the junior high school.
- 312-761. School Organization and Administration**                      **Credit 4(4-0)**  
 A comprehensive course in organization and administration of schools, grades K-12, placing primary emphasis on the following areas: (1) formal and informal organizational structure, concepts and practices; (2) the management processes; (3) the administrative functions, with particular reference to personnel, program, and fiscal management; and (4) leadership styles and the leadership role, with special attention to planning, decision-making, and conflict-resolution.
- 312-762. The Principalship**    **Credit 3(3-0)**  
 A professional education course for the principalship, examines the role of principal in the modern school system with emphasis on planning, programming, and management functions.
- 312-763. Public School Administration**                                  **Credit 3(3-0)**  
 Review of school administration, the organization and structure of the school system; agencies of administration and control, legal basis of school administration, standards for administration in the various functional areas.
- 312-764. Pupil Personnel Administration**                              **Credit 3(3-0)**  
 Pupil accounting, records and reports, financial reports, school census, special school reports, pupil adjustment and progress, health and safety, and legal aspects of pupil administration.
- 312-765. School Community Relations and Communication**      **Credit 3(3-0)**  
 Study of the relationship between the school/school district and the community it serves; community structure, resources and services, inter-agency cooperation, community involvement, committees and volunteer services, publication and media relations; public information, business and organizational cooperation and their interrelation with the school/school district.
- 312-766. School Planning**    **Credit 3(3-0)**  
 An examination of the principles governing the selection and landscaping of school grounds, location and design of buildings, and care of plants from standpoint of use, sanitation, health and attractiveness.

**312-767. Public School Finance** **Credit 3(3-0)**

A current study of the political, legal, and economic aspects of financing public education, with particular attention to school finance in North Carolina. Major areas include: (1) public education and the national economy; (2) the tax structure and sources of revenue; (3) resource allocation and methods of funding; (4) school finance reform; (5) school finance in North Carolina; and (6) practical experience in budget planning and development.

**312-768. Principles of School Law** **Credit 3(3-0)**

An analysis of the legal aspects of public education. Constitutional, statutory, and case law, with special attention to North Carolina law, provide the basis for understanding the legal framework and examining legal principles pertaining to such areas as: (1) church-state-education relations; (2) race-state-education relation; (3) school districts; (4) school boards; (5) finance; (6) curriculum; (7) property; (8) teacher personnel; and (9) pupil personnel.

**312-769. Problems in Educational Administration and Supervision** **Credit 3(3-0)**

An internship of field study on a supervised project arising out of the needs of the student. Prerequisite: 15 graduate hours, including Organization and Administration, Supervision, and Curriculum Development.

**312-770. Problems in Educational Supervision (Internship)** **Credit 3(3-0)**

An internship of field study on a supervised project arising out of the needs of the student. Prerequisite: 15 graduate hours, including Organization and Administration; Supervision of Instruction; Curriculum Development; and Seminar in Educational Problems (Research).

**312-771. Program Development: Community Education** **Credit 3(3-0)**

The study of community needs assessment, community program design, program budgeting; grant writing; planning and infusion of education that is multi-cultural into the community education curriculum.

**312-772. Program Management: Community Education** **Credit 3(3-0)**

Study of organization and governance of community education, program implementation, direction, supervision and evaluation.

**312-776. Principles of College Teaching** **Credit 3(3-0)**

Principles involved in teaching at the college level: techniques of teaching aids, criteria used in evaluation. Prerequisite: Psychology 726, or graduate course in educational psychology.

**312-777. Seminar in Postsecondary Education** **Credit 3(3-0)**

A synthesis of current research in postsecondary education relating to administration, curriculum, and faculty development. Prerequisite: Education 690.

**312-778. Student Personnel Services** **Credit 3(3-0)**

Analysis of student development programs in postsecondary institutions, including pre-admission, education, vocational, and personal counseling; career guidance services, attitude and interest assessment, student affairs, rights and responsibilities, and financial aid.

**312-779. Technical Education in Community Junior Colleges** **Credit 3(3-0)**

Offers techniques in identifying community needs and in planning curriculums and courses for technical/ vocational education. Stresses the role of the two-year college in middle manpower development.

**312-781. Internship** **Credit 3(3-0)**

Offers opportunities for students to spend one semester as a teaching or adminis-

trative intern in a community college or technical institute in the North Carolina Community College System. Registration only by permission of the instructor.

**312-785-A. Independent Readings in Education I** **Credit 1(0-2)**

Individual study and selected readings in consultation with an instructor. Prerequisite: 24 hours of graduate credit.

**312-786-A. Independent Readings in Education II** **Credit 2(0-4)**

Individual study and selected readings in consultation with an instructor. Prerequisite: 24 hours of graduate credit.

**312-787-A. Independent Readings in Education III** **Credit 3(0-6)**

Individual study and selected readings in consultation with an instructor. Prerequisite: 24 hours of graduate credit.

**312-790-A. Seminar in Education Problems** **Credit 3(3-0)**

Intensive study, investigation, or research in selected areas of education; reports and constructive criticism. Prerequisite: A minimum of 24 hours in prescribed graduate courses.

**312-791-A. Thesis Research** **Credit 3(3-0)**

**312-792. Advanced Seminar and Internship in Education Administration** **Credit 3(3-0)**

Seminar and supervised internship experiences relating to problems in administration and to the needs and interests of the student (restricted to students in the Sixth-Year Program in Administration).

## **Department of Architectural Engineering**

### *Advanced Undergraduate and Graduate*

**410-601. Advanced Reinforced Concrete** **Credit 3(3-0)**

Design and analysis of columns for axial loads, and biaxial bending. One way and two way slabs, multistory building frames, continuous beams, precast joists, footings, retaining walls and prestressed and post tension beam design.

**410-602. Advanced Structural Analysis** **Credit 3(3-0)**

Matrix Algebra. Review of continuous beams, slope deflection, moment distribution, and energy methods. Flexibility and stiffness methods. Application of computer aided methods to beams, trusses, plane space frames.

**410-603. Foundation Engineering** **Credit 3(3-0)**

Subsoil investigations analysis and design of foundations and other substructures. Caisson and cofferdam design and methods of construction-ground water control.

**410-610. Airside System Design Concepts** **Credit 3(3-0)**

Introduction to fans, duct design methodology, terminal air devices, louvers and dampers. Equipment selection and layout, testing and balancing. Operation and maintenance.

**410-611. Hydronic Systems Design** **Credit 3(3-0)**

Introduction to centrifugal pumps and pump systems. Air control devices. Cooling tower pumping and piping. Primary - secondary pumping systems. System balancing. Steam heating systems. Chillers.

**410-612. HVAC Controls, Operation and Maintenance** **Credit 3(2-2)**

Introduction to HVAC control concepts. Electric, electronic, pneumatic and digital equipment. Heating and cooling control systems. Energy management systems.

**410-613. Design of Energy Conservation Systems** **Credit 3(3-0)**

Utility rate schedules, energy conservation opportunities in lighting, electrical systems HVAC, compressed air, steam generation and distribution, waste heat recovery, thermal energy storage and co-generation.

**410-620. Architectural Design IV** **Credit 3(0-6)**

Laboratory-lecture course presenting a series of problems in the design, analysis, and organization of buildings. Economic and social considerations are given to problems. Group planning, mass and orientation are studies for more complex building requirements. More detailed study and presentation is required to emphasize the complete architectural complex.

**410-621. Advanced Architectural Design** **Credit 4(1-6)**

Advanced studies in architectural design. Projects deal with various aspects of building design, urban design, and community design in a comprehensive and integrated manner.

**410-622. City Planning & Urban Design** **Credit 3(1-4)**

Lecture and laboratory course. History of city planning and urban design; general problems of city planning and urban design-architectural space composition. Regional and urban planning; scale of the plan for region and city. Transportation in the city; the city as a human unit. Greenery in the city. Location of the residential areas, industry, business and commerce, etc. Location criteria. Design of the neighborhood unit. Prerequisite: Juniors enrolled in the program of the Transportation Institute and Architectural Engineering majors of Junior classification. Open to practicing design professionals.

**410-644. Matrix Analysis of Structures** **Credit 3(2-2)**

Lecture and Laboratory. Review of Matrix algebra; statically and kinematically, indeterminate structures; introduction of flexibility and stiffness methods; applications to beams, plane trusses and plane frames. Prerequisite 410-457 or equivalent.

**410-656. HVAC Systems Analysis and Simulation** **Credit 3(3-0)**

The use of FORTRAN and numerical methods to analyze and simulate the operation of HVAC components of HVAC systems.

**410-658. Value Analysis in Design and Construction** **Credit 3(3-0)**

Introduction to functional analysis, the job plan, the typical project cycle, programming phase, and value analysis in the design and construction context.

**410-660. Selected Topics in Engineering** **Credit Variable (1-3)**

Selected engineering topics of interest to students and faculty. The topics will be selected before the beginning of the course and will be pertinent to the programs of the student enrolled. Prerequisite: Consent of the instructor.

**410-666. Special Projects** **Credit Variable (1-3)**

Study arranged on a special engineering topic of interest to student faculty member, who will act as advisor. Topics may be analytical and/or experimental and encourage independent study. Prerequisite: Consent of the instructor.

**410-700. Advanced Reinforced Concrete Design II** **Credit 3(3-2)**

Advanced theory and methods applied to the design of reinforced concrete structures, including yield line methods, ultimate strength theory and limit design. Prerequisite: 410-601 or equivalent.

**410-701. Advanced Structural Analysis II** **Credit 3(3-0)**

The analysis of various types of structural problems, including the application of modern analytical methods. Prerequisite: 410-602 or equivalent.

**410-719. Design of Buildings for Extreme Wind and Earthquake Forces** **Credit 3(3-0)**

Principles of structural dynamics; response of buildings to earthquake induced forces; evaluation of earthquake forces using the response spectra; study of the behavior of wind, variation in wind velocity with respect to topography and height above ground; the study of the response of building components of hurricanes and tornadoes. Prerequisite: 225-300, 410-602.

**410-720. Finite Element Analysis** **Credit 3(3-0)**

Concepts of the finite element are used in the analysis of continuous beams, arches, retaining walls, piles multistory plane and space frames reinforced concrete slabs and matt foundations, cylindrical tanks and shell structures.

**410-759. Advanced Foundation Engineering** **Credit 3(3-0)**

Concepts of soil mechanics are applied to particular cases of soil interaction with foundations of structures, bridge abutments, piles, caissons. Effect of vibrations on the stability of soil structures, rock mechanics, multi-layered soil structures. Case history examples will be provided.

**410-773. Energy Management Planning** **Credit 3(3-0)**

Concepts of energy management planning for building complexes and multiple facilities. Topics include: data collection and analysis, facility audits, on-site measurements, operations and maintenance and economic impact analyses.

**410-774. Facility Planning and Site Analysis** **Credit 3(3-0)**

Strategic and long range planning concepts, environmental impact studies. Population projections, growth, maintenance and retrofit, accessibility and economics.

**410-775. Computer-Aided Project Management** **Credit 3(3-0)**

The use of computers in project scheduling, manpower forecasting, cash flow analysis, progress reports, billings and profitability analysis. The emphasis is on the management of a small construction or consulting engineering firm.

**410-776. Professional Practice and Labor Relations** **Credit 3(3-0)**

Professional practice, ethics contract documents, project administration and office management. Labor law in contractor's language, employment standards, collective bargaining, special agreements, Occupational Safety and Health Act.

**410-777. Thesis** **Credit Variable (1-6)**

**410-779. Advanced Structural Steel Design** **Credit 3(2-2)**

Modern methods and advanced theory applied to the design of steel structures. Project design includes the solution to various types of framed structures. Prerequisite: 410-602 or equivalent.

**410-784. Advanced HVAC System Design** **Credit 3(3-0)**

Comprehensive HVAC design of complex facilities including hospitals and high rise buildings.

**410-788. Research** **Credit Variable (1-3)**

Advanced research in an area of interest to student and instructor.

**410-789. Special Topics** **Credit Variable (1-3)**

Study of advanced topics selected prior to the offering and pertinent to student's programs of study.

## Department of Chemical Engineering

### *Advanced Undergraduate and Graduate Courses\**

#### **470-600. Advanced Process Control** **Credit 3(3-0)**

The course covers advanced methods of controlling chemical processes: adaptive control, feed forward control, cascade control, multivariable control, multi-loop control, decoupling, and deadtime compensation. Emphasis is placed on computer design. Prerequisite: ChE 340; Senior standing in ChE courses.

#### **470-605. Biochemical Engineering** **Credits 3(3-0)**

The course covers the application of engineering principles to the design and control of fermentation processes. Biochemical production of industrial chemicals. Immobilized enzyme technology. Biological waste treatment. Mixer design and oxygen transfer in fermentors. Separation of fermentor effluents. Corequisites: ChE 400, ChE 420; Prerequisites: Biology 121, or permission of the instructor.

#### **470-610. Advanced Chemical Engineering Thermodynamics** **Credit 3(3-0)**

Molecular thermodynamics of fluid phase equilibria, introduction to statistical thermodynamics, thermodynamics of nonequilibrium processes. Prerequisite: ChE 310.

#### **470-620. Advanced Chemical Engineering Analysis** **Credit 3(3-0)**

Solution of chemical engineering problems by advanced mathematical techniques. Solution of uncoupled and coupled momentum, heat and mass transfer problems. Solution of matrix analysis. Advanced design and optimization of chemical processes. Prerequisites: All core ChE courses up to and including the seventh semester, Math 331.

#### **470-630. Transport Phenomena** **Credit 3(3-0)**

A unified approach to momentum, energy, and mass transfer with emphasis on the microscopic approach. Development of the differential transport balances. Applications in solving simple chemical process problems. Prerequisites: ChE 320 with a C grade or higher; Math 331 or permission of the instructor.

#### **470-650. Interfacial Transport Phenomena** **Credit 3(3-0)**

Fundamental principles of phase interfaces. Surface tension, contact angle and dispersive forces. Study of suspensions, emulsions and foams. Applications in wetting, floatation, coating and dyeing. Prerequisite: Permission of the instructor.

\*Graduate courses in Chemical Engineering are listed under the MSE program.

## **Special and Advanced Engineering**

### *Advanced undergraduate and Master of Science in Engineering Program*

#### **400-660. Selected Topics in Engineering** **Credit Variable (1-3)**

Selected engineering topics of interest to students and faculty. The topics will be selected before the beginning of the course and will be pertinent to the programs of the students enrolled. Prerequisite: Consent of the instructor.

#### **400-666. Special Projects** **Credit Variable (1-3)**

Study arranged on a special engineering topic of interest to student faculty member, who will act as advisor. Topics may be analytical and/or experimental and encourage independent study. Prerequisite: Consent of the instructor.

## *Graduate—Master of Science in Engineering Program*

### **400-710. Advanced Transport Phenomena** **Credit 3(3-0)**

An advanced treatment of the mechanisms of momentum, heat and mass transport. Methods of solution of transport problems with emphasis on coupled systems where two or more transport processes interact; Non-Newtonian Flow; Boundary Layer Theory; Analysis and solution of transport problems of significance in chemical process. Prerequisite: ChE 300, ChE 320, ChE 400, ChE 420.

### **400-720. Advanced Chemical Reaction Engineering** **Credit 3(3-0)**

An advanced treatment of chemical reaction engineering including effects of non-ideal flow and fluid mixing on reactor design. Multi-phase reaction system. Heterogeneous catalysis and catalytic kinetics. Prerequisite: ChE 420.

### **400-730. Advanced Biochemical Engineering** **Credit 3(3-0)**

Advanced topics in biochemical engineering and enzyme engineering, highlight research trends. Modeling and optimization of biochemical systems. Design and analysis of enzyme reactors. Use of enzyme in industrial, environmental, and medical applications. Prerequisite: ChE 605.

### **400-740. Advanced Chemical Process Design** **Credit 3(3-0)**

Topics in advanced conceptual process engineering: process analysis, process synthesis, process optimization. Specific topics include: flowsheeting, design variable selection, computational algorithm formulation, separation sequences, heat exchanger networks, recycle-purge processes, process design and simulation software development including physical and thermodynamic properties packages. Prerequisite: Graduate Standing.

### **400-750. Separation Processes** **Credit 3(3-0)**

Differential and equilibrium stage operations involving non-isothermal and multicomponent systems. Simultaneous mass transfer and chemical reaction; dispersion effects. Applications to important operations including absorption, extraction, chromatography, distillation, ion exchange and reverse osmosis membrane separation. Prerequisite: Graduate Standing.

### **400-760. Topics in Molecular Thermodynamics** **Credit 3(3-0)**

Statistical ensembles and thermodynamics connection, classical statistical mechanics, ideal monatomic, diatomic and polyatomic gas, virial equation of state, distribution functions and liquid theory, integral equations, perturbation theory, MC and MD computer simulations, current topics, projects. Prerequisite: Graduate standing.

### **400-777. Thesis** **Credit Variable (1-6)**

### **400-788. Research** **Credit Variable (1-3)**

Advanced research in an area of interest to student and instructor.

### **400-789. Special Topics** **Credit Variable (1-3)**

Study of advanced topics selected prior to the offering and pertinent to student's programs of study.

## **Advanced Engineering Electives to be Chosen from the Following List:**

### *Advanced Undergraduate and Graduate Courses Department of Electrical Engineering*

### **420-602. Semiconductor Theory & Devices** **Credit 3(3-0)**

A study of the phenomena of solid-state conduction and devices using band models;

excess carriers in semiconductors; p-n junctions and devices; bipolar junction transistors field effect transistors; integrated circuits. Prerequisites: 227-406 and 420-460.

**420-614. Integrated Circuit Fabrication Methods** **Credit 3(3-0)**

Device technology for the fabrication of silicon integrated circuits. Techniques will be applicable to bipolar and MOS transistor structures, LSI and VLSI circuits. Oxidation, diffusion, epitaxy and ion implantation processes will be studied. Limits on device design and performance; compound semiconductor device technology. Prerequisite: 420-602 or consent of instructor.

**420-615. Silicon Device Fabrication Laboratory** **Credit 2(0-2)**

Laboratory experiments in the fabrication of silicon devices. P-N junctions diodes, metal-oxide semiconductor (MOS) capacitors and (MOS) field effect transistors will be fabricated. Oxidation, diffusion and photolithographic techniques will be presented. Prerequisite: 420-614 or consent of instructor.

**420-616. Introduction to Microprocessors** **Credit 3(3-0)**

An introduction to microprocessor systems with emphasis on software design. A popular microprocessor system will be used as the basis for the course. Programming techniques that lead to error free programs using assembly language will be emphasized. Prerequisite: 420-427.

**420-617. Microprocessor Hardware Design** **Credit 3(3-0)**

Microprocessor architectures and supporting components, RAMS, ROMS, PORTS, timers, etc. are studied. I/O structures in microcomputers, interrupts, DMA operations and interfacing problems are also addressed. Emphasis will be placed on microcomputer development from the device to the system level. Prerequisite: 420-616.

**420-619. Microprocessor Laboratory** **Credit 2(0-2)**

Experiments are geared to provide students with practical understanding of microprocessor systems design techniques, including memory, I/O interfacing interrupts and DMA operations. A student project provides an opportunity for students to gain experience in using the microcomputer in typical applications in process control, test equipment communication, etc. Prerequisite: 420-616, Corequisite: 420-617 or consent of instructor.

**420-627. Switching Theory** **Credit 3(3-0)**

A study of design techniques for systems at the gate and flip flop level with applications to both combinational and sequential logic circuits. Functional minimization and state minimization algorithms, timing problems, and state assignment are discussed. MSI and LSI circuits are also discussed. Prerequisite: 420-427.

**420-629. VLSI Design** **Credit 3(3-0)**

A study of the principles for designing large scale integrated systems. Emphasis is placed upon implementation of combinational logic and sequential machines as regular structures such as PLA's and iterative networks. CAD techniques and circuit simulation methods are discussed. MOS devices and their properties are also studied. Prerequisite: 420-627.

**420-633. Digital Electronics** **Credit 3(3-0)**

Families of logic; resistor-transistor logic (RTL), integrated-injection logic (ILL), diode-transistor logic (DTL), transistor-transistor logic (TTL), emittercoupled logic (ECL), MOS gates and CMOS gates. Basic digital structures; Flipflops, registers and counters, interface between digital and analog signals. Prerequisite: 420-460.

**420-636. Computer Methods in Power Systems** **Credit 3(3-0)**

Study of the algorithms adaptable to digital computers for modeling and analysis

of the electric power system. Load flow, fault and stability analysis. Prerequisite: 420-430.

**420-637. Power Systems Analysis I** **Credit 3(3-0)**

Study of the dilemmas facing the electric power industry and the impact of exponential growth. System model, load flow, fault studies, voltage profiles, stability, economic operation. Digital computer solutions emphasized. Prerequisite: 420-430.

**420-638. Power Systems Analysis II** **Credit 3(3-0)**

Continuation of 420-637 (Power Systems Analysis I). Prerequisite: 420-637 or consent of instructor.

**420-642. Solid State Energy Conversion** **Credit 3(3-0)**

Review of semi-conductor and solar radiation principles. Operation and design of solid state thermoelectric generators. Operation and design of solar cells. Use of solar collectors and solar cells in terrestrial applications. Prerequisites: 227-406 & 420-460 or consent of instructor.

**420-649. Modulation Theory & Communication Systems** **Credit 3(3-0)**

Fundamental principles of modulation theory applied to amplitude, single and double side band, frequency, pulse amplitude, pulse duration, pulse code and multiplexing modulation methods and their application to communication systems are studied. Random signals, noise considerations and probability theory are introduced. Prerequisites: 420-300, 420-320, and 225-500.

**420-650. Digital Signal Processing I** **Credit 3(3-0)**

Develop working knowledge of basic signal processing functions such as digital filtering, spectral analysis, and detection/post detection processing. Methods of generating the coefficients of the digital filters will be derived. Alternate structures for filters such as indefinite impulse response and finite impulse response will be compared. The effect of finite register length will be covered. Prerequisites: 420-400 & 225-500 or consent of instructor.

**420-651. Digital Signal Processing Laboratory** **Credit 2(0-3)**

Experiments and students projects related to the practical application of digital signal processing techniques for data acquisition, digital filtering, control, spectral analysis. Communications, etc. Prerequisite: 420-400, Corequisite: 420-650.

**420-656. Probability & Random Processing** **Credit 3(3-0)**

Sample space and events, conditional probabilities, independent events, Bayes' formula, discrete random variable, continuous random variable, expectation of random variable, joint distribution, conditional expectation, Markov chains, stationary processing, ergodicity, correlation and power spectrum of stationary processes. Gaussian processes. Prerequisite: 420-400.

**420-660. Selected Topics in Engineering** **Credit Variable (1-3)**

Selected engineering topics of interest to students and faculty. The topics will be selected before the beginning of the course and will be pertinent to the programs of the students enrolled. Prerequisite: consent of instructor.

**420-666. Special Projects** **Credit Variable (1-3)**

Study arranged on a special engineering topic of interest to student and faculty member, who will act as advisor. Topics may be analytical and/or experimental and encourage independent study. Prerequisite: consent of instructor.

**420-668. Automatic Control Theory** **Credit Variable (1-3)**

The automatic control problem; review of operational calculus; state and transient solutions of feedback control systems; types of servo-mechanisms and control systems; design principles. Prerequisite: 420-400 for equivalent.

**420-672. Analog Electronics** **Credit 3(3-0)**

Circuits and systems of linear electronics studied. Design techniques for linear integrated circuits technology are emphasized. Core topics include: Operational amplifiers, A/D and D/A converters, function generator and voltage regulators. Selected topics on: Feedback amplifiers, oscillators, PLL (Phase Locked Loop), consumer electronics, noise. Prerequisite: 420-460.

**420-674. Network Synthesis** **Credit 3(3-0)**

Use of positive real functions in the synthesis of passive networks. Properties of second order systems and their realization; control of poles and zeros through independent sources. Synthesis and analysis of active and passive filters. Prerequisites: 420-300, 420-460.

**420-678. Projects in Electronic Network & Systems** **Credit 3(3-0)**

Laboratory of special interest to students in electronic network and systems; students will be required to do projects emphasizing actual circuit construction and systems integration. Corequisite: 420-633.

**420-705. Solid State Devices** **Credit 3(3-0)**

Semiconductors heterojunctions and metal-semiconductor junctions. Optoelectronic devices: light emitting diodes, laser diodes and solar cells. Bulk effect devices. Advanced treatment of field effect transistors and charge coupled devices. Prerequisite: E.E. 602 or consent of the instructor.

**420-706. Solid State Laboratory Techniques** **Credit 3(3-0)**

Lectures and experiments in the measurement of semiconductor material properties and semiconductor device characteristics. Mobility, resistivity, lifetime, optical absorption. Semiconductor diode I-V and C-V measurement techniques. Liquid phase epitaxy theory. Schottky barriers and ohmic contacts. Prerequisite: E.E. 602 or consent of the instructor.

**420-707. Physical Tensor Properties of Crystals** **Credit 3(3-0)**

Tensor analysis; crystal symmetry and symmetry transformations; dielectric magnetic and elastic anisotropic properties of crystals; interaction effects and diagrams; piezoelectric and optical properties of crystals. Prerequisite: E.E. 602 or consent of instructor.

**420-727. Switching and Finite Automata Theory** **Credit 3(3-0)**

Abstract mathematical modeling of combinational and sequential switching networks. A study of finite automata theory and fault tolerant concepts with applications to both combinational networks and finite state machines. Prerequisite: E.E. 627.

**420-729. Digital System** **Credit 3(3-0)**

Architecture and design of general purpose and special purpose digital systems will be covered. Special emphasis will be placed on those systems for which VLSI design techniques may be applied. Systolic algorithms, array processors and pipeline processors will be covered. Prerequisites: E.E. 627, 629 and 650.

**420-740. Photovoltaic Power Generation** **Credit 3(3-0)**

Elements of photovoltaic power systems; solar cell basic theory and present performance; review of solar radiation principles; solar cells for unconcentrated and concentrated sunlight systems; photovoltaic system design considerations; system performance prediction; system economic analysis; economic assessment of photovoltaic power systems. Prerequisite: E.E. 450 or equivalent.

**420-746. Electromagnetic Wave Theory** **Credit 3(3-0)**

Electrostatics; dipoles and multipoles, boundary value problems. Magnetostatics; magnetic dipoles and multipoles; boundary value problems. EM waves in dielectric

slabs. Geometric optics of EM waves. Radiation, scattering and diffraction, as applied to optical systems. Prerequisite: E.E. 450 or equivalent.

**420-748. Statistical Communication Theory** **Credit 3(3-0)**

Statistical theory of signal transmission, Markov chain processes and systems, information measures, channel capacity and coding theorems. Detection and extraction of signals in noise background based on statistical decision theory. Prerequisite: E.E. 612.

**420-750. Digital Signal Processing II** **Credit 3(3-0)**

Continuation of Digital Signal Processing I. Homomorphic filtering simulation of dynamical systems, random functions, correlation and power spectra will also be covered. Prerequisite: E.E. 650 or consent of the instructor.

**420-756. Optical Electronics** **Credit 3(3-0)**

Optical source devices: LED, injection lasers; photodetectors; visible and infrared. Optical waveguide components, repeaters, modulators, multiplexers, demultiplexers, switches, logic elements. Opto-electronic interfacing; fiber-fiber coupling and interfacing. Prerequisites: E.E. 450, 602 or consent of the instructor.

**420-760. Theory of Linear Systems** **Credit 3(3-0)**

State space representation of dynamical systems. Analysis techniques for linear models in control systems, network theory, and signal processing. Continuous, discrete and sampled representations. Prerequisites: E.E. 400 and 668.

**420-762. Network Matrices and Graphs** **Credit 3(3-0)**

Use of vector space techniques in the description, analysis and realization of networks modeled as matrices and graphs. The course investigates vector space concepts in the modeling and study of networks. The system concept of networks is introduced and explored as a dimensional space consideration in terms of matrices and graphs. Prerequisite: E.E. 400 or equivalent.

**420-777. Thesis** **Credit Variable (1-6)**

**420-788. Research** **Credit Variable (1-3)**

Advanced research in an area of interest to student and instructor.

**420-789. Special Topics** **Credit Variable (1-3)**

Study of advanced topics pertinent to student's program of study.

**Department of Industrial Engineering**  
**Arup Mallik, Chairperson**  
**Office: 419 McNair Hall**

*Advanced Undergraduate and Graduate*

**430-615. Industrial Simulation** **Credit 3(3-0)**

Study of the GPSS (i.e., General Purpose Simulation System) language including a term project. Review of other simulation languages, such as: 1) Industrial Dynamics, 2) CSMP, 3) SIMSCRIPT. Prerequisites: IE210 and IE320 or consent of the instructor.

**430-621. Engineering Cost Control and Analysis** **Credit 3(3-0)**

Emphasis on utilization of cost data and reports by management control over industrial operation. This course is designed to emphasize use of accounting data internally by engineers in directing the affairs of organizations, both business and non-business. Prerequisites: IE460 or IE465, or equivalent.

**430-624. Production Systems** **Credit 3(2-1)**

Study of modern production and assembly methods. Techniques of deciding the most appropriate production method for new product. Manufacturing resource planning, numerical control technology, industrial robots, computer-aided manufacturing, group technology, computer-aided process planning and other automated manufacturing methods. Computer integrated manufacturing systems. Prerequisite: IE530 or equivalent.

**430-625. Information Systems** **Credit 3(3-0)**

Systems concepts. Methodology of systems analysis and design. Information systems analysis. Design of information systems, file structures and data base concepts. Prerequisite: IE210 or equivalent.

**430-626. Systems Analysis and Design** **Credit 3(3-0)**

Analysis and development of systems, including management requirements, decision making levels, economic justification, and implementation. The computer is considered as a tool in analysis and design as well as one component in the total system. Prerequisite: Graduate standing in engineering.

**430-632. Robotic Systems and Applications** **Credit 3(2-1)**

Study of robotics technology, applications and justification Principal topics: anatomy, characteristics, end effectors, sensors, vision systems, programming and application criteria of industrial robots. Robotic systems design and analysis. Prerequisite: IE530 or instructor's consent.

**430-640. Intermediate Engineering Economy** **Credit 3(2-1)**

Review of traditional methods. Replacement analysis. Capital planning and budgeting. Risk and uncertainty methodologies. Decision tree analysis. Multiple criteria analysis. Prerequisites: IE320 and IE460 or consent of the instructor.

**430-649. A Survey of Operations Research Methodologies** **Credit 3(3-0)**

Operations research models such as linear programming, inventory and queueing theory are derived and applications presented. Prerequisites: Math132 or consent of the instructor.

**430-650. Operations Research II** **Credit 3(3-0)**

Quantitative decision-making models using queueing theory, dynamic programming, game theory and network optimization. Computer applications in operations research. Prerequisite: IE320 and IE480 or equivalent.

**430-658. Project Management and Scheduling** **Credit 3(3-0)**

Project scheduling with CPM and PERT. Scheduling within resource constraint. Cost scheduling. Cost estimation with emphasis on learning curves. Assembly line balancing. Introduction to theory of sequencing/scheduling with applications of priority rules and Heuristic Methods. Prerequisite: IE320 or consent of the instructor.

**430-660. Selected Topics in Engineering** **Credit Variable (1-3)**

Selected engineering topics of interest to students and faculty. The topics will be selected before the beginning of the course and will be pertinent to the programs of the students enrolled. Prerequisite: consent of the instructor.

**430-662. Reliability** **Credit 3(3-0)**

Review of probability theory; combinatorial reliability; catastrophic-failure models; system reliability; reliability improvement; statistical parameter and interval estimation for reliability functions. Prerequisite: IE320 or consent of the instructor.

**430-664. Safety Engineering** **Credit 3(3-0)**

History; legislation; engineering safety analysis; OSHA (i.e., Occupational Safety

and Health Act); Safety program organization and procedures. Prerequisite: Senior standing in engineering or consent of instructor.

**430-665. Man/Machine Systems** **Credit 3(3-0)**

Human engineering approach to the analysis of systems development cycle. Function allocation between man and machine. Design implication of capabilities and limitations of human beings. Design of controls and displays. Design of individual and multi-man-machine work areas. Engineering anthropometry. Maintainability design.

**430-666. Special Projects** **Credit Variable (1-3)**

Study arranged on a special engineering topic of interest to student and faculty member, who will act as advisor. Topics may be analytical and/or experimental and encourage independent study. Prerequisite: consent of the instructor.

**430-678. Engineering Management** **Credit 3(3-0)**

A brief review of engineering management history and its relationship to industrial engineering, operations research, management science, and technical engineering disciplines. Planning, organizing, staffing, directing and controlling an engineering environment. Prerequisite: Senior standing in engineering or consent of the instructor.

**430-712. Work Measurement Theory** **Credit 3(3-0)**

A review of classical methods of engineering and work measurement. Critical analysis of the underlying theory. Analysis of wage incentive systems. Prerequisite: IE410 or consent of the instructor.

**430-716. Engineering Statistics II** **Credit 3(3-0)**

Simple, multiple, polynomial models for regression and correlation; non-parametric statistics; introduction to analysis of variance and experimental designs. Prerequisite: IE320 or consent of the instructor.

**430-718. Advanced Quality Control** **Credit 3(3-0)**

Concepts, theories and utilities of modern statistical quality control will be covered with emphasis on optimal product design, process optimization, computerized process evaluation, statistical theories on failure mechanisms, product reliability. Prerequisite: IE510 or consent of the instructor.

**430-730. Industrial Dynamics** **Credit 3(3-0)**

Study of DYNAMO language including a term project. Analysis of classical industrial dynamics models and industrial dynamics system methodologies. Prerequisite: IE615 or consent of the instructor.

**430-733. Advanced Operations Research** **Credit 3(3-0)**

Quantitative decision models using nonlinear programming, large scale linear programming, goal programming and multi-criteria decision making. Prerequisite: IE 650 or equivalent.

**430-735. Human-Computer Interface** **Credit 3(3-0)**

Critical parameters of designing human-computer interface; VDT workstation design, display screen formatting, user-friendliness of software, and other related persons, machine, and environmental considerations. Various computerized human engineering models such as SAINT, MAWADES, CAPADES. Prerequisite; IE665 or equivalent.

**430-740. Decision Support Systems** **Credit 3(3-0)**

Generic description of Decision Support Systems, Study of generalized problem processor, state space approach, problem reduction approach and production system approach to DSS, knowledge-based system, Prerequisite: IE650 or equivalent, IE625 (Information System) or equivalent.

**430-745. Manufacturing Automation** **Credit 3(3-0)**

Concepts and principles of automated production lines, analysis of automated flowlines, flowline balancing, product and process design consideration, computer monitoring and control of manufacturing operations, flexible manufacturing systems, systems for manufacturing support. Prerequisite: IE632 or equivalent.

**430-749. Inventory Systems Analysis and Design** **Credit 3(3-0)**

Demand forecasting with emphasis on statistical techniques and smoothing. Inventory control system philosophy. Study of deterministic and probabilistic inventory systems. Use of lagrange multipliers, dynamic programming and queueing in inventory control. Introduction to queueing theory. Prerequisite: IE 530 or consent of the instructor.

**430-777. Thesis** **Credit Variable (1-6)**

**430-778. Research** **Credit Variable (1-3)**

Advanced research in an area of interest to student and instructor.

**430-789. Special Topics** **Credit Variable (1-3)**

Study of advanced topics pertinent to student's program of study.

## **Department of Mechanical Engineering**

### *Advanced Undergraduate and Graduate*

**440-602. Advanced Strength of Materials** **Credit 3(3-0)**

Stress-strain relations as applied to statically indeterminate structures, bending in curved bars, plates, shells, and beams on elastic foundations; strain energy concepts for formulation of flexibility matrix on finite elements; bending in beams and plates, introduction to cartesian tensor notation and matrix structural analysis. Prerequisites: 440-336, 225-332 or equivalent.

**440-604. Intermediate Dynamics** **Credit 3(3-0)**

Review of particle and system dynamics, then introduction to rigid body dynamics with solution techniques for the non-linear systems of ordinary differential equations as initial value problems. Angular and linear momentum, energy and Lagrangian methods of body problems. Generalized variables, small vibrations, gyroscopic effects and stability. Prerequisites: 440-337, 225-332 or equivalent.

**440-606. Mechanical Vibrations** **Credit 3(3-0)**

An introduction to the dynamics of systems with and without external damping, stability, lumped and distributed masses. Vibration isolation mounts and central systems are analyzed with classical differential equations, electromechanical analogies and computer methods. Prerequisites: 440-440, 225-332 or equivalent.

**440-608. Experimental Stress Analysis** **Credit 3(3-0)**

Principles and methods of experimental stress analysis. Photo-elastic and micro-measurement techniques applied to structural models; student project work. Prerequisites: 410-457 or 440-602 or equivalent.

**440-610. Theory of Elasticity** **Credit 3(3-0)**

Introduction; stress; strain-strain relations; energy principles; special topics. Prerequisites: 225-332 and 440-336 or equivalent.

**440-612. Modern Composite Materials** **Credit 3(3-0)**

Basic concepts of strength, stiffness, micro-mechanics, fracture, time-dependent properties, interfacial relationship, etc. as related to composite materials. The prop-

erties and fabrication of reinforcement materials such as whiskers, poly-crystalline inorganic fibers, metals, and boron filaments, glass, fibers, reinforced plastics, metals, and other modern composite materials. Prerequisite: 440-602 or equivalent.

**440-614. Mechanics of Engineering Modeling** **Credit 3(3-0)**

Engineering modeling techniques including time dependent integration simulation models of systems, finite difference and finite element methods in mechanics. Prerequisites: 430-210, 440-336, 225-332 or equivalent.

**440-616. Design by Finite Element Methods** **Credit 3(3-0)**

Application of standard finite element method computer codes to design problems. An introduction to axi-symmetric element models and complex programs such as NASTRAN and SPAR. Static, dynamic buckling solutions will be generated in-house to contemporary and classical elasticity and structures problems. Prerequisite: 440-614.

**440-618. Numerical Analysis for Engineers** **Credit 3(3-0)**

Scientific programming, error analysis, matrix algebra, eigenvalue problems, curve-fitting approximations, interpolation, numerical differentiation and integration, solutions to simultaneous equations, and numerical solutions of differential equations. Prerequisite: 430-210 or equivalent.

**440-619. Computer Aided Graphics and Design** **Credit 3(3-0)**

The principles of computer graphics and interactive graphical methods for problem solving and mechanical design. Emphasis placed on both development and use of graphical tools for various purposes. Prerequisites: 440-103, 440-440 and 430-210 or equivalent.

**440-626. Advanced Fluid Dynamics** **Credit 3(3-0)**

Derivation of Navier-Stokes Equations, continuity equation and energy equation; exact solutions of Navier-Stokes Equations, invicid flow, potential theory, complex potentials and conformal mapping. Prerequisite: 440-416 or equivalent.

**440-636. Design of Thermal Systems** **Credit 3(3-0)**

Selection of components in fluid and energy-processing systems to meet system performance requirements; computer-aided design; system simulation; optimization techniques; and investment economics. Prerequisite: 440-562 or equivalent.

**440-640. Materials Forming** **Credit 3(3-0)**

Theory and application of materials processing. Hot and cold working; forging, rolling; wire and tube drawing; extrusion, deep drawing, bending, stretch forming, upsetting, spinning, explosive and high energy forming. Formability Lubrication, die design, viscous materials. Prerequisites: 440-226 and 225-332 or equivalent.

**440-642. Materials Joining** **Credit 3(3-0)**

Theory and application of joining of metals, ceramics, and plastics by the standard industrial techniques, arc, gas, electron beam, laser, ultrasonic, diffusion bonding. Principles of the use of phase diagrams, diffusion equations, and physical/chemical properties in joining considerations. Prerequisites: 440-226 and 225-332, or equivalent.

**440-644. Theories of Machining Processes** **Credit 3(3-0)**

Material behavior characteristics. Metal cutting analysis, mechanics of chip formation, thermal aspects, built-up edge and chip curl, tool wear and tool life. Three dimensional machining. Cutting fluids, cutting tool material. Unconventional machining processes: electric discharge machining (DM), electro chemical machining (ECM), Ultrasonic grinding, electron beam, laser, plasma-arc. Economics of machining processes. Prerequisites: 440-226 and 225-332 or equivalent.

**440-645. Microprocessors for Engineering Measurement & Process Control** **Credit 3(3-0)**

An elementary course designed for mechanical engineers to develop microprocessor based "real time" programming techniques for advanced CAD/CAM. Emphasis is placed on the applications: Microcomputer components in CAD/CAM systems, information and power, position control with a stepping motor, process control using a state counter, data selection and data distribution. Two packages are to be used in this course: ISA-PADDS package and ECM package. Prerequisites: M.E. 105, M.E. 540 or consent of the instructor.

**440-647. Computational Engineering Kinematics** **Credit 3(3-0)**

Development of computer-oriented methods for the analysis and modeling of engineering kinematics systems; applications of interactive graphics for machine and mechanism design. Comparative study of the dynamic range of several commercially available packages including IMP, ADAMS, DRAMS, KINSYN and others. Prerequisite: M.E. 440 or consent of instructor.

**440-648. Computer-Controlled Manufacturing** **Credit 3(3-0)**

Concepts of Computer Integrated Manufacturing, Numerical Control and Group Technology. Manufacturing process interfacing, discrete process modeling, analysis and control techniques and algorithms. Characteristics and software of control computers. Sensors for computer control. Programmable controllers and sequential control. Prerequisites: M.E. 226, Math 331, or consent of the instructor.

**440-649. Design of Robot Manipulators** **Credit 3(3-0)**

Fundamentals of kinematics, dynamics, computer graphics, sensing devices, measurements and control in robot manipulators. Prerequisites: 440-440, 440-619 or equivalent.

**440-650. Mechanical Properties and Structure of Solids** **Credit 3(3-0)**

An examination of the elastic and plastic behavior of matter in relation to its structure, both macroscopic and microscopic. Major representative classes of materials to be examined are thermoplastic materials, elastomers, glasses, ceramics, metals, and composites. Prerequisite: 440-560 or equivalent.

**440-654. Strengthening Mechanisms in Commercial Materials** **Credit 3(3-0)**

This course bridges the gap between fundamental material science courses and advanced mechanical properties courses. A primary objective of the course is to provide the student with an understanding of the principles and mechanisms involved in strengthening processes. The course provides a review of current microstructural and micro-chemical approaches used in developing high strength materials. Prerequisites: 440-560 and 440-569 or equivalent.

**440-660. Selected Topics in Mechanical Engineering** **Variable (1-3)**

Selected mechanical engineering topics of interest to students and faculty. The topics will be selected before the beginning of the course and will be pertinent to the programs of the students enrolled. Prerequisite: Consent of instructor.

**440-666. Special Projects** **Variable (1-3)**

Study arranged on a special mechanical engineering topic of interest to student and faculty member, who will act as advisor. Topics may be analytical and/or experimental and encourage independent study. Prerequisite: Consent of instructor.

**440-702. Continuum Mechanics** **Credit 3(3-0)**

The applications of the laws of mechanics and thermodynamics to the continuum: a rigorous development of the general equations applied to a continuum, the application and reduction of the general equations for specific cases of both solids and fluids. Prerequisite: 440-336 or equivalent.

**440-704. Advanced Dynamics** **Credit 3(3-0)**

Lagrange's equations of motion as applied to rigid body dynamics. A study of generalized coordinates, generalized conservative and dissipative forces, degrees of freedom, holonomic constraints as related to rigid body motion. Also, a brief study of the calculus of variations and Hamilton's equations of motion. Prerequisite: 440-604 or equivalent.

**440-706. Theory of Vibrations** **Credit 3(3-0)**

Vibration analysis of systems with one, two or multi-degrees of freedom. Instrumentation, continuous systems, computer techniques. Prerequisites: 440-440, 225-332 or equivalent.

**440-707. Real Time Analysis of Dynamic Systems** **Credit 3(3-0)**

Theory and application of real time analysis used in system identification and machinery fault detection. RTA can be applied in production engineering and product development to study short-lived events or analyze system operation in time domain or frequency domain to identify system characteristics or possible problems. Prerequisite: 440-576 or equivalent.

**440-708. Energy Methods in Applied Mechanics** **Credit 3(3-0)**

The use of energy methods in solving applied mechanics problems; applications include topics such as beams and frames, deformable bodies, plates and shells, buckling, variational methods. Prerequisite: 440-610 or equivalent.

**440-710. Advanced Theory of Elasticity** **Credit 3(3-0)**

The analyses of strains, stresses, and the equations of elasticity, general formulation of the 2-D boundary value problems, and the formulation of certain three dimensional problems with symmetry. Prerequisite: 440-610 or equivalent.

**440-712. Theory of Elastic Stability** **Credit 3(3-0)**

Beam-columns, buckling of bars, frames and beams; torsional buckling; buckling of rings, curved bars, and arches; bending and buckling of thin plates and shells. Introduction to dynamic stability. Prerequisite: 440-602 or equivalent.

**440-714. Mathematical Theory of Plasticity** **Credit 3(3-0)**

A review of elasticity including the stress and strain tensors, transformations and equilibrium and elastic behavior. Theories of strength, plastic stress/strain, classical problems of plasticity including thick-walled pressure vessels and rotating cylinders in elastic-plastic conditions, slip line theory with applications. Prerequisite: 440-610 or equivalent.

**440-719. Advanced Computer-Aided Design** **Credit 3(3-0)**

Currently important methods and techniques for using the computer to aid the design process. Simulation and optimization methods applied to the design of physical systems. Prerequisites: 440-565, 440-619 or equivalent.

**440-720. Advanced Classical Thermodynamics** **Credit 3(3-0)**

Basic concepts and postulates; conditions of equilibrium; processes and thermodynamic engines; alternative formulations and Legendre transformations; Maxwell Relations; Stability of thermodynamic systems; first and second order phase transitions; Nernst Postulate. Prerequisite: 440-442 or equivalent.

**440-722. Statistical Thermodynamics** **Credit 3(3-0)**

Statistical mechanics and macroscopic properties from statistical methods. Equilibrium information, generalized coordinates, and general variables. Prerequisite: 440-442 or equivalent.

**440-724. Irreversible Thermodynamics** **Credit 3(3-0)**

A study of processes which are inherently entropy producing. Development of

general equations, theory of minimum rate of entropy production, mechanical processes, life processes and astronomical processes. Prerequisite: 440-720 or equivalent.

**440-726. Boundary Layer Theory** **Credit 3(3-0)**

Fluid flow with friction and the boundary layer concept; general properties and solutions of Navier-Stokes equations; two dimensional laminar boundary layer flow-general properties; exact solutions; approximate methods of solution; thermal boundary layers; boundary layer control; introduction to turbulent boundary layers. Prerequisite: 440-626 or equivalent.

**440-731. Conduction Heat Transfer** **Credit 3(3-0)**

Development of the general heat conduction equation. Applications to one, two and three dimensional steady and unsteady boundary value problems in heat conduction. Closed form and numerical solution techniques. Prerequisites: 440-562 or equivalent.

**440-732. Convection Heat Transfer** **Credit 3(3-0)**

Analysis of heat convection in laminar and turbulent boundary layer and pipe flow; dimensional analysis; free convection; condensation and boiling. Prerequisite: 440-562 or equivalent.

**440-733. Radiation Heat Transfer** **Credit 3(3-0)**

A comprehensive treatment of basic theories; radiation characteristics of surfaces and radiation properties taking account of wave length, direction, etc.; analysis of radiation exchange between idealized and real surfaces; fundamentals of radiation transfer in absorbing, emitting and scattering media; interaction of radiation with conduction and convection. Prerequisite: 440-562 or equivalent.

**440-734. Special Topics in Applied Heat Transfer** **Credit 3(3-0)**

Selected special topics in applied heat transfer such as heat exchanger design and performance, cooling of electronic equipment, advanced thermal insulation systems, etc. Prerequisite: 440-562 or equivalent.

**440-738. Solar Thermal Energy Systems** **Credit 3(3-0)**

Characteristic of extraterrestrial and terrestrial solar radiation. Analysis of thermal performance of concentrating and non-concentrating solar collectors, thermal energy storage systems and energy transport systems. Life cycle cost analysis of solar energy systems. Computer simulations. Prerequisites: 440-731 and 440-732 or equivalent.

**440-740. Machine Tool Design** **Credit 3(3-0)**

Outlines and general requirements of machine tools. Design principles: static and dynamic stiffness and rigidity. Criteria for requirements on stiffness, weight and cutting forces. Machine tool vibrations, stability against chatter, general features, theories. Damping and dampers. Transmission of motion and standardization of speed change gears. Design of constructional elements: bearings, electrical components, pneumatic, hydraulics, material selection, main spindle layouts. Prerequisites: 440-564 and 440-644 or equivalent.

**440-742. Tools, Jigs, and Fixtures** **Credit 3(3-0)**

Tool design methods, tool-making practices, tool materials and heat treatments, plastics for tool materials. Design of cutting tools for N/C machine tools. Design of size and fixture; basics of clamping, chucking and indexing for various machining processes. Prerequisites: 440-560, 225-332 or equivalent.

**440-746. Statistical Analysis of Manufacturing Systems** **Credit 3(3-0)**

Analysis of experimental data by means of stochastic models. Systems approach to mathematical modeling and applications in machine tool dynamics, control of chatter, tool wear, surface finish, system identification. Prerequisite: 440-644 or equivalent.

**440-747. Computational Engineering Dynamics** **Credit 3(3-0)**

Development of computer-oriented methods for the analysis and design of engineering dynamic systems; analytical and experimental techniques for modal development and design refinement of components in flexible dynamics systems (machine tools, robots, moving vehicles, etc.); optimization techniques for transient response analysis on both constrained and unconstrained systems. Prerequisite: M.E. 540 or consent of instructor.

**440-748. Numerical Control in Manufacturing** **Credit 3(3-0)**

N/C systems, coding, feedback, point to point positioning and continuous path contouring, programming commands and addresses. Preparing manuscripts for multi-axis operations. Interpolation: linear, circular, parabolic for continuous path control. Preparatory functions, manuscript for a two-axis lathe, N/C electronics. Prerequisites; 440-210 and 440-644 or equivalent.

**440-749. Computer Control of Robot Manipulator** **Credit 3(3-0)**

Introduction of basic robot control systems, sensory requirements and capabilities; microcomputer control of robotic systems, robot teaching systems; adaptive robot control systems; robot system diagnosis and applications. Prerequisite: M.E. 649 or consent of instructor.

**440-750. Phase Equilibria** **Credit 3(3-0)**

Interpretation and mathematical analysis of unary, binary and ternary, inorganic, phase equilibria systems with examples for solving practical materials science problems; isophthal and isothermal sections, and crystallization paths; thermodynamic fundamentals. Prerequisite; 227-408 or consent of instructor.

**440-752. Mechanical Properties and Theories of Failures** **Credit 3(3-0)**

Static properties in tension and compression; stress and combined stresses; fatigue, impact, creep and temperature. Various theories of failure under the above loading conditions. Applications. Prerequisite: 440-336 or equivalent.

**440-754. Deformation Analysis in Metal Processing** **Credit 3(3-0)**

Analytic approaches to the solution of forming problems. Following a review of stress strain analysis, the relationship of stress to strain via various plasticity equations, yield conditions and deformation equations is examined. After development of some methods of solution of forming problems, several model processes are examined; forging, extrusion, coining, rolling, and drawing. Prerequisite: 440-679.

**440-756. Physical Metallurgy of Industrial Alloys** **Credit 3(3-0)**

Review of principles of alloying and heat treatment and their application to commercially important alloy systems. Principles of corrosion. Prerequisites: 440-226 and 440-560 or equivalent.

**440-758. Mechanical Metallurgy** **Credit 3(3-0)**

A review of continuum mechanics followed by an examination of the microscopic basis of plastic behavior. Emphasis on the development and use of dislocation theory. Prerequisite: 440-714 or equivalent.

**440-766. Advanced Special Projects** **Variable (1-3)**

Independent Project Work on an advanced special topic of interest to the student and faculty member acting as advisor. Three credit hours of this course are required for the MSME project option. Topics may be analytical or experimental in nature and must be agreed upon by the advisor before students register for the course. Prerequisite: Consent of instructor.

**440-777. Thesis** **Variable (1-3)**

Thesis work. Prerequisite: Consent of instructor.

**440-788. Research** **Variable (1-3)**

Advanced research in an area of interest to student and instructor. Prerequisite; Consent of instructor.

**440-789. Special Topics** **Variable (1-3)**

A course designed to allow the introduction of potential new courses on a trial basis or offering of special course topics on a once only basic. The course may be offered to individuals or groups of students. A definite topics and title must be agreed upon by the advisor before students register for the course. Prerequisite: Consent of instructor.

## **Department of English**

### *Advanced Undergraduate and Graduate Courses*

**212-600. Language Variations in American English** **Credit 3(3-0)**

A survey of regional and social dialects in the United States and a study of their interrelationship; and example of some of the motivations for dialectical divergences, especially in the instance of non-standard dialects; and a consideration of functional varieties and social dialect shifting. Prerequisites: English 310 or graduate standing. (Offered upon sufficient demand)

**212-603. Introduction to Folklore** **Credit 3(3-0)**  
**(Formerly English 2498)**

Basic introduction to the study and appreciation of folklore. (Cross listed as Anthropology 603.) (Offered in Spring/alternate years)

**212-620. Elizabethan Drama** **Credit 3(3-0)**  
**(Formerly English 2741)**

Chief Elizabethan plays, tracing the development of dramatic forms from early works to the close of the theaters in 1642. Prerequisite: English 210, 220-221. (Offered in Spring/alternate years)

**212-626. Children's Literature** **Credit 3(3-0)**  
**(Formerly English 2476)**

A study of the types of literature designed especially for students in the upper levels of elementary school and in junior high school. (Not accepted for credit toward graduate concentration in English.) Prerequisite: English 101, Humanities 200-201. (Offered in Fall, Spring, and Summer)

**212-627. Literature for Adolescents** **Credit 3(3-0)**

A course to acquaint prospective and in-service teachers with a wide variety of good literature that is of interest to adolescents. Emphasis on thematic approach to the study of literature, bibliotherapy, continental writers, book selection, and motivating students to read widely and independently with depth and understanding. Prerequisite: English 101, 200, and 201 or graduate standing. (Offered in Spring)

**212-628. The American Novel** **Credit 3(3-0)**  
**(Formerly English 2478)**

A history of the American novel from Cooper to Faulkner, Melville, Twain, Howells, James, Dreiser, Lewis, Hawthorne, Faulkner, and Hemingway will be included. Prerequisite: English 210. (Offered upon sufficient demand)

**212-650. Afro-American Folklore** **Credit 3(3-0)**

A study of folk tales, ballads, riddles, proverbs, superstitions and folk songs of black Americans. Parallels will be drawn between folklore peculiar to black Americans and that of Africa, the Caribbean, and other nationalities. (Offered in Spring)

**212-652. Afro-American Drama****Credit 3(3-0)**

A detailed study of the dramatic theory and practice of black American writers against the backdrop of Continental and American trends. Special attention will be given to the works of major figures from the Harlem Renaissance to the present. Works by Bontemps, Cullen, Hughes, Hansberry, Ward, Davis, Bladwin, Baraka (Jones), Gardone, and Bullins will be included. (Offered upon sufficient demand)

**212-654. Afro-American Novel I****Credit 3(3-0)**

An intensive bibliographical, critical, and interpretative study of novels by major black writers through 1940. Novelists emphasized include Dunbar, Chesnutt, Toomer, McKay, Larsen, Hurston, Griggs, Fauset, and Wright. (Offered in Fall/alternate years)

**212-656. Afro-American Novel II****Credit 3(3-0)**

An intensive bibliographical, critical, and interpretative study of novels by major black writers after 1940. Novelists emphasized include Wright, Ellison, Baldwin, Himes, Demby, Williams, Walker, Brooks, Petry, Gaines, and Mayfield. (Offered in Fall/alternate years)

**212-658. Afro-American Poetry I****Credit 3(3-0)**

An intensive study of Afro-American poetry from its beginning to 1940 with special attention given to poets of the Harlem Renaissance. Poets to be studied include Terry, Hammon, Wheatley, A.A. Whitman, Horton, Braithwaite, J.W. Johnson, Horne, Fenton Johnson, George Douglas Johnston, McKay, Cullen, Cuney, and Hughes. (Offered in Summer/alternate years)

**212-660. Afro-American Poetry II****Credit 3(3-0)**

An intensive study of Afro-American poetry from 1940 to the present with consideration attention given to the revolutionary poets of the sixties and seventies. Poets to be studied include Hughes, Walker, F.M. Davies, Brooks, Brown, Hayden, Tolson, Lee, Reed, Giovanni, Angelou, Jeffers, Sanchez, Redmond, Fabio, Fields, and Jones. (Offered in Fall)

**212-662. History of American Ideas****Credit 3(3-0)**

A study of major ideas which have animated American thought from the beginning to the present. (Offered upon sufficient demand)

**212-672. Independent Study in English****Credit 3(3-0)**

Provides an opportunity for students to pursue independently in-depth study in literature, linguistics, or professional writing. Work done in literature in this course may serve as groundwork for students pursuing the thesis option. Prerequisites: Second semester junior, senior, or graduate standing, and prior consultation with department faculty. (Offered Fall, Spring and Summer)

**Graduate****212-700. Literary Analysis and Criticism  
(Formerly English 2485)****Credit 3(3-0)**

An introduction to intensive textual analysis of poetry, prose fiction, prose non-fiction, and drama. A study of basic principles and practices in literary criticism and of the various schools of criticism from Plato to Eliot. (Offered in Summer)

**212-702. Milton  
(Formerly English 2486)****Credit 3(3-0)**

A study of the works of Milton in relation to the cultural trends of the seventeenth-century England. Emphasis is placed upon Milton's poetry. (Offered in Spring/alternate years)

**212-704. Eighteenth Century English Literature** **Credit 3(3-0)**  
**(Formerly English 2487)**

A study of the major prose and poetry writers of the eighteenth century in relation to the cultural and literary trends. Dryden, Defoe, Swift, Fielding, Addison, Pope, Johnson, and Blake will be included. (Offered upon sufficient demand)

**212-710. Language Arts for Elementary Teachers** **Credit 3(3-0)**  
**(Formerly English 2488)**

A course designed to provide elementary school teachers with an opportunity to discuss problems related to the language arts taught in the elementary school. (Not accepted for credit towards concentration in English.) (Offered in Summer/alternate years)

**212-711. Language Arts for Elementary Teachers II** **Credit 3(3-0)**

A continuation of the study of relevant language situations with which elementary teachers should be concerned. Emphasis will be placed on strategies for guiding pupils to explore the nature and structure of language and for teaching essential language skills. (Not accepted for credit towards concentration in English.) (Offered in Summer/alternate years)

**212-720. Studies in American Literature** **Credit 3(3-0)**  
**(Formerly English 2489)**

A study of major American prose and poetry writers. (Offered in Summer/alternate years)

**212-749. Romantic Prose and Poetry of England** **Credit 3(3-0)**  
**(Formerly English 2490)**

A study of nineteenth-century British authors whose works reveal characteristics of Romanticism. Wordsworth, Coleridge, Shelley, Keats, Byron, Lamb, Carlyle, and DeQuincey will be included. (Offered in Summer/alternate years)

**212-750. Victorian Literature** **Credit 3(3-0)**

A study of nineteenth-century Victorian writing, including poetry, fiction, and non-fictional prose. Among the writers to be considered will be Tennyson, Browning, Arnold, Roseetti, Carlyle, Mill, Dickens, the Brontes, Eliot, Thackeray, and Hardy. (Offered in Summer/alternate years)

**212-751. Modern British and Continental Fiction** **Credit 3(3-0)**  
**(Formerly English 2491)**

A study of British and European novelists from 1914 until the present. Included in the study are Joyce, Kafka, Gide, Mann, and Camus. (Offered upon sufficient demand)

**212-752. Restoration and 18th Century Drama** **Credit 3(3-0)**  
**(Formerly English 2492)**

A study of the theatre and drama in relation to the cultural trends of the period. Etherege, Farquhar, Vanbrugh, Congreve, Fielding, Gay, Steele, Goldsmith, and Sheridan will be included. (Offered upon sufficient demand)

**212-753. Literary Research and Bibliography** **Credit 3(3-0)**  
**(Formerly English 2493)**

An introduction to tools and techniques used in investigation of literary subjects. (Offered in Spring)

**212-754. History and Structure of the English Language** **Credit 3(3-0)**  
**(Formerly English 2494)**

A study of the changes in the English language — syntax, vocabulary, spelling, pronunciation, and usage from the fourteenth century through the twentieth century. (Offered in Fall)

**212-755. Contemporary Practices in Grammar and Rhetoric** Credit 3(3-0)  
(Formerly English 2495)

A course designed to provide secondary teachers of English with experiences in linguistics applied to modern grammar and composition. (Offered upon sufficient demand)

**212-760. Non-fiction by Afro-American Writers** Credit 3(3-0)

A study of non-fiction by black writers including slave narratives, autobiographies, biographies, essays, letters and orations. (Offered upon sufficient demand)

**212-762. Short Fiction by Afro-American Writers** Credit 3(3-0)

An extensive examination of short fiction by Afro-American writers. Among those included are Chesnutt, Dunbar, Toomer, Hurston, McKay, Hughes, Bontemps, Wright, Clarke, Ellison, Fair, Alice Walker, Ron Milner, Julia Fields, Jean W. Smith, Petry, Baldwin, Kelley, and Jones. (Offered in Spring/alternate years)

**212-764. Black Aesthetics** Credit 3(3-0)

A definition of those qualities of black American literature which distinguishes it from traditional American literature through an analysis of theme, form, and technique as they appear in a representative sample of works by black writers. (Offered upon sufficient demand)

**212-766. Seminar in Afro-American Literature and Language** Credit 3(3-0)

A topics course which will vary; focus will be on prominent themes and/or subjects treated by Afro-American writers from the beginning to the present. An attempt will be made to characterize systematically the idiom (modes of expression, style) of Afro-American writers. (Offered upon sufficient demand)

**212-770. Seminar** Credit 3(3-0)  
(Formerly English 2499)

Provides an opportunity for presentation and discussion of thesis, as well as selected library or original research projects from non-thesis candidates. Prerequisite: 15 hours of graduate-level courses in English. (Offered upon sufficient demand)

**212-775. Thesis Research** Credit 3(3-0)  
(Offered upon demand)

## **Department of Foreign Languages**

### **French**

#### *Advanced Undergraduate and Graduate Courses*

**217-602. Problems and Trends in Foreign Languages** Credit 3(3-0)  
(Formerly French 501, 2571)

Problems encountered by teachers given consideration. Place and purpose of foreign language in the curriculum today. Offered by demand.

**217-603. Oral Course for Teachers of Foreign Languages** Credit 3(3-0)  
(Formerly French 502)

Designed for teachers of foreign languages to improve pronunciation and spelling. Offered by demand.

**217-606. Research in the Teaching of Foreign Languages** Credit 3(3-0)  
(Formerly French 503, 2573)

Open to students who are interested in undertaking the study of a special problem in the teaching of a foreign language. Offered by demand.

**217-607. French Literature of the Seventeenth Century** Credit 3(3-0)  
(Formerly French 302, 2574)

Course presents Classicism through masterpieces of Corneille, Racine, Moliere and other authors of the "Golden Period" in French letters. Offered by demand.

**217-608. French Literature in the Eighteenth Century** Credit 3(3-0)  
(Formerly French 303, 2575)

To study in particular the life and works of Montesquieu, Voltaire, and Rousseau, and the Encyclopedists. Offered by demand.

**217-609. French Literature of the Nineteenth Century** Credit 3(3-0)  
(Formerly French 304, 2576)

Study of the great literary currents of the Nineteenth Century Romanticism and Realism. Offered by demand.

**217-610. The French Theatre** Credit 3(3-0)  
(Formerly French 504, 2577)

A thorough study of the French theatre from the Middle Ages to the present.

**217-612. The French Novel** Credit 3(3-0)  
(Formerly French 505, 2578)

A study of the novel from the Seventeenth Century to the present.

**217-614. French Syntax** Credit 3(3-0)  
(Formerly French 506, 2579)

Designed to teach grammar on the advanced level. Offered by demand.

**217-616. Contemporary French Literature** Credit 3(3-0)  
(Formerly French 305 and 2542, 2580)

Course deals with the chief writers and literary currents from 1900 to the present. Offered by demand.

### *Graduate*

**217-720. Advanced Reading and Composition** Credit 3(3-0)  
(Formerly French 601 and 2580, 2585)

An advanced study of the content and stylistics of selected contemporary writings. Assigned topics for compositions and explications de textes. Offered by demand.

**217-722. Romantic Movement in France** Credit 3(3-0)  
(Early Nineteenth Century)  
(Formerly French 602 and 2581, 2586)

Background study of romanticism in works of Chateaubriand and Madame de Staël; emphasis placed on Lamartine, Hugo, Vigny and Musset; other writers and genres of the period will be studied. Offered by demand.

**217-724. Seminar in Foreign Languages** Credit 3(3-0)  
(Formerly French 603, and 2582, 2587)

Readings and special topics in French. Presentations from students, faculty and guest lecturers. Paper showing research techniques in literary study are required of all candidates for a degree with concentration in French. Offered by demand.

**217-726. Contemporary Literary Criticism** Credit 3(3-0)  
(Formerly French 604, and 2583, 2587)

Methods and purposes of literary criticism and of French literary criticism. Offered by demand.

**217-728. Independent Study in Foreign Languages** Credit 3(3-0)  
(Formerly French 258, 2589)

Independent study and research in a special area of the foreign language. Offered by demand.

## **Department of Health, Physical Education and Recreation**

### *Advanced Undergraduate and Graduate*

**330-651. Personal, School and Community Health Problems      Credit 3(3-0)**

A study of personal, school and community health problems and resources. Emphasis is placed on the control of communicable diseases, healthful school living and the development of individuals of the scientific attitude and a positive philosophy of health living. Field experiences will include observations, service as aides and assistants.

**330-652. Methods and Materials in Health Education for Elementary  
and Secondary School Teachers      Credit 3(3-0)**

A study of the fundamentals of the school health program, pupil needs, methods, planning instruction, teaching techniques, and selection and evaluation of materials for the elementary and secondary programs, and the use of the community resources.

**330-655. Current Problems and Trends in Physical  
Education      Credit 3(3-0)**

A practical course for experienced teachers. Consideration given to individual problems in physical education with analysis of present trends.

**330-656. Administration of Interscholastic and Intramural  
Athletics      Credit 3(3-0)**

A study of the relation of athletics to education, and the problems of finance, facilities, scheduling, eligibility, and insurance. Consideration given to the organization and administration of intramural activities in the school program.

**330-657. Community Recreation      Credit 3(3-0)**

A study of the recreational facilities and problems with consideration being given to the promotion of effective recreational problems in rural and urban communities.

**330-658. Current Theories and Practices of Teaching  
Sports      Credit 3(3-0)**

Methodology and practice at various skills levels. Emphasis placed on seasonal activity.

**330-669. Exercise Physiology      Credit 3(3-0)**

The purpose of this course is to provide a theoretical and practical experience in studying acute and chronic effects of exercise on man.

### *Graduate*

**330-780. Organization and Administration of Health,  
Physical Education and Recreation in  
Elementary Schools      Credit 3(3-0)**

This course studies the modern developments in methods and materials of elementary school physical education. Prerequisite: Consent of the instructor.

**330-785. Research in Health, Physical Education and  
Recreation      Credit 3(3-0)**

A course that is designed to study the various methods of investigating the principles underlying the work in the field of health, physical education and recreation. Prerequisite: Consent of the instructor.

**330-786. Scientific Foundations of Physical Education      Credit 3(3-0)**

A course designed to provide an overview of the scientific areas in physical education along with practical laboratory experiences.

**330-787. Scientific Foundations of Physical Fitness** **Credit 3(3-0)**

A study of the concepts of physical fitness and the application of these concepts to school and community programs. Prerequisite: Consent of the instructor.

**330-798. Seminar** **Credit 3(3-0)**

A course of study in which the research projects are prepared, discussed, and evaluated by the faculty and students.

**Department of History**

*Advanced Undergraduate and Graduate*

**233-600. The British Colonies and the American Revolution** **Credit 3(3-0)**

The planting and maturation of the English colonies of North America. Relationships between Europeans, Indians, and transplanted Africans, constitutional development, religious ferment, and the colonial economy are studied.

**233-603. Civil War and Reconstruction** **Credit 3(3-0)**

Causes as well as constitutional and diplomatic aspects of the Civil War, the role of the Afro-American in slavery, in war, and in freedom; and the socio-economic and political aspects of Congressional Reconstruction and the emergence of the New South are studied.

**233-605. Seminar on the Soviet Union** **Credit 3(3-0)**

A seminar course on the Soviet Union including extensive reading and discussion and a major research paper.

**233-606. U.S. History, 1900-1932** **Credit 3(3-0)**

Emphasizes political, economic, social, cultural and diplomatic developments from 1900 to 1932 with special attention to their effect upon the people of the United States and their influence on the changing role of the U.S. in world affairs.

**233-607. U.S. Since 1932-Present** **Credit 3(3-0)**

With special emphasis on the Great Depression, New Deal, the Great Society, and the expanding role of the United States as a world power, World War II, Cold War, and Korean and Vietnam conflicts are studied. Major themes include the origin, consolidation, and expansion of the New Deal, the growth of executive power, the origins and spread of the Cold war, civil liberties, and civil rights, and challenges for the extension of political and economic equality and the protection of the environment.

**233-615. Seminar in the History of Black America** **Credit 3(3-0)**

A reading, research, and discussion course which concentrates attention on various aspects of the life and history of Afro-Americans. Emphasis is placed on historiography and major themes which include nationalism, black leadership and ideologies, and economic development.

**233-616. Seminar in African History** **Credit 3(3-0)**

Research, writing and discussion on selected topics in African history.

**233-617. Readings in African History** **Credit 3(3-0)**

By arrangement with instructor.

**233-620. Seminar in Asian History** **Credit 3(3-0)**

Research, writing, and selected topics in Asian history.

**233-625. Seminar in Historiography and Historical Methods** **Credit 3(3-0)**

The study of the writing of history as well as training in research methodology and communication, including basic computer and quantification skills.

- 233-626. Revolutions in the Modern World** **Credit 3(3-0)**  
 A seminar course stressing comparative analysis of revolutions and revolutionary movements in the United States, France, Russia, China, Cuba, and Iran. Students will also evaluate theories of revolution in light of historical examples.
- 233-630. Studies in European History, 1815-1914** **Credit 3(3-0)**  
 Intensive study of selected topics in Nineteenth Century European history.
- 233-631. Studies in Twentieth Century Europe, 1914-Present** **Credit 3(3-0)**  
 Intensive study of selected topics including World Wars I and II, the Russian Revolution, Hitler and the Holocaust, the Depression, the threat of nuclear war, the Welfare State, and the Solidarity movement in Poland.
- 233-6333. Independent Study in History** **Credit 3(3-0)**  
 By arrangement with instructor.
- 233-645 American Foreign Policy—1945-Present\*** **Credit 3(3-0)**  
 Examination of forces and policies that have emerged from Potsdam, Yalta, and World War II. Emphasis will be on understanding the policies that were formulated, why they were formulated, the consequences of their formulation, and the alternative policies that may have come about. Prerequisite: Survey course in American history, American Diplomatic history or consent of instructor.

### *Graduate*

- 233-701. Recent United States Diplomatic History** **Credit 3(3-0)**  
 Episodes in the history of American foreign relations that were especially important in influencing persistent patterns of this nation's role in international relations. Possible examples studied: Pearl Harbor, the Cold War, Korean War, Cuban missile crisis, Vietnam, nuclear arms limitation, and black Africa.
- 233-712. The Black American in the Twentieth Century** **Credit 3(3-0)**  
 Research, reading, discussion, and an analysis of major facets of black life in the United States from 1900 to the present. Requires a major research paper.
- 233-730. Seminar in History** **Credit 3(3-0)**  
 Topics to be selected by students and instructor. Includes a major research project.
- 233-730. Constitutional Development Since 1865\*** **Credit 3(3-0)**  
 Historical study of the development of the Constitution since 1865. Treatment will be given to important Constitutional decisions, major documents, major Supreme Court decisions, and public policy. Assignments in paperback books will be frequent.
- 233-740. History, Social Science, and Contemporary World Problems** **Credit 3(3-0)**  
 Readings, discussions, and reports on the relationships between history and the social sciences as a whole, as well as their combined roles in dealing with contemporary world problems.
- 233-750. Thesis in History** **Credit 3(3-0)**  
 Thesis work will be done with the appropriate instructor in accordance with field of interest.
- 311-725. Problems and Trends in Teaching the Social Sciences\*\*** **Credit 3(3-0)**  
 Current strategies, methods, and materials for teaching the social sciences. Emphasis on innovations, evaluation and relation to learning. Provision for clinical experiences.

\*Political Science 645 and 730 are accepted for history credit.

## Geography

### *Undergraduate and Graduate*

**233-640. Topics in Geography of the United States and Canada** **Credit 3(3-0)**

Selected topics in cultural geography of the United States and Canada are studied intensively. Emphasis is placed upon individual reading and research and upon group discussion.

**233-641. Topics in World Geography** **Credit 3(3-0)**

Selected topics in geography are studied intensively. Concern is for cultural characteristics and their interrelationships with each other and with habit. Emphasis is upon reading, research, and discussion.

## Department of Home Economics

### Food and Nutrition

#### *Advanced Undergraduate and Graduates*

**170-630. Advanced Nutrition** **Credit 3(3-0)**

Intermediate metabolism and interrelationships of organic and inorganic food nutrients in human biochemical functions. Prerequisites: Food and Nutrition 337 and Chemistry 251, 252 or equivalent.

**170-631. Food Chemistry** **Credit 3(2-2)**

An introduction to the biochemistry of foods with emphasis on the basic composition, structure, properties and nutritive value of food. The chemistry of changes occurring during processing and utilization of foods will also be studied. Prerequisites: Food Science 236, Chemistry 102, 221.

**170-632. Food and Nutrition in Early Childhood** **Credit 3(3-0)**

A study of the elementary principles of nutrition and their influence on the growth and development of children. Special consideration is given to nutrition education techniques to be used with children and parents in preschool centers and elementary schools.

**170-635. Introduction to Research Methods in Food and Nutrition** **Credit 3(0-6)**

Laboratory experiences in the use of methods applicable to food and nutrition research. Prerequisite: Consent of the instructor.

**170-636. Food Promotion** **Credit 4(1-6)**

A course which gives experiences in the development and testing of recipes. Opportunities will be provided for demonstrations, writing and photography with selected business.

**170-637. Special Problems in Food and Nutrition** **Credit 3(0-6)**

Independent study and/or experiences in food and/or nutrition. Prerequisite: Admission by instructor.

**170-638. Sensory Evaluation** **Credit 3(2-2)**

A study of the color, flavor, aroma and texture of foods by the use of sensory evaluation methods. Prerequisites: Food Science 236, Food and Nutrition 337.

## *Graduate*

**170-730. Nutrition in Health and Disease** **Credit 5(3-4)**

Significance of nutrition in health and disease. Consideration of: (1) the methods of appraisal of human nutritional status to include clinical, dietary, biochemical, and anthropometric techniques; (2) various biochemical parameters used to diagnose and treat disorders; and (3) the role of diet as a therapeutic tool. Prerequisite: Food and Nutrition 630 or equivalent.

**170-733. Nutrition During the Growth and Development** **Credit 3(2-2)**

Nutritional, genetical and environmental influences on human growth and development. Prerequisite: Home Economics 630 or equivalent.

**170-734. Nutrition Education** **Credit 3(2-2)**

Interpretation of the results of nutrition research for use with lay groups. Preparation of teaching materials based on research for use in nutrition education programs.

**170-735. Experimental Foods** **Credit 4(1-6)**

Objective and subjective evaluation of food; development and testing of recipes; experimentation with food. Prerequisite: Food and Nutrition 236 or equivalent.

**170-736. Research Methods in Food and Nutrition** **Credit 4(2-6)**

Experimental procedures in food and nutrition research; care of experimental animals; analysis of food, body fluids, animal tissues. Prerequisites: Analytical Chemistry and Biochemistry.

**170-739. Thesis Research** **Credit 3(0-6)**

Research problems in food or nutrition.

**170-740. Community Nutrition** **Credit 3(3-0)**

Individualized work, team teaching or guest speakers. Application of the principles of nutrition to various community nutrition problems of specific groups (geriatrics, preschoolers, adolescents and expectant mothers). Evaluation of nutrition programs of public health and social welfare agencies at local, state, federal and international levels.

**170-742. Cultural and Social Aspects of Food and Nutrition** **Credit 3(3-0)**

Sociological, psychological, and economical background of ethnic groups and their influence on food consumption patterns, and nutritional status.

**170-744. Seminar in Food and Nutrition** **Credit 2(2-0)**

Required of all graduates in Food and Nutrition.

**170-745. Practicum in Food or Nutrition** **Credit 3(0-6)**

Field experiences with private or public agencies.

### **Food Science and Technology Program**

**170-547. Cooperative Training in Industry II** **Var. Credit (1-6)**

The description of this course is the same as Food and Nutrition 437, and is normally the second Co-op experience of the student.

**120-556. Processing and Marketing of Poultry Products** **Credit 3(2-2)**

Methods of killing, dressing, grading and storage of poultry meats and the grading and storage of eggs; transportation of poultry products and factors influencing price.

**120-618. Food Technology Seminar** **Credit 1(1-0)**

A review and discussion of selected topics and recent advances in the fields of animal and food science. Prerequisite: Senior standing.

- 120-629. Special Problems in Dairy Management** **Credit 3(3-0)**  
 Special work in problems dealing with dairy production. Prerequisite: Senior standing.
- 170-631. Advance Food Science** **Credit 3(3-0)**  
 A study of the chemical and physical properties of components of raw foods and behavior of the food components during processing and storage.
- 170-635. Food Analysis** **Credit 3(1-4)**  
 Fundamental chemical, physical and sensory aspects of food composition as they related to physical properties, acceptability and nutritional value of foods. Prerequisites: Chemistry 102, Food Science 236.
- 170-637. Special Problems in Food and Nutrition and Food Science** **Credit 3(0-6)**  
 Independent study and/or research with a staff member in the areas of Food Science and Food and nutrition. Prerequisite: Junior, senior, or graduate standing, and consent of instructor.
- 170-643. Food Preservation** **Credit 3(2-2)**  
 Harvesting, assembling and receiving of food materials, major unit operation and current methods of preserving foods, including canning, freezing, dehydration, radiation and fermentation. Prerequisites: Chemistry 101, Food Science 236.
- 170-647. Cooperative Training in Industry III** **Var. Credit (1-6)**  
 The description of this course is the same as Food and Nutrition 437, and is normally the third Co-op experience for the student.

### **Department of Human Development and Services**

- 320-435. Educational Psychology** **Credit 3(3-0)**  
 A study of basic problems underlying the psychology of education, individual differences, development of personality, motivation of learning and development, nature of learning and procedures which best promotes its efficiency. (Undergraduate only.)
- 320-600. Introduction to Guidance** **Credit 3(3-0)**  
 A foundation course of prospective teachers, part-time or full-time counselors who plan to do further work in the field of guidance or education. Special consideration will be given to the nature, scope, and principles of guidance services. No credit toward concentration in guidance.
- 320-623. Personality Development** **Credit 3(3-0)**  
 A study of the basic processes in personality development, the contents of personality, and the consequences of personality development.
- 320-660. Introduction to Exceptional Children** **Credit 3(3-0)**  
**(Formerly Elementary Education and Reading 660)**  
 An overview of the educational needs of exceptional or "different" children in the regular classroom situation, emphasis placed on classroom techniques known to be most helpful to children having hearing losses, speech disorders, visual problems, emotional, social handicaps and intelligence deviation, including slow-learners and gifted children. An introduction to the area of special education. Designed for classroom teachers.
- 320-661. Psychology of the Exceptional Child** **Credit 3(3-0)**  
**(Formerly Elementary Education and Reading 661)**  
 An analysis of psychological factors affecting identification and development of

mentally retarded children, physically handicapped children, and emotionally and socially maladjusted children.

**320-662. Mental Deficiency** **Credit 3(3-0)**

A survey of types and characteristics of mental defectives; classification and diagnoses criteria for institutional placement and social control of mental deficiency.

**320-663. Measurement and Evaluation in Special Education** **Credit 3(3-0)**  
**(Formerly Elementary Education and Reading 663)**

The selection, administration, and interpretation of individual tests; intensive study of problems in testing exceptional and extremely deviant children; consideration to measurement and evaluation of children who are mentally, physically, and emotionally or socially handicapped. Emphasis upon the selection and use of group tests of intelligence and the interpretation of their results.

**320-664. Materials, Methods and Problems in Teaching Mentally Retarded Children** **Credit 3(3-0)**  
**(Formerly Elementary Education and Reading 664)**

Basic organization of programs for the education of the mentally retarded; classification and testing of mental defectives; curriculum development and principles of teaching intellectually slow children. Attention is also given to the provision of opportunities for observing and working with children who have been classified as mentally retarded.

**320-665. Practicum in Special Education** **Credit 3(3-0)**  
**(Formerly Elementary Education and Reading 665)**

Observation, participation, and teaching in an educational program for the mentally retarded.

**320-706. Organization and Management of Guidance Services** **Credit 3(3-0)**

A study of methods by which guidance policies and services may be properly implemented through organizational framework; consequently, leads to more effective organization of current guidance programs.

**320-707. Research Seminar** **Credit 3(3-0)**

Critical discussions of research projects in progress and of the related literature to such projects. An acceptable written report is required. The course recommended for guidance majors in the degree program and others seeking the School Counselor's certificate. Prerequisite: Guidance 730, prior or concurrent.

**320-714. Internship in Guidance** **Credit 3(1-4)**

The Internship will be concerned with experiences involved in the organization and operation of the many and varied public school programs and their interaction with community agencies. An extended period of continuous full-time experience must be completed by students who have not had previous teaching experience, with a required supervised field placement. Department approval required. Prerequisite: Education 701 and 702, or 721, or 722.

**320-715. Measurement for Guidance** **Credit 3(2-2)**

The development and understandings and skills in collecting and interpreting data concerning the individual, and the use of such data in case studies and follow-up procedures.

**320-716. Techniques of Individual Analysis** **Credit 3(3-0)**

A study of educational and vocational testing with reference to a general framework for using statistical information in several types of counseling problems. Statistics necessary for the evaluation of psychological and educational measurement will be considered. This course also includes the measurement of aptitude,

including special aptitude, with reference to prediction of proficiency in various occupations and curricula.

**320-717. Educational and Occupational Information** **Credit 3(3-0)**

Study of vocational theories of career development, career counseling, basic resources available in the area of occupational, educational, personal and social information, and their application to Guidance and Counseling.

**320-718. Introduction to Counseling** **Credit 3(3-0)**

Designed as an introduction to skill development which is essential to effective counseling. Emphasis is upon characteristics of the counseling relationship and their effect upon counseling process. Learning activities such as role playing, audio taping and video taping, and practice interview will be utilized, to help make theoretical constructs concrete and practical. Prerequisite: Human Development and Services 623.

**320-719. Case Studies in Counseling** **Credit 2(1-2)**

The development of a basic understanding of the case study technique as used in counseling. Compilation, analysis, diagnosis, and treatment of theoretical and actual counseling case histories.

**320-720. Principles and Dynamics of Group Counseling** **Credit 3**

A critical analysis of class and contemporary theories of counseling, the nature, rationale, development, research and use of theories in counseling. Major points of view include the psychodynamic rationale, cognitive, behavioral and existential humanistics are studied and compared.

**320-721. Independent Studies** **Credit 3(3-0)**

Offerings in this area are intended to allow a student in any of our degree programs to demonstrate how well he/she can learn, working alone but under faculty supervision. A student(s) will conduct independent research on a specific topic or a delineated area in Educational Psychology or Counseling. Prerequisite: Departmental permission.

**320-722. Career Education and Vocational Development Theories** **Credit 3(3-0)**

What career education is and how to implement it along with the study of career development theories, review of vocational development research, application of theoretical propositions to counseling cases, and writing a proposal to investigate career development concepts, will be the major units.

**320-723. Student Personnel Services in Postsecondary Education** **Credit 3(3-0)**

Theory and practice in counseling problems of the student personnel staff and other supporting services in the postsecondary setting. An in-depth study of student personnel services such as admissions, orientation, educational advising, student programs, health services, living accommodations, financial aid career counseling and placement will be included.

**320-724. Advanced Counseling Theories, Strategies and Techniques** **Credit 3(3-0)**

An advanced graduate course designed to offer a thorough in-depth examination of the theoretical basis and research evidence for several specific behavior change techniques. Particular attention will be given to application of selected modes of counseling and application of learning models in counseling procedures. It will provide an opportunity for students to further synthesize their own "personal theory" of counseling.

**320-725. Human Resource Internship** **Credit 3-5(9-15)**

An Internship involving an extended period of continuous time experience. Must be completed by each student participating in the Human Resource Concentration.

The Internship should be a learning experience, a work experience and an on-the-job training thus, one who completes the Internship, will be more knowledgeable in the field of Human Resource Counseling. Each student will receive a copy of the job description outlining the duties to be performed in the agency. Students who are placed will intern as Human Resource Administrators, Human Resource Planners, or Human Resource Program Evaluators for a semester during the year. Students are responsible for preregistering for the Human Resource Internship one semester prior to the actual placement with department approval required. Prerequisite: Professional Core.

**320-726. Educational Psychology** **Credit 3(3-0)**

A study of applications of psychological principles to educational practices.

**320-727. Child Growth and Development** **Credit 3(3-0)**

A comprehensive analysis of physical, mental, emotional, and social growth and development from birth through adolescence.

**320-728. Measurement and Evaluation** **Credit 3(2-2)**

A consideration of measurement techniques and interpretation of group tests and individual pupil diagnostic tests.

**320-729. Mental Hygiene for Teachers** **Credit 3(3-0)**

An analysis of the functions of mental hygiene in the total educative process. Attention is given to the basic principles of mental health as these apply to pupils and teachers alike, to the types of adjustment, to the development of personality, and to psychotherapeutic techniques for the restoration of mental health. Prerequisite: Human Development and Services 726.

**320-730. Practicum** **Credit 3(1-4)**

Designed to provide practical work in the student's area of specialization. Real life experiences are provided in a laboratory setting so that the student may put into practice the knowledge and behaviors gained during previous studies. In addition, a supervised professional experience is required in a setting appropriate to the student's vocational objectives. Learning activities include making and viewing video taped counseling sessions, practice interviews and actual counseling situations. Students are responsible for preregistering for the field placement, one semester prior to the actual placement, with departmental approved required. Prerequisite: Professional Care.

**320-731. Group Practicum** **Credit 3**

The course will emphasize the practical use of group techniques, and focus on facilitating the group process. The objectives will be to give students maximum practice in the group setting, with emphasis on both the group activities in guidance work in counseling, with special emphasis on the therapeutic forces for behavior change with the group process.

## **Department of Mathematics and Computer Science**

### *Advanced undergraduate and Graduate*

**225-600. Introduction to Modern Mathematics for  
Secondary School Teachers** **Credit 3(3-0)**

Elementary theory of sets, elementary logic and propositional systems, nature and methods of mathematical proofs, structure of the real number system. Open only to in-service teachers or to others having the permission of the Department of Mathematics.

**225-601. Algebraic Equations for Secondary School Teachers** **Credit 3(3-0)**

Algebra of sets, algebraic equations, systems of equations, matrices and determinants with applications, and the elements of vector spaces. Prerequisite: Mathematics 600 or consent of the Department of Mathematics.

**225-602. Modern Algebra for Secondary School Teachers** **Credit 3(3-0)**

Sets and mappings, properties of binary operations, groups, rings, integral domains, vector spaces and fields. Prerequisite: Mathematics consent of the Department of Mathematics 600 or consent of the Department of Mathematics.

**225-603. Modern Analysis for Secondary School Teachers** **Credit 3(3-0)**

Properties of the real number system, functions, limits, sequences, continuity, differentiation, integration, logarithmic and exponential functions. Prerequisite: Mathematics 600 or consent of the Department of Mathematics.

**225-604. Modern Geometry for Secondary School Teachers** **Credit 3(3-0)**

Re-examination of Euclidean geometry, axiomatic systems and the Hilbert axioms, introduction to projective geometry and other non-Euclidean geometries. Prerequisite: Mathematics 600 or consent of the Department of Mathematics.

**225-606. Mathematics for Chemists** **Credit 3(3-0)**

Review of those principles of mathematics which are involved in chemical computations and derivations from general chemistry through physical chemistry; topics covered include significant figures, methods of expressing large and small numbers, algebraic operations, trigonometric functions and an introduction to calculus.

**225-607. Theory of Numbers** **Credit 3(3-0)**

Divisibility properties of the integers, the Euclidean algorithm, congruences, diophantine equations, number-theoretic functions and continued fractions. Prerequisite: Twenty hours of college mathematics.

**225-608. Mathematics of Life Insurance** **Credit 3(3-0)**

Probability, mortality tables, life insurance, annuities, endowments, computation of net premiums, evaluation of policies, construction and use of tables. Prerequisite: Mathematics 224.

**225-620. Elements of Set Theory and Topology** **Credit 3(3-0)**

Operations on sets, indexed families of sets, products of sets, relations, functions, metric spaces, general topological spaces, continuity, compactness and connectedness. Prerequisites: Mathematics 231 and consent of the instructor.

**225-623. Advanced Probability and Statistics** **Credit 3(3-0)**

Review of elementary postulates and theorems of probability; probability functions, probability densities, mathematical expectation, moments of special probability distributions, moment generating functions, sampling distributions, decision theory and estimations. Prerequisites: Mathematics 224 and Mathematics 231.

**225-624. Methods of Applied Statistics** **Credit 3(3-0)**

Review of various statistical procedures; applications of normal, binomial, Poisson, chi-square, student's "t" and "F" distributions; analysis of variance, covariance and regression analysis based on available packaged computer programs; factor analysis, discriminant analysis and the analysis of categorical data using linear models. Prerequisite: Mathematics 224.

**225-625. Mathematics for Elementary Teachers, K-8, I** **Credit 3(3-0)**

Designed for in-service and prospective teachers who have as their goal "to teach the basic skills and competencies of mathematics sought in today's world." The course emphasizes that the teacher, first, must have the knowledge and skills in

order to accomplish this goal. It stresses fundamentals of arithmetic, sets and operations, number systems, fractions, decimals, percents, estimation, consumer arithmetic, problem solving and traditional and metric geometry and measurement. This course may not be used for degree credit.

**225-626. Mathematics for Elementary Teachers, K-8, II** **Credit 3(3-0)**  
**(Formerly 3686)**

A continuation of Mathematics 625. No credit towards a degree in mathematics; not open to secondary school teachers of mathematics. Credit on elementary education degree. Prerequisites: Mathematics 625.

**225-631. Linear and Non-Linear Programming** **Credit 3(3-0)**

Optimization subject to linear constraints; transportation problems; simplex method, network flows, applications of linear programming to industrial problems and economic theory. Introduction to non-linear programming. Prerequisite: Mathematics 350 and consent of the instructor.

**225-632. Games and Queue Theory** **Credit 3(3-0)**

General introduction to game theory; two-person-non-zero-sum-non-cooperative games; two-person cooperative games; reasonable outcomes and values; the minimax theorem. Introduction to queuing theory; single server queuing processes; many serve queuing processes; applications to economics and business. Prerequisite: Mathematics 224, Mathematics 350, or consent of the instructor.

**225-651. Methods in Applied Mathematics I** **Credit 3(3-0)**

An introduction to complex variables and residue calculus, transform calculus (Fourier, Laplace, Hankel, Mellin, etc. Transforms), higher order partial differential equations governing various physical phenomena, non-homogeneous boundary value problems, orthogonal expansions, Green's functions and variational principles. Prerequisite; Mathematics 331.

**225-652. Methods of Applied Mathematics II** **Credit 3(3-0)**

An introduction to integral equations and conversion of differential problems into integral equations of Volterra and Fredholm types, solution by iteration and other methods, existence theory, eigenvalue problems, Hilbert-Schmidt theory of symmetric kernels and topics in the calculus of variation, including optimization of integrals involving functions of more than one variable, Hamilton's principles, Sturm-Liouville theory, Rayleigh-Ritz methods, etc. Prerequisite: Mathematics 331.

**225-660. Computer Science for Secondary School Teachers** **Credit 3(3-0)**

The history, nature and use of computers. The goals and principles of teaching computer science in secondary schools. Development of skills in the use and development of computer-assisted instruction modules using CAN and GENOSIS course writer systems. Prerequisite: Consent of the instructor.

**225-665. Principles of Optimization** **Credit 3(3-0)**

Algebra, linear inequalities, duality, graphs, transport networks; linear programming; special algorithms; selected applications. An upper level course. Prerequisite: Mathematics 231 or equivalent and Mathematics 350.

**225-670. Simulation Concepts and Languages** **Credit 3(3-0)**

GPSS, SIMULA, CSMP and general purpose languages in their relationship with simulation in decision making. Application of these concepts to inventory, scheduling, queuing, job shop and gaming. Prerequisite: Mathematics 632 and one of C-260, C-280 or C-290.

**225-675. Graph Theory** **Credit 3(3-0)**

Varieties of graphs, graph theory algorithms, and applications of graph theory to other disciplines. Prerequisite: Mathematics 512.

**225-680. Systems Analysis Techniques** **Credit 3(3-0)**

Quantitative techniques using basic analytical models to aid system development, use of work sampling and data presentation techniques, construction of decision tables and flow charts, automated documentation theory and its applications, structured documentation and analysis. Prerequisite: C-570.

**226-690. Advanced Topics in Computer Science** **Credit 3(3-0)**

Prerequisite: Consent of the instructor.

### *Graduate*

**225-700. Theory of Functions of a Real Variable I** **Credit 3(3-0)**

**225-701. Theory of Functions of a Real Variable II** **Credit 3(3-0)**

**225-710. Theory of Functions of a Complex Variable I** **Credit 3(3-0)**

**225-711. Theory of Functions of a Complex Variable II** **Credit 3(3-0)**

**225-715. Projective Geometry** **Credit 3(3-0)**

**225-717. Special Topics in Algebra** **Credit 3(3-0)**

**225-720. Special Topics in Analysis** **Credit 3(3-0)**

## **Department of Music**

### *Advanced Undergraduate and Graduate*

**219-609. Music in Early Childhood** **Credit 3(2-2)**

A conceptual approach to the understanding of musical elements; and understanding of the basic activities in music in early childhood; modern trends in music education; Kodaly and Orff methods.

**219-610. Music in Elementary School Today** **Credit 3(2-2)**

Music in the elementary school curriculum; creating a musical environment in the classroom; child voice in singing, selection and presentation of rote songs; development of rhythmic and melodic expressions; directed listening; experimentation with percussion and simple melodic instruments; criteria for utilization of notational elements; analysis of instrumental materials.

**219-611. Music in the Secondary School Today** **Credit 3(3-0)**

Techniques of vocal and instrumental music instruction in the junior and senior high schools; the general music class; the organization, administration and supervision of music programs, as well as music in the humanities. This course includes the adolescent's voice and its care; the testing and classification of voices; operetta production; the instrumental program; and training glee clubs, choirs, bands, and instrumental ensembles.

**219-614. Choral Conducting of School Music Groups** **Credit 2(0-4)**

Rehearsal techniques; balance, blend and relationship of parts to the total ensemble; analysis and interpretation of literature appropriate for use in school at all levels of ability; conducting experience with laboratory group.

**219-616. Instrumental Conducting of School Music Groups** **Credit 2(0-4)**

Rehearsal techniques; balance blend and relationship of parts to the total ensemble; analysis and interpretation of literature appropriate for use in school groups at all levels of ability; conducting experience with laboratory groups.

**219-618. Psychology of Music** **Credit 3(2-2)**

The study of the physical and psychological properties of musical sounds and the

responses of the human organism to musical stimuli. The principles developed are applied to various fields of applied psychology such as the learning of musical skills, Therapeutic uses of music, and the use of music in industry to improve production.

**219-620. Advanced Music Appreciation** **Credit 3(2-2)**

Analytic studies of larger forms from all branches of music writing; Special emphasis on style and structural procedures by principal composers; works taken from all periods in music history. Designed for students with previous study of music appreciation.

## **Department of Physics**

### *Advanced Undergraduate and Graduate*

**227-600. Physical Mechanics II** **Credit 3(3-0)**

A continuation of Physics 400. Prerequisites: Physics 400, Math 231.

**227-603. Electromagnetism II** **Credit 3(3-0)**

Development and applications of the differential forms of Maxwell's equations. Prerequisites: Physics 403,, Math 231.

**227-604. Electromagnetism III** **Credit 3(3-0)**

A continuation of Physics 603. Prerequisite: Physics 603.

**227-605. Quantum Mechanics I** **Credit 3(3-0)**

Postulates of wave mechanics and Schrodinger equation. Solutions of the Schrodinger equation for the harmonic oscillator, the square well, and the hydrogen atom. Concepts of spin and angular momentum. Approximate solutions of the Schrodinger equation, perturbation theory. Stark and Zeeman affects. Prerequisites: Physics 406 and Math 231.

**227-606. Nuclear Physics** **Credit 3(3-0)**

Nuclear structure, nuclear interactions, radioactive decay, reactions and cross-sections, nuclear forces, and scattering theory. Prerequisites: Physics 406 and Math 231.

**227-615. Quantum Mechanics II** **Credit 3(3-0)**

The problem of one and two electron atoms. Hydrogen atom and the alkalis. The hydrogen molecule and the molecular bond. The deuteron problem in nuclear physics. Alpha decay. Scattering theory and the nature of the nuclear force. The motion of a particle in a periodic potential and the role of Quantum Mechanics in solids. Operator formalism. Prerequisite: Physics 605.

**227-705. General Physics for Science Teachers I** **Credit 3(2-2)**

For persons engaged in teaching. Includes two hours of lecture demonstrations and one two-hour laboratory period each week.

**227-706. General Physics for Science Teachers II** **Credit 3(2-2)**

A continuation of Physics 705.

**227-707. Electricity for Science Teachers** **Credit 2(2-0)**

Includes electric fields, potentials, direct current circuits, chemical and thermal emfs, electric meters, and alternating currents. For teaches. Prerequisite: College Physics.

**227-708. Modern Physics for Science Teachers I** **Credit 2(2-0)**

An introductory course covering the usual areas of modern physics. Both courses may be combined during a single semester for double credit. For teachers only. Prerequisite: College Physics.

A continuation of Physics 708.

## **Department of Plant Science and Technology**

### *Advanced Undergraduate and Graduate*

#### **130-600. Soil and Water Conservation Engineering I** **Credit 3(2-2)**

Improvement of soil by use and study of conservation practices, design of irrigation systems used and water control structures. Prerequisites: Agri. Engr. 401, 410 and Soil Science 532.

#### **130-604. Crop Ecology** **Credit 3(3-0)**

The physical environment and its influence on crops; geographical distribution of crops.

#### **130-607. Research Design and Analysis** **Credit 3(3-0)**

Experimental designs, methods and techniques of experimentation; application of experimental design to plant and animal research; interpretation of experimental data. Prerequisite: Agri. Econ. 644 or Math 224.

#### **130-619. Instrumentation and Measurement** **Credit 3(2-2)**

This instrumentation and measurement course emphasizes quantitative evaluation of some of the well established parameters and the application of such parameters on problem solving. Parameters include temperature, humidity, fluid flow, pressure, displacement, velocity, acceleration, force, stress, strain, etc. that are widely used in the area of agricultural research. Prerequisites: Physics 221 and 222, Mechanical Engineering 335 or 336.

#### **130-622. Environmental Sanitation and Waste Management** **Credit 3(2-2)**

Study of traditional and innovative patterns of managing and handling waste products of urban and rural environments, their renovation and reclamation.

#### **130-627. Strategies of Conservation** **Credit 3(2-2)**

An approach to the teaching of environmental conservation as an integral part of the general curriculum.

### *Graduate*

#### **130-701. Soil and Water Conservation Engineering II** **Credit 3(3-0)**

Design of drainage and irrigation systems and their applicability to specific regions and climatic conditions. In depth discussion of saturated and unsaturated flow and various equations that are used to solve soil water movement. Open channel flow and transient flow in wells and earth dams or embankments will be discussed. Prerequisite: Agri. Engr. 600.

#### **130-708. Conservation of Natural Resources** **Credit 3(3-0)**

A study of conservation and development of renewable natural resources encompassing soil, water, and air; cropland, grassland, and forests; livestock, fish, and wildlife; and recreational, aesthetic, and scenic values. Protection and development of the nation's renewal natural resources. Prerequisite: Agricultural Engineering 600.

#### **130-710. Soils of North Carolina** **Credit 3(2-2)**

A study of the factors basic to the understanding of the soils of North Carolina, their classification, and properties as related to sound land use and management. Prerequisite: Fundamentals of Soil Science 338.

**130-715. Soil Mineralogy** **Credit 3(3-0)**

A study of soil minerals with regard to their composition, structure, classification, identification, origin, and significance. Special emphasis on primary weatherable silicates, layer silicates, and oxide minerals. Prerequisites: Soil Science 534 and consent of instructor.

**130-717. Methodology in Soil and Plant Material Analysis** **Credit 3(0-6)**

A study of principles involved in the analysis of soils and plants. Emphasis on basic chemical and biological methods for interpretation of soil fertility. Instruction in the use of special instruments. Prerequisite: Soil Chemistry 534.

**130-718. Applied Environmental Microbiology** **Credit 3(2-2)**

Discussion of interactions between micro-organisms and their physical environment, and significance of micro-organisms in eutrophication, mining spoils, and waste treatments. Prerequisites: General Microbiology 121 and consent of instructor.

**130-720. Graduate Seminar in Plant Science** **Credit 1(1-0)**

**130-721. Soil Microbiology** **Credit 3(2-2)**

Discussion of major groups of organisms, their description, taxonomy, abundance, and their significance and functions. The major role of the microflora in elemental cycle and their presence in terms of agronomic and ecological importance. Prerequisites: Fundamentals of Soil Science 338 and Microbiology 121.

**130-727. Soil Fertility and Plant Nutrition** **Credit 3(3-0)**

Fundamental and theoretical aspects of soil fertility, productivity and plant nutrients. A discussion of important research data on soil fertility and plant nutrition. Prerequisites: Soil Science 517 and consent of instructor.

**130-777. Special Problems in Plant Sciences Graduate Studies** **Credit 3(3-0)**

**130-799. Graduate Thesis** **Credit 6(6-0)**

## **Department of Plant Science**

### **Plant Science**

#### *Advanced Undergraduate and Graduate*

**130-618. General Forestry and Ecology** **Credit 3(2-2)**

History, classification, culture, and utilization of native trees, with special emphasis on their importance as a conservation resource and the making of national forestry policy, and the ecological impact of trees on environmental quality. Prerequisite: Botany 140.

### **Agricultural Engineering**

#### *Advanced Undergraduate and Graduate*

**130-600. Conservation, Drainage and Irrigation** **Credit 3(1-4)**

Improvement of soil by use and study of conservation practices, engineering structures, and irrigation systems. Prerequisites: Ag. Engr. 401, Math 132, Mech. Eng. 416.

**130-601. Advanced Farm Shop** **Credit 3(1-4)**  
**(Formerly Ag. Engr. 1476)**

Study of the care, operation, and maintenance of farm shop power equipment. Prerequisites: Ag. Engr. 114 and Ag. Engr. 525.

**130-602. Special Problems in Agricultural Engineering** **Credit 3(0-6)**  
(Formerly Ag. Engr. 1477)

Special work in agricultural engineering on problems of special interest to the student. Open to seniors in Agricultural Engineering. Prerequisite: Ag. Eng. 600.

**130-619. Instrumentation and Measurement** **Credit 3(2-2)**

This course will emphasize quantitative evaluation of some of the well established parameters such as: temperature, humidity, fluid flow, pressure, displacement, velocity, acceleration, force, stress, strain, etc. that are widely used in the area of Agricultural Engineering. Prerequisite: Physics 222, Mech. Eng. 336.

### *Graduate Students*

**130-700. Rural Electrification for Vocational Agricultural Teachers (Formerly 1489)** **Credit 3(3-0)**

Rural electrification for vocational teachers. A study of electricity with particular emphasis on its application to the home and farm.

### **Crop Science**

**130-603. Plant Chemicals** **Credit 3(2-2)**

A study of the important chemical pesticides and growth regulators used in the production of economic plants. Prerequisites: Chemistry 102 and Plant Science 300.

**130-604. Crop Ecology** **Credit 3(3-0)**

The physical environment and its influence on crops; geographical distribution of crops.

**130-605. Breeding of Crop Plants** **Credit 3(2-2)**

Significance of crop improvements in the maintenance of crop yields; application of genetic principles and techniques used in the improvement of crops; the place of seed certification in the maintenance of varietal purity.

**130-606. Special Problems in Crops** **Credit 3(3-0)**

Designed for students who desire to study special problems in crops. Repeatable for a maximum of six credits. Prerequisite: By consent of instructor.

**130-607. Research Design and Analysis** **Credit 3(2-2)**

Experimental designs, methods and techniques of experimentation; application of experimental design to plant and animal research; interpretation of experimental data. Prerequisites: Agricultural Economics 644, Mathematics 224.

### **Earth and Environmental Science**

#### *Advanced Undergraduate and Graduate*

**130-616. Environmental Planning and Natural Resources Management** **Credit 3(2-2)**

Problems of uncontrolled use of natural resources, increased urbanization, unplanned growth and general deterioration of the man-made and natural environments; basic principles of environmental planning and natural resources management.

**130-622. Environmental Sanitation and Waste Management** **Credit 3(2-2)**

Study of traditional and innovative patterns and problems of managing and handling waste products of urban and rural environments, their renovation and reclamation.

**130-624. Earth Science, Geomorphology** **Credit 3(2-2)**

Various land forms and their evolution—the naturally envolved surface features of the Earth's crust and the processes responsible for their evolution, their relation to man's activities and as the foundation for understanding the environment.

**130-625. Earth Resources** **Credit 3(2-2)**

Conservation, management and use of renewable and non-renewable resources. Their impact on the social and economic quality of our environment.

**130-626. Aquaculture** **Credit 3(2-2)**

Using water as a natural resource in the production of food, for recreation, and wildlife preservation, and its management as it relates to environmental problems affecting water quality, with emphasis on freshwater lakes and ponds.

**130-627. Strategies of Conservation** **Credit 3(2-2)**

An approach to the teaching of environmental conservation as an integral part of the general curriculum.

## **Horticulture**

### *Advanced Undergraduate and Graduate*

**130-608. Special Problems in Horticulture** **Credit 3(3-0)**

Work along special lines given largely by the project method for advanced undergraduate and graduate students who have the necessary preparation. Special arrangement with instructor required.

**130-610. Commercial Greenhouse  
Production I** **Credit 3(2-2)**

Culture of floriculture crops in the greenhouse out-of-doors with emphasis on cut flowers and potted plants. Special attention given to seasonal production as it relates to soils, fertilization and environmental factors.

**130-611. Commercial Greenhouse  
Production II** **Credit 3(2-2)**

Culture of floriculture crops in the greenhouse with emphasis on seasonal production, marketing, insect and disease controls, and plant growing structures. Prerequisites: Horticulture 334 and Horticulture 610.

**130-612. Plant Materials and  
Landscape Maintenance** **Credit 3(2-2)**

Identification, merits, adaptability, and maintenance of shrubs, trees, and vines used in landscape planting trees, shrubs, bulbs, and perennials.

**130-613. Plant Materials and Planning Design** **Credit 3(2-2)**

Continuation of Horticulture 612 with added emphasis on plant combinations and use of plants as design elements.

## **Soil Science**

### *Advanced Undergraduate and Graduate*

**130-609. Special Problems in Soils** **Credit 3(3-0)**

Research problems in soils for advanced students. Prerequisite: Consent of instructor.

**130-710. Soils of North Carolina** **Credit 3(2-2)**

A study of the factors basic to the understanding of the soils of North Carolina, their classification and properties as related to sound land-use and management.

## *Graduate Course in Crop Science*

### **130-702. Grass Land Ecology (Formerly 1491)**

**Credit 3(3-0)**

The use of grasses and legumes in a dynamic approach to the theory and practice of grass-land agriculture, dealing with the fundamental ecological principles and their application to management practices.

### **130-750. Advanced Crop Genetics**

**Credit 3(2-2)**

Reproductive Mechanisms in crop plants; genetic basis for the breeding of self-pollinated species and for breeding cross-pollinated crops; spontaneous and induced mutations in plants; polyploidy and plant breeding; incompatibility mechanisms in crop plants; requirements for successful breeding for resistance to plant diseases; combining ability and the effects of hybridization in cultivated species; general quality problems in crop plants and variety testing and seed control; preservation of useful germ plasm and the organization of international plant breeding. Prerequisite: Graduate student.

### **130-751. Advanced Plant Cytogenetics**

**Credit 3(2-2)**

Male sterility and its effects on gene recombination; apomixis and parthenocarpy in crop plants and their effects on variability; cell reproduction and differentiation in tissue culture; gene splicing and crop improvement through genetics; cytological techniques. Prerequisite: Graduate student.

## *Graduate Course in Earth and Environmental Science*

### **130-703. Topics in Earth Science**

**Credit 2(2-0)**

A discussion of special topics from astronomy, geology, soil genesis, meteorology, oceanography, and physical geography.

### **130-704. Problem Solving in Earth Science**

**Credit 3(0-6)**

A laboratory-demonstration course involving identification of earth materials, measurements in environmental processes, and field observation of natural physical phenomena.

### **130-705. The Physical Universe**

**Credit 3(3-0)**

The course is designed to give the student a broad general background knowledge of the earth's physical environment; its lithosphere, hydrosphere and atmosphere and their interaction on weather and climate. The physical nature of the star, the sun, and the planets will also be studied in the light of modern concepts of space.

### **130-706. Physical Geology**

**Credit 3(3-0)**

The development of the earth's surface, its material composition and forces acting upon its surface will be considered. Specific topics include origin of mountains and volcanos, causes of earthquake, work of rivers, wind, wave and glaciers. Prerequisite: Earth Science 705 or consent of instructor.

### **130-708. Conservation of Natural Resources**

**Credit 3(3-0)**

A descriptive course dealing with conservation and development of renewable natural resources encompassing soil, water, and air; cropland, grassland, and forests; livestock, fish, and wildlife; and recreational, aesthetic and scenic values. Attention will be given to protection and development of the nation's renewable natural resources base as an essential part of the national security, defense, and welfare.

### **130-709. Seminar in Earth Science**

**Credit 2(2-0)**

A seminar concerned with recent developments in the earth sciences and related disciplines.

## **Landscape Architecture**

### *Advanced Undergraduate and Graduate*

**100-601. Environmental Perception and Design Determinants** **Credit 3(3-0)**

Comprehensive perception of natural forces as design determinants. An assessment of systems and methods of perception, classification, analysis and synthesis of natural forces and elements as they affect physical design and human use. Lecture and workshops will emphasize perception and landscape design.

**100-602. Qualitative Analysis in Landscape Planning** **Credit 3(3-0)**

Evolution and trends of applied physical design in landscape planning. Investigation of actual hypothetical design situations; study of visual and cultural values of landscape resources in planned environments. Lectures and practicums of physical design, site capabilities, landscape structuring, and landscape values.

**100-603. Land-Use Planning and Management** **Credit 3(3-0)**

A study of human behavioral responses and use patterns within physical environments, with emphasis on special group needs and compatibility with landscape resource areas. Consideration of problems affecting a synthesis of landscape values and design forms, visual and psychological values of planned and unplanned environments and relationships of social functions to landscape architectural forms.

**100-604. Factors of Physical Design** **Credit 3(3-0)**

A study of human behavioral responses and use patterns within physical environments, with emphasis on special group needs and compatibility with landscape resource areas. Consideration of problems affecting a synthesis of landscape values and design forms, visual and psychological values of planned and unplanned environments and relationships of social functions to landscape architectural forms.

## **Department of Political Science**

### *Advanced Undergraduate and Graduate*

**237-604. Directed Study/Research** **Credit 3(0-6)**

Directed study or research on a specific topic in political science. (UPON DEMAND)

**237-640. Federal Government (Formerly Pol. Sci. 2976)** **Credit 3(3-0)**

After a brief review of the structure and functions of the federal government, this course concerns itself with special areas of federal government: problems of national defense, the government as a promoter, the government as regulator, etc. Students will engage in in-depth study in one of the specific areas under consideration. (UPON DEMAND)

**237-641. Seminar in State Political Problems** **Credit 3(3-0)**

An in-depth study of special problems connected with operations of state and local governments. (UPON DEMAND)

**237-642. Modern Political Theory (Formerly Pol. Sci. 5973)** **Credit 3(3-0)**

Includes selected political works for adherence to modern conceptions of the state, political institutions as well as the works of Machiavelli, Hobbes, Spinoza, Rousseau, Burke, Mill, Hegel, Marx and Dewey. (SUMMER)

**237-643. Urban Politics and Government** **Credit 3(3-0)**

A detailed analysis of the urban political arena including political machinery, economic forces and political structures of local governmental units. (FALL)

**237-644. International Law**  
**(Formerly Pol. Sci. 543)** **Credit 3(3-0)**

A study of the major principles and practices in the development of the Law of Nations, utilizing significant cases for purposes of clarification. Prerequisites: Pol. Sci. 200, 444. (UPON DEMAND)

**237-645. American Foreign Policy — 1945 to Present** **Credit 3(3-0)**  
**(Formerly Pol. Sci. 2976)**

Examination of forces and policies that have emerged from Potsdam, Yalta, and World War II. Emphasis will be on understanding the policies that were formulated, why they were formulated, the consequences of their formulation, and the alternative policies that may have come about. Prerequisites: Survey course in American History, American Diplomatic History, and consent of the instructor. (SPRING)

**237-646. The Politics of Developing Nations**  
**(Formerly Pol. Sci. 5974)** **Credit 3(3-0)**

Political structures and administrative practices of selected countries in Africa, Latin America, Asia, analysis of particular cultural, social and economic variables peculiar to the nations. (FALL)

**237-647. Research and Current Problems** **Credit 3(3-0)**

Study of selected problems of current importance with an emphasis on the application of scientific methods of research and analysis. (SPRING)

**237-653. Urban Problems** **Credit 3(3-0)**

Analysis of some of the major problems in contemporary urban America. This course includes an examination of their causes, effects and possible solutions. (SPRING)

*Graduate*

**237-730. Constitutional Development Since 1865**  
**(Formerly History 2896)** **Credit 3(3-0)**

Historical study of the development of the Constitution since 1865. Treatment will be given to important Constitutional decisions, major documents, major Supreme Court decisions, and public policy. Assignments in paperback books will be frequent. (UPON DEMAND)

**237-741. Comparative Government**  
**(Formerly Pol. Sci. 2899)** **Credit 3(3-0)**

Comparative analysis of the American system of government and selected foreign governments. Administration, organization, and processes in systems of these governments will also be considered. (SUMMER)

**237-742. Research and Current Problems**  
**(Formerly Pol. Sci. 2980)** **Credit 3(3-0)**

Considered are fundamental concepts of scientific method of research; effective research procedures; techniques and sources used in research about government investigation of some current and recurrent problems inherent in Federalism and "State Rights", individualism and collective action, free enterprise and governmental regulations. (UPON DEMAND)

**237-743. Readings in Political Science**  
**(Formerly Pol. Sci. 5985)** **Credit 3(3-0)**

Selected subjects arranged by student and teacher. It may include preliminary research in political theory or philosophy. (UPON DEMAND)

## Department of Speech Communication and Theatre Arts

### **215-633. Speech for Teachers** **Credit 2(2-0)**

Study and application of the fundamental principles of oral communication related to teaching and learning; speech activities and interpersonal relations identified with teaching and learning and the teaching profession; exercises for self-improvement in the various speech processes.

### **215-636. Persuasive Communication** **Credit 3(3-0)**

A study of the theory and practice of persuasive speaking in the democratic society, including formal and informal persuasive speaking, types of proof, and the ethics of persuasion. Practice in the preparation and presentation of persuasive messages.

## **Theatre**

### **215-620. Community and Creative Dramatics** **Credit 3(3-0)**

Theory and function of creative dramatics and applications in elementary education; demonstrations with children; special problems for graduate students.

### **215-630. Early American Drama and Theatre to 1900** **Credit 3(3-0)**

A study of significant developments in the American Theatre before 1900 as reflected through the major playwrights and theatre organizations.

### **215-631. Modern American Drama and Theatre since 1900** **Credit 3(3-0)**

A study of significant developments in the American Theatre since 1900 as reflected through the major playwrights and theatre organizations.

### **215-650. Theatre Workshop** **Credit 3-6(0-6)**

A practicum involving the total theatrical experience. Involves units in acting, directing, stagecraft, designing and other such activities. Approximately 90 clock hours are devoted to technical production. Prerequisite: Senior standing or consent of the instructor.

### **215-653. Principles and Practice of Stage Costume** **Credit 3(2-2)**

The function of costumes for the stage and for television, and their relationship to other elements of dramatic production. Includes research in construction and authentic period forms. Prerequisite: Consent of the instructor.

### **215-654. Problems in Acting (Advanced)** **Credit 3(3-0)**

Acting problems arising from differences in the types and style of dramatic production; emphasis on individual and group performance. Prerequisite: Theatre 301.

### **215-655. Advanced Play Production** **Credit 3(3-0)**

A study of modern methods of staging and lighting plays. Directing on a multiple set; arena staging, intellectual values; script analysis. Prerequisites: Theatre 302, 440, and 441.

### **215-656. Advanced Directing** **Credit 3(2-2)**

A consideration of rehearsal problems and techniques as may be reflected in the 3-act play. In conjunction with the acting classes and the Richard B. Harrison Players, students direct projects selected from a variety of genres. Prerequisite: Theatre 440.

## Department of Sociology and Social Work

### Sociology

- 235-671. Research Methods II** **Credit 3(3-0)**  
Continuation of Soc. 403. Prerequisite: Senior or graduate standing; minimum of 6 to 9 credits in statistics and research.
- 235-672. Selected Issues in Sociology** **Credit 3(3-0)**  
Topics of current interest to sociologists and the student body are explored.
- 235-673. Population Studies** **Credit 3(3-0)**  
The study of social structural causes, correlates, and consequences of population trends.
- 235-674. Evaluation of Social Programs** **Credit 3(3-0)**  
Theoretical, methodological and substantive aspects of program evaluation.

### Anthropology

- 235-603. Introduction to Folklore** **Credit 3(3-0)**  
Basic introduction to the study and appreciation of folklore.
- 235-650. Independent Study in Anthropology** **Credit 3(3-0)**  
Enables the student to do readings and research in anthropology in cooperation with the instructor.
- 235-651. Anthropological Experience** **Credit 3(2-2)**  
An exploration of anthropological theories and research methods with an emphasis on qualitative research methods.
- 235-701. Seminar in Cultural Factors in Communication** **Credit 3(3-0)**  
Course is designed both to sensitize the student to the importance of cultural factors in non-verbal and verbal communication and to equip the student with ways to record and analyze this behavior.

### Intra-Departmental Courses

- 235-600. Seminar in Social Planning** **Credit 3(3-0)**  
Personal and social values as related to social planning: "systems" theories program planning and evaluation. Prerequisite: Senior or graduate standing.
- 235-601. Seminar in Urban Studies** **Credit 3(3-0)**  
An analysis of the nature and problems of cities, urban society and urban development.
- 235-625. Sociology/Social Service Internship** **Credit 5(0-5)**  
An internship to provide opportunities for students to enhance their employability by supervised experiences in selected agencies.
- 235-669. Small Groups** **Credit 3(3-0)**  
Elements and characteristics of small group behavior and process. Prerequisite: Senior or graduate standing; permission of the instructor.
- 235-670. Law and Society** **Credit 3(3-0)**  
This course examines selected and representative forms of social justice and injustices; barriers to and opportunities for legal redress, as related to contemporary issues. Prerequisite: Senior or graduate standing.

## Department of Technology Education

### *Advanced Undergraduate and Graduate*

**861-616. Plastic Craft** **Credit 3(2-2)**

For teachers of industrial arts, arts and crafts, and those interested in plastics as a hobby. Operations in plastics analyzed and demonstrated; design, color, kinds and uses of plastics, how plastics are made and sold; career information. Projects suitable for class use constructed.

**861-617. General Crafts** **Credit 3(2-2)**

Principles and techniques of crafts used in school activity programs. Emphasis on materials, tools, and processes used in elementary schools and industrial arts courses. Open to all persons interested in craft instruction for professional or non-professional use.

**861-618. Vocational Education for Special Needs Students** **Credit 3(3-0)**

Opportunities provided for vocational teachers, counselors, and administrators to improve skills in working with disadvantaged handicapped learners. Emphasis on motivational and creative instructional strategies, discipline, drug abuse, module development.

**861-619. Industrial Arts Construction** **Credit 3(2-2)**

Industrial Arts Curriculum Project Workshop encompassing rationale, strategies, techniques and media. Prerequisite for middle grade teachers initiating course in the "World of Construction" or "World of Manufacturing."

**861-620. Industrial Arts Manufacturing** **Credit 3(2-2)**

See I.E. 619 course description.

**861-630. Photography and Educational Media** **Credit 3(2-1)**

Nomenclature, operation and maintenance of various still and motion picture cameras. The use of exposure meters, film processing, contact printing, slide preparation, film editing, copying, enlarging, preparation and storage of chemical solutions, print spotting, dry mounting.

**861-635. Graphic Arts** **Credit 3(2-2)**

Fundamentals of typography, composition, press operation, block printing, screen printing, offset lithography, other reproduction methods, and bookbinding.

**861-660. Industrial Cooperative Programs** **Credit 3(3-0)**

For prospective teachers of vocational education. Principles, organization and administration of industrial cooperative education programs.

**861-661. Organization of Related Study Materials** **Credit 3(3-0)**

Principles of scheduling and planning pupil's course and work experience; selecting and organizing related instructional materials in I.C.T. programs. Prerequisite: I.E. 660.

**861-662. Industrial Course Construction** **Credit 3(3-0)**

Selecting, organizing and integrating objectives, content, media and materials appropriate to industrial courses. Strategies and techniques of designing and implementing group and individual teaching-learning activities to develop student interest awareness or specialization. Prerequisites: I.E. 462, 463, and 465.

**861-663. History and Philosophy of Vocational Education** **Credit 3(3-0)**

Chronological and philosophical development of vocational education with special emphasis on its growth and function in American schools.

**861-664. Occupational Exploration for Middle Grades** **Credit 3(3-0)**

Designed for persons who teach or plan to teach middle grades occupational exploration programs. Emphasis will be placed on occupational exploration in the curriculum, sources and uses of occupational information, approaches to middle grades teaching, and philosophy and concepts of occupational education.

**861-665. Middle Grades Occupational Exploration in Industrial Occupations** **Credit 3(3-0)**

Course organization, teaching strategies, resources, and facilities for teaching industrial-technological career exploration in Middle grades, emphasis on occupational clusters in manufacturing, construction, communication, transportation, fine arts, and public service.

**861-666. Curriculum Modification for Vocational Education Special Needs Personnel** **Credit 3(3-0)**

For vocational teachers, administrators, and others interested in program modifications for disadvantaged handicapped learners. Emphasis on curriculum adaptations, instructional planning, teaching strategies, media development, and performance assessment for special needs youth.

**861-668. Independent Studies in Industrial Education** **Credit 3(3-0)**

Intensive study in the field of Industrial Education under the direction of a faculty advisor. Prerequisite: Approval of graduate coordinator.

**861-715. Comprehensive General Shop** **Credit 3(2-2)**

Problems involving wood, electricity-electronics, graphic arts, metal and crafts; emphasis on organization, instructional materials and procedures.

**861-717. Industrial Education Problems I** **Credit 3(2-2)**

An advanced study in modern technology, may deal with recent developments, trends, practices and procedures of manufacturing and construction industries. Individual and group research and experimentation, involving selection, design, development and evaluation of technical reports and instructional materials for application in Industrial Education program. Prerequisite: I.E. 510 or 715.

**861-718. Industrial Education Problems II** **Credit 3(2-2)**

A continuation of I.E. 717.

**861-719. Advanced Furniture Design and Construction** **Credit 3(2-2)**

Laws, theories and principles of aesthetic and structural design, planning, designing, pictorial sketching and furniture drawing. Laboratory work involving setting up, operating, and maintaining furniture production equipment, plus forms, requisitions, orders, invoices, stock, bills, buying and professional problems. Prerequisite: Permission from the instructor.

**861-731. Advanced Drafting Techniques** **Credit 3(2-2)**

For teachers with undergraduate preparation or trade experience. School of techniques, standards, conventions, devices, experimentation in advance of opportunities offered in regular courses. Use of literature and research expected.

**861-762. Evaluation of Vocational Education Program** **Credit 3(3-0)**

Standards, criteria, and strategies for evaluating vocational education curricula, facilities, and personnel; emphasis on designing and conducting program evaluation activities. For local directors and administrators.

**861-763. General Industrial Education Programs** **Credit 3(3-0)**

A study of the development of local, state, and national levels of day industrial schools, evening industrial schools, part-time day and evening schools. Their organizations, types, courses of study, scope of movement; study of special student groups, fees and charges, building and equipment.

**861-764. Supervision and Administration of Industrial Education** **Credit 3(3-0)**

A study of the relation of industrial education to the general curriculum and the administration responsibilities involved. Courses to study, relative costs, coordination problems, class and shop organization, and the development of an effective program of supervision will be emphasized.

**861-765. Evaluation in Industrial Subjects** **Credit 2(3-0)**

Study and application of principles of achievement test construction to industrial subjects: evaluation of results.

**861-766. Curriculum Laboratory in Industrial Education** **Credit 3(3-0)**

Principles and preparation of instructional materials for classroom use. Students select and develop significant areas of instruction for use in industrial courses. Courses of study that function in teaching situations are prepared. Opportunity offered to analyze existing courses of study.

**861-767. Research and Literature in Industrial Education** **Credit 3(3-0)**

Research techniques applied to technical and educational papers and thesis classification of research, selection, delineation and planning; collection, organization and interpretation of data: survey of industrial education literature.

**861-768. Industrial Education Seminar** **Credit 3(3-0)**

Design to enable non-thesis graduate majors to complete educational and technical investigations. Each student will be expected to plan and complete a research paper and present a summary of his findings to the seminar.

**861-769. Thesis Research in Industrial Education** **Credit 3**

*Advanced Undergraduate and Graduate  
in Safety and Driver Education*

**861-651. Driver Education and Teacher Training** **Credit 3(2-2)**

This course provides the student with the necessary preparation to administer to in-car phase of high school driver education. Special attention will be given to methods of developing safe driving skills and habits.

**861-652. Advanced Driver Education and Teacher Training** **Credit 3(2-2)**

Advanced professional preparation in teaching driver education. Laboratory experiences with the multiple car range and driving simulator. Prerequisite: S.D. Ed. 651 or its equivalent.

**861-653. Driver Education and General Safety** **Credit 3(3-0)**

Designed to present facts and information concerning the cost, in money and human suffering, of accidents in the home industry, school, and transportation. Included is the establishment of knowledge and background conducive to the development of personal activities and practice which reduce accidents.

**861-654. Highway Transportation Systems** **Credit 3(3-0)**

A description and analytical study of the various transportation systems that have developed in this country. Special emphasis will be given to transportation and its role on economic and social development of communities within this country.

**861-655. Automotive and Technology for Safety and Driver Education** **Credit 3(2-2)**

A study of the fundamental systems of the automobiles as they relate to traffic safety.

**861-656. Highway Traffic Administration** **Credit 3(3-0)**

This course is to study the origin of traffic laws, the administration of motor vehicles and the adjudication resulting from traffic offenses. A critical analysis of traffic management procedure: past, present, and future. Also explore the agencies involved with traffic study. Consent of the instructor.

**861-657. Traffic Engineering in Safety and Driver Education** **Credit 3(3-0)**

An investigation of the vehicle and environmental components of the various types of highway transportation systems. Particular emphasis is given to highway engineering in relation to the flow of traffic in congested and non-congested areas. Traffic studies are performed within the traffic engineering functions, and traffic planning to improve the efficiency of traffic flow and control, and to meet future needs of society.

**861-658. Curricula Integration of Safety Education** **Credit 3(3-0)**

Integration of safety concepts and principles in the kindergarten through grade twelve curricula. Philosophy and psychology of safety: strategies, techniques, and materials appropriate for the various grade levels.

**861-659. Motorcycle Safety Education** **Credit 3(2-2)**

Theory and laboratory sessions in motorcycle safety education. Emphasis on laws, maintenance, skills, and safe riding habits and practices.

*Graduate*

**861-750. Innovations in Safety and Driver Education** **Credit 3(3-0)**

Workshop or institute dealing with contemporary problems and methods in safety and driver education.

**861-751. Psychological Factors in Safety and Driver Education** **Credit 3(3-0)**

A study of psychological variables influencing the driver's behavior. Emphasis on emotional, attitudinal, psychophysical, and social characteristics prevalent in the traffic scene.

**861-752. Alcohol and Safety and Driver Education** **Credit 3(3-0)**

Consideration of the psychological and physical aspects of alcohol and its resulting problems on the traffic scene.

**861-755. School and Occupational Safety** **Credit 3(3-0)**

Analysis of Occupational Safety and Health Act in the school. Organization and administration of school safety programs including recordkeeping, inspection, building and grounds, facilities, personnel, transportation, materials, and occupational health hazards.

**861-756. Seminar in Safety and Driver Education** **Credit 3(3-0)**

Presentation and consideration of safety and traffic education research, issues and problems. Relationships within school, community and related agencies.

**861-757. Administration and Supervision of Safety and Driver Education** **Credit 3(3-0)**

Organization, administration, and supervision of safety and driver education programs. Methods of organization, techniques, materials, program planning, records and reports, financing and insurance, procurement, personnel selection, planning and securing facilities.

- 861-758. Independent Project in Safety and Driver Education** **Credit 3(1-3)**  
Study on an individual or group basis in the field of safety and driver education. In consultation with an advisor.
- 861-759. Thesis Research in Safety and Driver Education** **Credit 3(3-0)**









