Rice

Rice University
General Announcements *1981-1982* *1982-1983*

Academic Calendar 1981-82

First Semester

Monday, August 10	Last day for payment of fees for continuing students
Monday, August 24	First day of classes
Monday, September 7	Labor Day holiday
Friday, September 18	Deadline for adding courses to schedule and designating Pass/Fail, 5 P.M.
Friday, September 25	Deadline for removal of Incompletes, 5 P.M.
Wednesday, October 7	Last day to file college course plans with the dean of undergraduate affairs
Thursday, October 8— Sunday, October 11	Midterm recess
Friday, October 30	Deadline for doctoral candidacy petitions, Office of the Vice-President of Advanced Studies and Research, 5 P.M.
Friday, October 30	Deadline for dropping courses or converting Pass/Fail to number grade, 5 P.M.
Tuesday, November 24— Wednesday, November 25	All classes normally held on Thursday and Friday meet; all Tuesday and Wednesday classes are canceled to equalize holidays by days of the week during the semester
Thursday, November 26— Sunday, November 29	Thanksgiving recess
Friday, December 4	Last day of classes
Wednesday, December 9	First day of final examinations
Wednesday, December 16	Last day of final examinations
Tuesday, December 22	All grades due, Office of the Registrar, 9 A.M.

Second Semester

Thursday, January 7	First day of classes
Friday, January 22	Final registration for undergraduates and candidates for B.Arch. and B.F.A. degrees, spring semester, 5 P.M.
Tuesday, January 26	Majors Day for first- and second-year students
Friday, February 5	Deadline for adding courses to schedule and designating Pass/Fail, 5 P.M.
Friday, February 12	Deadline for removal of Incompletes, 5 P.M.
Friday, February 26	Last day to file college course plans with the dean of undergraduate affairs
Friday, February 26	Deadline for master's degree petitions, Office of the Vice-President of Advanced Studies and Research, 5 P.M.
Monday, March 1— Sunday, March 7	Midterm recess
Saturday, March 20	Parents Day
Friday, March 26	Deadline for dropping courses and for converting Pass/Fail to number grade, 5 P.M.
Thursday, April 8— Sunday, April 11	Spring recess (Easter, April 11)
Friday, April 23	Last day of classes
Saturday, April 24— Thursday, April 29	Final examinations for graduating seniors and fifth-year degree candidates
Wednesday, April 28	First day of finals for remaining students
Friday, April 30	Deadline for submission of theses for spring graduation, Office of Advanced Studies and Research, 12 N.
Monday, May 3	Grades of all degree candidates due in Office of the Registrar, 9 A.M.
Wednesday, May 5	Last day of final examinations
Saturday, May 8	Sixty-ninth commencement
Wednesday, May 12	Deadline for remaining grades due in the Office of the Registrar, 5 P.M.

Summer 1982

May-June-July	Rice Summer Program for college students
June-July	Teaching Apprentice Session

Rice

Rice University
General Announcements
Houston, Texas

1981-1982 *1982-1983*

Cover photo: stone carving on capital of Chemistry Building of student extracting poison from dragon's mouth

NOTE: This catalog represents the most accurate information available at the time of publication. However, as a two-year document, it necessarily cannot reflect changes in staff and costs over time. As far as courses are concerned, the departments have used their best judgment in anticipating which courses will be offered over the two-year period and when they will be offered. Despite their best efforts, though, the inevitable changes in faculty as well as student demand and even funding, in some cases, may affect course offerings. A good faith effort has been made to indicate these uncertainties appropriately.

Offices to contact for additional information:

Mailing Address: Rice University, P.O. Box 1892, Houston, Texas 77001
Location: 6100 South Main, Houston, Texas
Telephone: (713) 527-8101
Please address all correspondence to the appropriate office or department followed by the university mailing address given above.

Admission, Catalogs, Applications	Office of Admissions 109 Lovett Hall; (713) 527-4036
Business Matters	Office of the Cashier 110 Allen Center; (713) 527-4946
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Financial Aid, Scholarships, Part-time Employment on Campus	Financial Aid Office 201 Lovett Hall; (713) 527-4958
Graduate Study	Chairman of the Appropriate Department
Housing for Undergraduates	Office of Admissions 109 Lovett Hall; (713) 527-4036
Undergraduate Students, Undergraduate Curricula	Office of the Dean of Undergraduate Affairs 101 Lovett Hall; (713) 527-4996

Rice University does not discriminate on the basis of race, color, national or ethnic origin, sex, age, or physical handicap.

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The University and the Campus

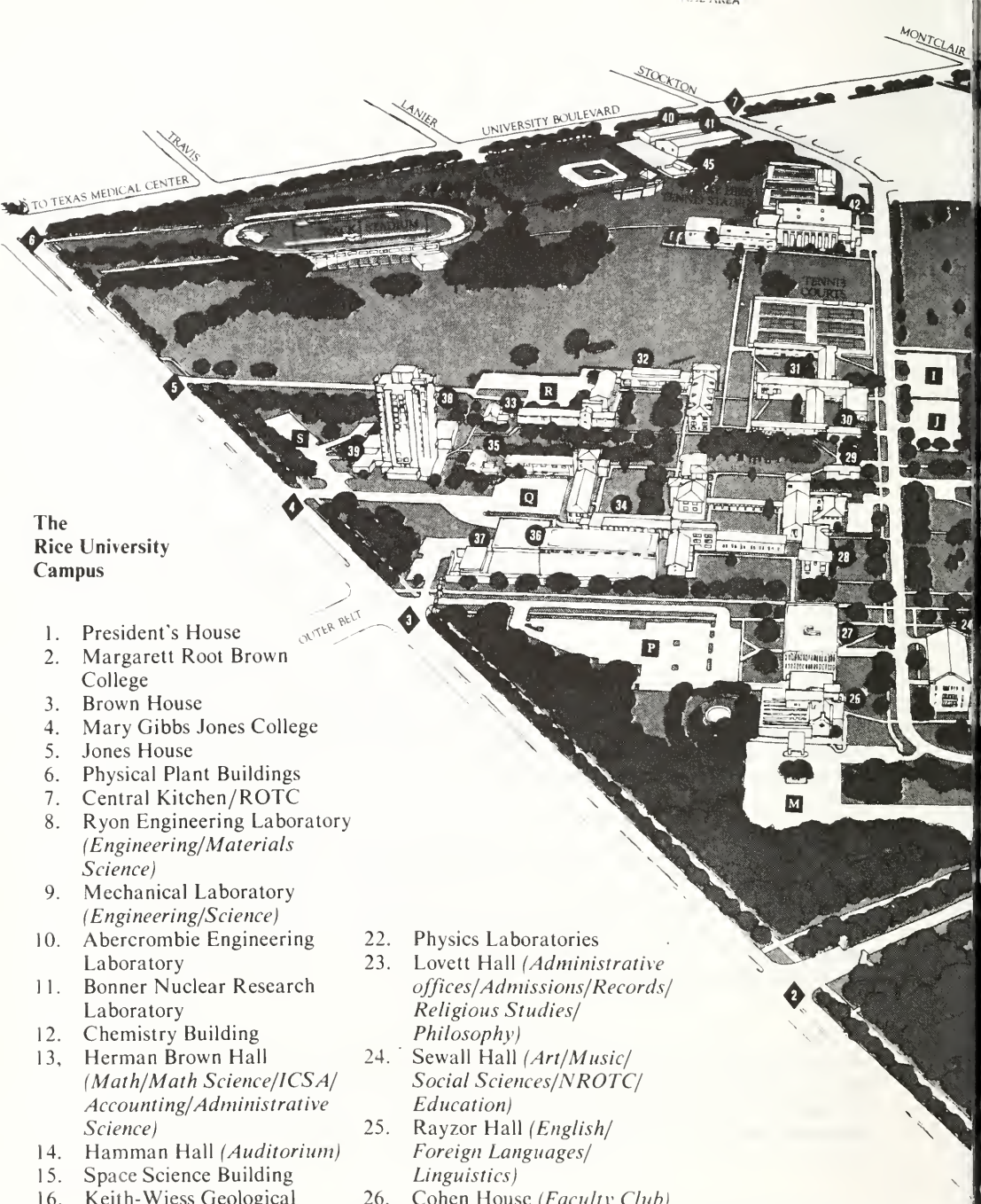
Dedicated to "the advancement of letters, science, and art," Rice University is private, independent, nonsectarian, and coeducational. It includes among its academic divisions both undergraduate and graduate studies in humanities, social sciences, natural sciences, engineering, architecture, administrative sciences, and music.

Highly talented students with diverse interests are attracted to Rice by the opportunities for creative learning. They find rewarding student-faculty relationships, options for individually tailored programs of study, opportunities for research, cooperative activities with other institutions in the nation's fourth largest city, and the unique experience of residential colleges.

About 60 percent of Rice's 2,500 undergraduate students live on campus in the eight residential colleges. The colleges have independent student governments, plan social functions, form field intramural teams, and sponsor innovative academic courses, distinguished speakers, plays, and other functions. In each college, the college master, comaster, and approximately eighteen faculty associates act as advisers to the students. This system provides students and faculty with a style of living in keeping with the tenets of fine education.

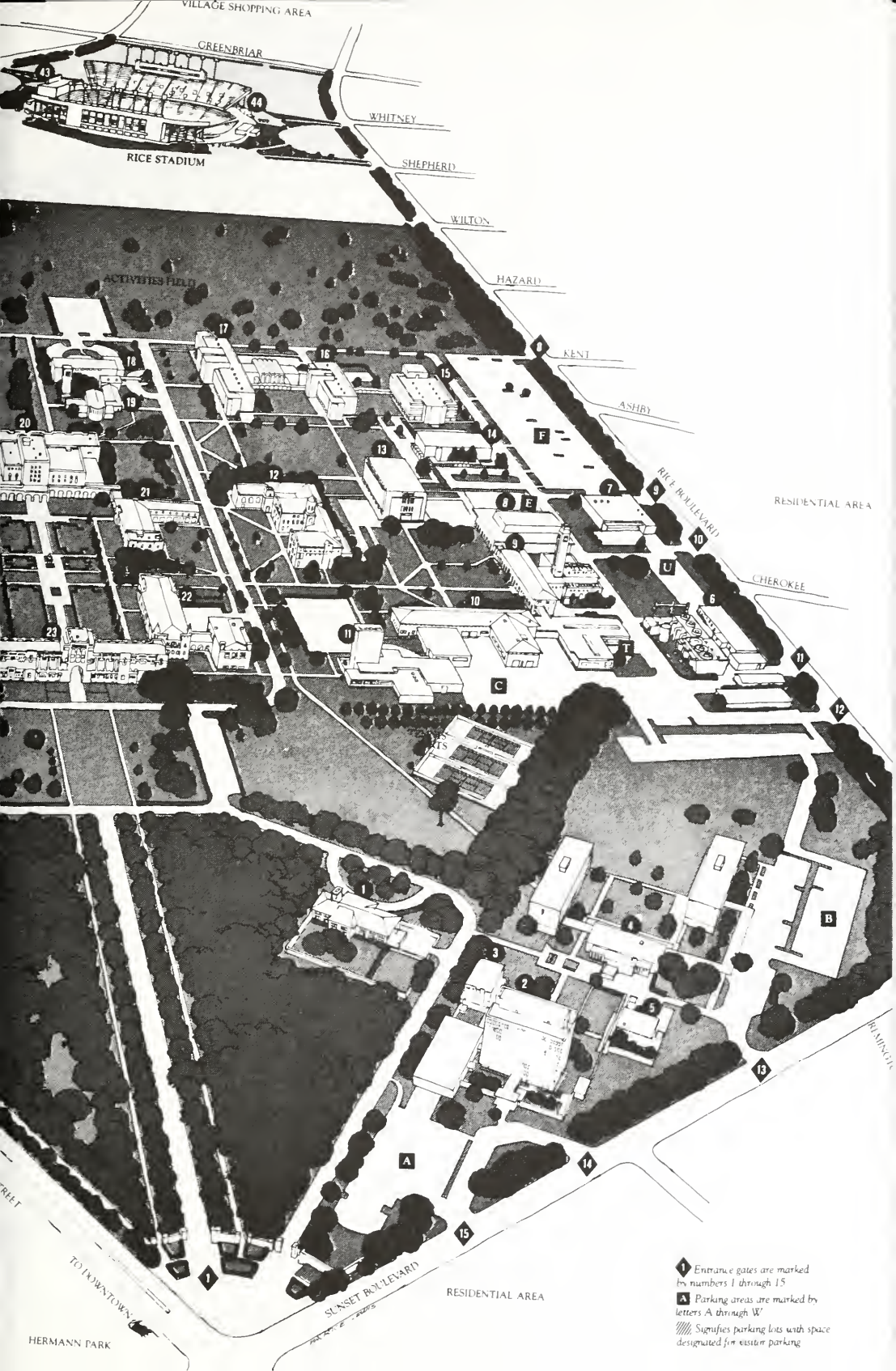
Rice's approximately 1,000 graduate students work closely with faculty members who are eminent in their fields and conduct innovative research to extend the horizons of current knowledge. Graduate students live off campus. The Graduate Student Association organizes and funds regular social activities and provides graduate students with a separate organization to represent their interests within the university.

A look through the archway of Lovett Hall shows even the casual visitor why the 300-acre Rice campus is widely acclaimed for its dignified yet casual beauty. Approximately forty permanent buildings are conveniently grouped in quadrangles under graceful live oak trees. The city's largest stadium, the million-volume Fondren Library, the Media Center, the gymnasium, and the computer center as well as its dramatic and musical presentations make Rice "behind the hedges" a community unto itself. Yet, only three miles from downtown Houston, Rice students enjoy all the commercial and cultural advantages of a major metropolitan center.



The Rice University Campus

1. President's House
2. Margarett Root Brown College
3. Brown House
4. Mary Gibbs Jones College
5. Jones House
6. Physical Plant Buildings
7. Central Kitchen/ROTC
8. Ryon Engineering Laboratory *(Engineering/Materials Science)*
9. Mechanical Laboratory *(Engineering/Science)*
10. Abercrombie Engineering Laboratory
11. Bonner Nuclear Research Laboratory
12. Chemistry Building
13. Herman Brown Hall *(Math/Math Science/ICSA/ Accounting/Administrative Science)*
14. Hamman Hall *(Auditorium)*
15. Space Science Building
16. Keith-Wiess Geological Laboratories
17. Anderson Biological Laboratories
18. Rice Memorial Center *(Student activities/Pub/ Sammy's/Campus Store and Bookstore/Band Hall)*
19. Rice Chapel
20. Fondren Library *(History)*
21. Anderson Hall *(Architecture)*
22. Physics Laboratories
23. Lovett Hall *(Administrative offices/Admissions/Records/ Religious Studies/ Philosophy)*
24. Sewall Hall *(Art/Music/ Social Sciences/NROTC/ Education)*
25. Rayzor Hall *(English/ Foreign Languages/ Linguistics)*
26. Cohen House *(Faculty Club)*
27. Allen Center for Business Activities
28. James A. Baker College
29. Baker House
30. Wiess House
31. Harry C. Wiess College
32. Harry C. Hanszen College
33. Hanszen House
34. Will Rice College
35. Will Rice House
36. Edgar Odell Lovett College
37. Lovett House
38. Sid W. Richardson Colleg
39. Richardson House
40. Rice Museum
41. Rice Media Center *(Photography)*
42. Gymnasium and Autry Court *(Health & PE/ Athletics)*
43. Owl Club Room
44. Rice Stadium
45. Recycling Center


VILLAGE SHOPPING AREA
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WHITNEY
SHEPHERD
WILTON
HAZARD
KENT
ASHBY
RICE BOULEVARD
CHEROKEE
RESIDENTIAL AREA
RICE STADIUM
ACTIVITIES FIELD
SUNSET BOULEVARD
RESIDENTIAL AREA
TO DOWNTOWN
HERMANN PARK
Entrance gates are marked by numbers 1 through 15
Parking areas are marked by letters A through W
Signifies parking lots with space designated for visitor parking


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SUB LIBERTATE QUIETEM

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Mr. and Mrs. Frank C. Shelden
Mr. and Mrs. William Shiffick
Dr. and Mrs. Howard M. Siegler
Mr. and Mrs. David M. Smith
Mr. and Mrs. Thomas D. Smith
Mr. and Mrs. M. S. Stude
Mr. and Mrs. Robert W. Sumners
Mr. and Mrs. Jonathan Taft Symonds
Mr. and Mrs. Warren T. Thagard III
Mr. and Mrs. Jack A. Turpin
Dr. and Mrs. Charles A. Van Wart
Mr. and Mrs. Ame Vennema
Mr. and Mrs. Louis A. Waters
Mr. and Mrs. John F. Webre
Mr. and Mrs. John L. Welsh, Jr.
Mr. and Mrs. David R. Wintermann
Mr. and Mrs. Francis G. Winters
Mr. and Mrs. James C. Winters
Mr. and Mrs. M. A. Wright
Mr. R. Scott Ziegler
Mr. and Mrs. Frank E. Zumwalt, Jr.

Instructional and Research Staff

Emeritus Faculty

Bale, Allen M., 1947-78. Athletic Director Emeritus
B.S. (1939) Rice Institute; M.A. (1939) Columbia University

Bourgeois, Andre Marie Georges, 1928-72. Favrot Professor Emeritus of French
Bachelier ès lettres (1921), Bachelier en Droit (1923), Certifie d'etudes superieures de lettres (1930) University of Paris, France; M.A. (1934) University of Texas; Docteur de l'universite (1945) University of Paris, France; Commandeur de l'Ordre des Palmes Academiques (1971)

Bryan, Andrew Bonnell, 1957-68. Lecturer Emeritus in Physics
B.A. (1918), M.A. (1920), Ph.D. (1922) Rice Institute

Camden, Carroll, 1930-73. Professor Emeritus of English and Honorary Charter Associate of Hanszen College
A.B. (1925) Centre College; Ph.D. (1930) University of Iowa

Cason, Carolyn, 1956-74. Lecturer Emeritus in Dietetics
B.S. (1934) University of Texas; M.A. (1939) Columbia University

Franklin, Joe L., Jr., 1963-76. Robert A. Welch Professor Emeritus of Chemistry
B.S. (1929), M.S. (1930), Ph.D. (1934) University of Texas,

Fulton, James Street, 1946-74. Professor Emeritus of Philosophy and Honorary Master of Will Rice College
B.A. (1925), M.A. (1929) Vanderbilt University; Ph.D. (1934) Cornell University

Gallegly, Joseph S., 1929-68. Professor Emeritus of English
B.A. (1925), M.A. (1926) Rice Institute

Hake, Evelyn, 1932-74. Lecturer Emeritus in Biology
B.A. (1930), M.A. (1932) Rice Institute

Hale, Elton B., 1963-79. Professor Emeritus of Accounting
B.S. (1937), M.A. (1940) Southwest Texas State Teachers College; Ph.D. (1948) University of Texas

Hartsook, Arthur J., 1921-61. Professor Emeritus of Chemical Engineering
A.B. (1911) Nebraska Wesleyan University; B.S.Ch.E. (1920), M.S. (1921) Massachusetts Institute of Technology

Hodges, Lee, 1930-71. Professor Emeritus of French
B.S. (1930) Harvard University; M.A. (1934) Rice Institute

Hudson, Bradford Benedict, 1948-72. Professor Emeritus of Psychology
A.B. (1930) Stanford University; Ph.D. (1947) University of California at Berkeley

Jitkoff, Andrew N., 1950-72. Professor Emeritus of Russian
Bachelor (1928), Master (1931) Prague Institute of Technology, Czechoslovakia

Krzyzaniak, Marian, 1964-81. Professor Emeritus of Economics
B.A. (1932) University of Poznań, Poland; M.A. (1954) University of Alberta, Canada; Ph.D. (1959) Massachusetts Institute of Technology

Lecuyer, Maurice Antoine, 1962-79. Professor of French
Baccalauréat ès lettres (1937), License ès lettres (1943), Diplome d'etudes superieures (1944) Universite de Paris, France; Ph.D. (1954) Yale University

McEnany, Michael Vincent, 1943-79. Professor Emeritus of Electrical Engineering and Honorary Associate of Will Rice College
B.S.E.E. (1929) Colorado College; M.A. (1931) Dartmouth College

Morehead, James Caddall, Jr., 1940-79. Professor Emeritus of Architecture and Honorary Associate of Baker College
A.B. (1935) Princeton University; B.Arch. (1939) Carnegie Institute of Technology

Neely, Jess Claiborne, 1940-67. Athletic Director Emeritus
LL.B. (1924) Vanderbilt University

Nettleton, Lewis L., 1971-76. Lecturer Emeritus in Geology
B.S. (1918) University of Idaho; M.S. (1921), Ph.D. (1923) University of Wisconsin

Norbeck, Edward, 1960-81. Professor Emeritus of Anthropology
B.A. (1948), M.A. (1949), Ph.D. (1952) University of Michigan

Oliver, Covey T., 1979-81. Radoslav A. Tsanoff Professor Emeritus of Public Affairs
B.A. (1933), J.D. (1936) University of Texas; LL.M. (1953), S.J.D. (1954) Columbia University; LL.D. (1976) Southern Methodist University

O'Neil, John F., 1965-80. Professor Emeritus of Art
B.F.A. (1936), M.F.A. (1939) University of Oklahoma

Parsons, David G., 1953-81. Professor Emeritus of Art and Honorary Associate of Will Rice College
B.S. (1934), M.S. (1937) University of Wisconsin

Ransom, Harry Steelesmith, Jr., 1958-81. Professor Emeritus of Architecture
B.Arch. (1947) Carnegie Institute of Technology; M.Arch. (1967) Texas A&M University

Richter, George H., 1931-74. Professor Emeritus of Chemistry
B.A. (1926), M.A. (1927), Ph.D. (1929) Rice Institute

Risser, J.R., 1946-81. Professor Emeritus of Physics
A.B. (1931) Franklin and Marshall College; M.A. (1935), Ph.D. (1938) Princeton University

Rossini, Frederick D., 1971-74. Professor Emeritus of Chemistry
B.S. (1925), M.S. (1926) Carnegie Institute; Ph.D. (1928) University of California at Berkeley

Shelton, Fred Vernon, 1927-71. Professor Emeritus of French and Honorary Charter Associate of Hanszen College
B.A. (1926), M.A. (1928) Rice Institute; M.A. (1942) University of Mexico; Docteur de l'universite (1963) University of Paris, France

Thomas, Joe David, 1930-77. Professor Emeritus of English
Ph.B. (1929), A.M. (1930) University of Chicago

Wadsworth, Philip A., 1964-73. Professor Emeritus of French
A.B. (1935), Ph.D. (1939) Yale University

Wall, Frederick T., 1972-79. Professor Emeritus of Chemistry
B.C. (1933), Ph.D. (1937) University of Minnesota

Wann, T. W., 1962-79. Professor Emeritus of Psychology
B.A. (1937), Ph.D. (1949) University of California at Berkeley

Wilhoit, James Cammack, Jr., 1954-81. Professor Emeritus of Mechanical Engineering and Mathematical Sciences
B.S.M.E. (1948) Rice Institute; M.S. (1951) Texas A&M University; Ph.D. (1954) Stanford University

Williams, George Guion, 1924-68. Professor Emeritus of English
B.A. (1923), M.A. (1925) Rice Institute

Instructional and Research Staff

Abrahams, Julia, 1979. Assistant Professor in the Department of Electrical Engineering
B.A. (1974) Yale University; M.A. (1975) Stanford University; Ph.D. (1979) Princeton University

Adair, Linda S., 1980. Assistant Professor of Anthropology
B.A. (1971) State University of New York at Stony Brook; Ph.D. (1980) University of Pennsylvania

Adams, John Allan Stewart, 1954. Professor of Geology
Ph.B. (1946), B.S. (1948), M.S. (1949), Ph.D. (1951) University of Chicago

Adams, Raymond A., 1981. Visiting Assistant Professor of Religious Studies
B.A. (1959), Ph.L. (1960) Fordham University; S.T.L. (1967) Woodstock College of Theology; M.A. (1970) Oxford University, England; M.Phil. (1972) University of London, England; Ph.D. (1979) University of Manchester, England

Aghili, H., 1979. Adjunct Associate Professor in the Department of Chemical Engineering
B.S. (1971) University of Wisconsin; Ph.D. (1976) Rice University

Akers, William Walter, 1947. Professor in the Department of Chemical Engineering and Vice-President for Administration
B.S. (1943) Texas Technological College; M.S. (1944) University of Texas; Ph.D. (1950) University of Michigan

Alcover, Madeleine, 1975. Associate Professor of French
Licence de lettres modernes (1962), Diplome d'etudes superieures (1963), Doctorat de 3e cycle (1965) University of Bordeaux, France

Alfrey, Clarence P., Jr., 1968. Adjunct Professor in the Biomedical Engineering Laboratory
B.A. (1951) Rice Institute; M.D. (1955) Baylor College of Medicine; Ph.D. (1966) University of Minnesota

Ambler, John S., 1964. Professor of Political Science and Associate of Brown College
B.A. (1953) Willamette University; A.M. (1954) Stanford University; Certificat d'etudes politiques (1955) University of Bordeaux, France; Ph.D. (1966) University of California at Berkeley

Anderson, Craig A., 1980. Assistant Professor of Psychology
B.A. (1976) Butler University; M.A. (1978), Ph.D. (1980) Stanford University

Anderson, D. Kent, 1981. Adjunct Associate Professor of Administrative Science
B.A. (1962) Rice University; M.B.A. (1964) University of Virginia

Anderson, Hugh R., 1965. Professor of Space Physics and Astronomy and Associate of Wiess College
B.A. (1954), M.S. (1958) State University of Iowa; Ph.D. (1961) California Institute of Technology

Anderson, John B., 1975. Associate Professor of Geology and Associate of Hanszen College
B.S. (1968) University of South Alabama; M.S. (1970) University of New Mexico; Ph.D. (1972) Florida State University

Anderson, Michael T., 1981. G.C. Evans Instructor of Mathematics
B.A. (1975) University of California at Santa Barbara; M.A. (1977), Ph.D. (1981) University of California at Berkeley

Apple, Max I., 1971. Professor of English
B.A. (1963) University of Michigan; M.A. (1965) Stanford University; Ph.D. (1970) University of Michigan

Arbiter, Eric A., 1977. Lecturer in Music
B.M.E. (1972) Oberlin Conservatory of Music; M.Mus. (1973) Cleveland Institute of Music

Aresu, Bernard, 1977. Assistant Professor of French and Associate of Baker College
Licence es lettres (1967) Universite de Montpellier, France; Ph.D. (1975) University of Washington

Armeniades, Constantine D., 1969. Professor in the Department of Chemical Engineering and Master of Will Rice College
B.S. (1961) Northeastern; M.S. (1967) Case Institute of Technology; Ph.D. (1969) Case Western Reserve University

Atherton, W. Clifford, Jr., 1980. Instructor in Administrative Science
B.A. (1971) Rice University; M.B.A. (1977) University of Texas

Austin, Joe Dan, 1978. Associate Professor of Education and Associate of Jones College
B.S. in Applied Mathematics (1966) Georgia Institute of Technology; M.S. in Mathematical Statistics (1968), Ph.D. in Mathematics Education (1972) Purdue University

Austin, Walter J., 1960. Professor in the Department of Civil Engineering
B.S.C.E. (1941) Rice Institute; M.S. (1946), Ph.D. (1949) University of Illinois

Avé Lallemant, Hans G., 1970. Professor of Geology
B.Sc. (1960), M.Sc. (1964), Ph.D. (1967) Leiden University, Netherlands

Awapara, Jorge, 1957. Professor of Biochemistry
B.S. (1941), M.S. (1942) Michigan State University; Ph.D. (1947) University of Southern California

Bacon, Thomas, 1977. Assistant Professor of Music
B.S. (1975) Oakland University

Bailey, Edward L., 1980. Major, U.S. Army, and Senior Assistant Professor of Military Science
B.S. (1969), M.Ed. (1970), Texas A&M University

Baker, Donald Roy, 1966. Professor of Geology and Honorary Associate of Brown College
B.S. (1950) California Institute of Technology; Ph.D. (1955) Princeton University

Baker, Stephen D., 1963. Professor of Physics and Honorary Associate of Hanszen College
B.S. (1957) Duke University; M.S. (1959), Ph.D. (1963) Yale University

Ballas, George C., 1978. Adjunct Professor of Administrative Science

Bally, Albert W., 1981. Harry Carothers Wiess Professor of Geology
Ph.D. (1953) University of Zurich

Barker, J.R., 1949. Associate Professor of Health and Physical Education and Associate of Hanszen College
B.S. (1949) Rice Institute; M.Ed. (1954) University of Texas

Barnard, William, 1979. Adjunct Lecturer in Music
B.Mus. (1940), M.Mus. (1941) University of Michigan

Bartlett, John, 1974. Adjunct Associate Professor of Health Facilities Planning
L.L.B. (1961), M.A. (1963), Ph.D. (1970) University of Iowa

Batsell, Richard R., 1980. Assistant Professor of Administrative Science
B.A., B.B.A. (1971), Ph.D. (1976) University of Texas

Baum, Ernest Roy, 1962. Lecturer in Education
B.A. (1956) Trinity University; M.A. (1964) University of Texas

Bavinger, Bill Allen, 1977. Instructor in Architecture and Associate of Hanszen College
B.A. (1973), M.Arch. (1976) Rice University

Bayazitoglu, Yildiz, 1977. Associate Professor of Mechanical Engineering and Associate of Brown College
B.S. (1967) Middle East Technological University; M.S. (1969), Ph.D. (1974) University of Michigan

Bearden, Frank W., 1954. Professor of Health and Physical Education
B.S. (1947) Texas Technological College; M.A. (1949), Ed.D. (1954) Columbia University

Beckingham, Kathleen, 1980. Assistant Professor of Biochemistry and Resident Associate of Baker College
B.A. (1967), Ph.D. (1972) Cambridge University, England

Beckmann, Herbert W. K., 1957. Professor in the Department of Mechanical Engineering
Cand. Ing. (1939), Dipl. Ing. (1944) Dr. Ing. (1957) Hannover University, Germany

Bedient, Philip B., 1975. Associate Professor of Environmental Engineering
B.S. (1969), M.S. (1972), Ph.D. (1975) University of Florida

Bell, Gary E., 1981. Professor of Naval Science and Captain, U.S. Navy
B.S. (1960) Northwestern University

Bell, Philip W., 1978. William Alexander Kirkland Professor of Administrative Science and Associate of Lovett College
B.A. (1947) Princeton University; M.A. (1949) University of California at Berkeley; Ph.D. (1954) Princeton University

Benjamin, Don C., Jr., 1978. Lecturer in Religious Studies
B.A. (1964) St. Bonaventure University; M.A. (1968) Catholic University of America; Ph.D. (1981) Claremont Graduate School

Bennett, George N., 1978. Assistant Professor of Biochemistry
B.S. (1968) University of Nebraska; Ph.D. (1974) Purdue University

Berget, Susan M., 1978. Assistant Professor of Biochemistry and Associate of Baker College
B.S. (1969), M.S. (1971) Southern Illinois University; Ph.D. (1974) University of Minnesota

Berkman, Larry, 1979. Lecturer in Architecture
B.A. (1962) University of Texas

Berry, Michael J., 1980. Robert A. Welch Professor of Chemistry
B.S. (1967) University of Michigan; Ph.D. (1970) University of California at Berkeley

Bible, Frances L., 1975. Associate Professor of Music
Artists Diploma in Singing (1942), Graduate Diploma in Voice (1947) Juilliard School of Music

Biesele, Marguerite A., 1980. Adjunct Assistant Professor of Anthropology
B.A. (1967) University of Michigan; M.A. (1968), Ph.D. (1975) Harvard University

Billups, W. Edward, 1970. Professor of Chemistry and Associate of Will Rice College
B.S. (1961), M.S. (1965) Marshall University; Ph.D. (1970) Pennsylvania State University

Bivens, Irl C., 1980. G.C. Evans Instructor of Mathematics
B.A. (1973) Pfeiffer College; Ph.D. (1978) University of North Carolina

Blackburn, James B., 1975. Lecturer in Architecture
B.A. (1969), J.D. (1972) University of Texas; M.S. (1974) Rice University

Blanco, Herminio A., 1980. Assistant Professor of Economics
B.A. (1971) Instituto Tecnologico de Monterrey, Mexico; M.A. (1974), Ph.D. (1978) University of Chicago

Bland, Robert L., 1954. Associate Professor of Health and Physical Education and Associate of Hanszen College
B.A. (1953) Central Washington State College; M.A. (1954) Columbia University

Bochner, Salomon, 1968. Edgar Odell Lovett Professor of Mathematics
Ph.D. (1921) University of Berlin, Germany

Boles, John B., 1981. Professor of History
B.A. (1965) Rice University; Ph.D. (1969) University of Virginia

Boorman, Joan Rea, 1968. Associate Professor of Spanish and Portuguese and Associate of Lovett College
B.A. (1954) New York University; M.A. (1964) University of Houston; Ph.D. (1970) University of Texas

Borbridge, David C., 1972. Lecturer in Religious Studies and Associate of Wiess College
A.B. (1955) Spring Hill College; M.S.T. (1964) Santa Clara University; M.A. (1966), Ph.D. (1979) University of California at Berkeley

Bordelon, Cassius B., Jr., 1972. Lecturer in Health and Physical Education
B.S. (1964) Louisiana State University; Ph.D. (1972) Baylor College of Medicine

Boterf, Chester Arthur, 1973. Associate Professor of Art and Associate of Will Rice College
B.A. (1959) Kansas University; M.F.A. (1965) Columbia University

Bourland, H.M., 1961. Associate Director of Rice Engineering Design and Development Institute, Assistant to the Dean of Engineering for Student Development, Associate Director of Biomedical Engineering Laboratory, Lecturer in Electrical Engineering
B.S. (1955) Texas Technological College; S.M.E.E. (1957) Massachusetts Institute of Technology

Bowen, Ray M., 1967. Professor of Mechanical Engineering and Mathematical Sciences and Associate of Wiess College
B.S. (1958) Texas A&M University; M.S. (1959) California Institute of Technology; Ph.D. (1961) Texas A&M University

Boyd, Harold B., 1979. Adjunct Professor in the Department of Chemical Engineering
B.A. (1959) Drexel University; M.Ch.E. (1962) New York University

Brabson, John S., 1978. Lecturer in Biochemistry and Associate of Lovett College
B.A. (1970) Georgia Institute of Technology; Ph.D. (1975) University of Illinois

Brady, David W., 1973. Professor of Political Science
B.S. (1963) Western Illinois University; M.A. (1967), Ph.D. (1970) University of Iowa

Brady, Patrick, 1973. Professor of French
B.A. (1957) University of Sydney, Australia; Doctorat d'Université (1961) Université de Paris, France

Brelsford, John W., Jr., 1970. Professor of Psychology and Associate of Will Rice College
B.A. (1960), M.A. (1961) Texas Christian University; Ph.D. (1965) University of Texas

Brody, Baruch, 1975. Professor of Philosophy
B.A. (1962) Brooklyn College; M.A. (1965), Ph.D. (1967) Princeton University

Broker, Karin L., 1980. Visiting Assistant Professor of Art and Resident Associate of Lovett College
B.F.A. (1972) University of Iowa; M.F.A. (1980) University of Wisconsin

Brooks, Philip R., 1964. Professor of Chemistry and Associate of Lovett College
B.S. (1960) California Institute of Technology; Ph.D. (1964) University of California at Berkeley

Brotzen, Franz Richard, 1954. Professor of Materials Science, Master of Brown College, and Honorary Associate of Jones College
B.S. (1950), M.S. (1953), Ph.D. (1954) Case Institute of Technology

Brown, Barry W., 1970. Adjunct Professor of Mathematical Sciences
B.S. (1959) University of Chicago; M.S. (1961), Ph.D. (1963) University of California at Berkeley

Brown, Christopher J., 1973. Lecturer in Architecture
B.A. (1963) Yale University; M.Arch. (1969), M. City Planning (1970) University of Pennsylvania

Brown, Katherine Tsanoff, 1963. Professor of Art History and Dean of Undergraduate Affairs
B.A. (1938) Rice Institute; M.F.A. (1940) Cornell University

Brown, Peter Thomson, 1978. Lecturer in Art and Associate of Wiess College
B.A. (1971), M.F.A. (1977) Stanford University

Brown, Richard S., 1975. Assistant Professor of Music
B.M.E. (1969) Temple University; M.M. (1971) Catholic University of America

Brown, Stephen L., 1973. Lecturer in Health and Physical Education, Assistant Trainer in the Athletic Department, and Associate of Jones College
B.S. (1973) Texas Tech University

Bryant, Robert L., 1979. Associate Professor of Mathematics
B.S. (1974) North Carolina State University; Ph.D. (1979) University of North Carolina

Bunch, C. Robert, 1979. Lecturer in Accounting
B.A. (1976), Master of Accounting (1977) Rice University

Burago, Alla, 1977. Visiting Assistant Professor of Russian
B.A. (1965), Ph.D. (1976) University of Texas

Burnett, Sarah A., 1972. Associate Professor of Psychology and Resident Associate of Jones College
B.S. (1966) Memphis State University; M.S. (1970), Ph.D. (1972) Tulane University

Burrus, C. Sidney, 1965. Professor of Electrical Engineering, Honorary Associate of Will Rice College, and Associate of Lovett College
B.A., B.S.E.E. (1958) Rice Institute; M.S. (1960) Rice University; Ph.D. (1965) Stanford University

Bush, Michael J., 1981. Captain, U.S. Army, and Assistant Professor of Military Science
B.S. (1974) University of Wisconsin

Calfee, Richard V., 1977. Adjunct Lecturer in Biomedical Engineering
B.S. (1968), M.S. (1970) University of Texas at Arlington; Ph.D. (1975) Michigan State University

Camfield, William A., 1969. Joseph and Joanna Nazro Mullen Professor of Art History
A.B. (1957) Princeton University; M.A. (1961), Ph.D. (1964) Yale University

Campbell, James Wayne, 1959. Professor of Biology
B.S. (1953) Southwest Missouri State University; M.S. (1955) University of Illinois; Ph.D. (1958) University of Oklahoma

Cannady, William Tillman, 1964. Professor of Architecture
B.Arch. (1961) University of California at Berkeley; M.Arch. (1962) Harvard University

Cardus, David, 1970. Adjunct Professor of Mathematical Sciences
B.A., B.Sc. (1942) University of Montpellier, France; M.D. (1949) Barcelona Medical School, Spain

Cargill, Robert L., 1980. Adjunct Professor of Chemistry
B.A. (1955) Rice Institute; Ph.D. (1960) Massachusetts Institute of Technology

Carrington, Samuel M., Jr., 1967. Professor of French, University Librarian, and Associate of Jones College
A.B. (1960), M.A. (1962), Ph.D. (1965) University of North Carolina

Cartwright, Robert S., Jr., 1980. Associate Professor of Mathematical Sciences
B.A. (1971) Harvard College; M.A. (1973), Ph.D. (1977) Stanford University

Casbarian, John Joseph, 1973. Associate Professor of Architecture
B.A. (1969) Rice University; M.F.A. (1971) California Institute of the Arts; B.Arch. (1972) Rice University

Casey, Richard Edward, 1972. Professor of Geology
A.B. (1960) San Diego State University; Ph.D. (1966) University of Southern California

Castañeda, James A., 1961. Professor of Spanish and Honorary Master of Will Rice College
B.A. (1954) Drew University; M.A. (1955), Ph.D. (1958) Yale University

Cavanaugh, Kevin, 1979. Lecturer in Architecture
B.A. (1973) Yale University; M.Arch. (1976) Massachusetts Institute of Technology

Chamberlain, Joseph W., 1971. Professor of Space Physics and Astronomy
A.B. (1948), A.M. (1949) University of Missouri; M.S. (1951), Ph.D. (1952) University of Michigan

Chambers, Leslie A., 1974. Adjunct Professor of Environmental Science
B.S. (1927), M.S. (1928) Texas Christian University; Ph.D. (1930) Princeton University

Chang, Donald C., 1970. Adjunct Assistant Professor of Physics
B.S. (1965) National Taiwan University; M.A. (1967), Ph.D. (1970) Rice University

Chapman, Alan Jesse, 1946. Professor of Mechanical Engineering and Dean of the George R. Brown School of Engineering.
B.S.M.E. (1945) Rice Institute; M.S. (1949) University of Colorado; Ph.D. (1953) University of Illinois

Characklis, William G., 1970. Adjunct Professor of Environmental Science and Engineering
B.E.S. (1964) Johns Hopkins University; M.S.Ch.E. (1967) University of Toledo; Ph.D. (1970) Johns Hopkins University

Cheatham, John Bane, Jr., 1963. Professor of Mechanical Engineering
B.S. (1948), M.S. (1953) Southern Methodist University; Ph.D. (1960) Rice University

Citron, Marcia J., 1976. Associate Professor of Music and Associate of Brown College
B.A. (1966) Brooklyn College; M.A. (1970), Ph.D. (1971) University of North Carolina

Clark, Howard Charles, Jr., 1966. Associate Professor of Geology and Associate of Baker College
B.S. (1959) University of Oklahoma; M.A. (1965), Ph.D. (1967) Stanford University

Clark, John W., Jr., 1968. Professor in the Department of Electrical Engineering and Master of Sid Richardson College
B.S. (1962) Christian Brothers College; M.S. (1965), Ph.D. (1967) Case Western Reserve University

Clark, Susan L., 1973. Associate Professor of German and Associate of Baker College
B.A. (1969) Mount Union College; M.Phil. (1972), Ph.D. (1973) Rutgers University

Class, Calvin M., 1952. Professor of Physics
A.B. (1943), Ph.D. (1951) Johns Hopkins University

Clayton, Donald D., 1963. Andrew Hays Buchanan Professor of Astrophysics in the Departments of Space Physics and Astronomy and of Physics
B.S. (1956) Southern Methodist University; M.S. (1959), Ph.D. (1962) California Institute of Technology

Cloutier, Paul A., 1967. Professor of Space Physics and Astronomy and Associate of Richardson College
B.S. (1964) University of Southwestern Louisiana; Ph.D. (1967) Rice University

Colaco, Joseph P., 1975. Lecturer in Architecture
B.S. (1960) University of Bombay, India; M.S. (1962), Ph.D. (1965) University of Illinois

Cooke, Timothy W., 1979. Assistant Professor of Economics and Associate of Wiess College
B.S. (1975) George Mason University; M.A. (1977), Ph.D. (1980) Johns Hopkins University

Cooper, Joseph, 1967. Lena Gohlman Fox Professor of Political Science and Dean of the School of Social Sciences
A.B. (1955), M.A. (1959), Ph.D. (1961) Harvard University

Cooper, Paul, 1974. Professor of Music and Composer-in-Residence
B.Mus., B.A. (1950), M.A. (1953), D.M.A. (1956) University of Southern California

Copeland, James E., 1966. Associate Professor of German and Linguistics and Resident Associate of Baker College
B.A. (1961) University of Colorado; Ph.D. (1965) Cornell University

Crane, David A., 1972. Visiting Professor of Architecture
L.A. (1974) Davidson College; B.S., B.A. (1950) Georgia Institute of Technology; M.C.P. (1952) Harvard University Graduate School of Design

Crouse, Wayne T., 1975. Associate Professor of Music and The Shepherd Quartet
Soloist Diploma (1951) Juilliard School of Music

Culler, Marc, 1979. G.C. Evans Instructor of Mathematics
A.B. (1973) University of California at Santa Barbara; M.A. (1975), Ph.D. (1978) University of California at Berkeley

Cunningham, R. George, 1979. Lecturer in Architecture
B.S. (1952) University of Texas

Curl, Robert F., Jr., 1958. Professor of Chemistry and Associate of Lovett College
B.A. (1954) Rice Institute; Ph.D. (1957) University of California at Berkeley

Curtis, Doris M., 1980. Adjunct Professor of Geology
B.A. (1933) Brooklyn College; M.A. (1934), Ph.D. (1949) Columbia University

Curtis, Morton L., 1964. W.L. Moody, Jr., Professor of Mathematics and Associate of Brown College
B.S. (1943) Texas A&I University; Ph.D. (1951) University of Michigan

Cuthbertson, Gilbert Morris, 1963. Professor of Political Science and Resident Associate of Will Rice College
B.A. (1959) University of Kansas; Ph.D. (1963) Harvard University

Cyprus, Joel H., 1977. Lecturer in the Department of Electrical Engineering
B.A., B.S. (1959) Rice Institute; M.S. (1961), Ph.D. (1963) Rice University

Daichman, Graciela S., 1973. Lecturer in Spanish and Associate of Jones College
B.A. (1958) Instituto Nacional del Profesorado en Lenguas Vivas; M.A. (1975) Rice University

Danner, Ernie L., 1981. Adjunct Associate Professor of Accounting
B.A. (1976), Master of Accounting (1977) Rice University

Davesac, Bertrand M., 1979. Visiting Lecturer in Art and Curator of Rice Museum
B.A. (1957), Ph.D. (1971) Columbia University

Davidson, Chandler, 1966. Associate Professor of Sociology
B.A. (1961) University of Texas; M.A. (1966), Ph.D. (1969) Princeton University

Davis, Philip W., 1969. Professor of Anthropology and Linguistics
B.A. (1961) University of Texas; Ph.D. (1965) Cornell University

Davis, Sam H. Jr., 1957. Professor in the Department of Chemical Engineering, Professor of Mathematical Sciences, and Associate of Richardson College
B.A. (1952), B.S. (1953) Rice Institute; Sc.D. (1957) Massachusetts Institute of Technology

Deans, Harry Alexander, 1959. Adjunct Professor in the Department of Chemical Engineering
B.A. (1953), B.S. (1954) Rice Institute; Ph.D. (1960) Princeton University

De Bellas, Alfred F., 1981. Adjunct Associate Professor of Administrative Science
B.A. (1962) Brooklyn College; M.B.A. (1966) University of Pennsylvania

De Bremaecker, Jean-Claude, 1959. Professor of Geology and Associate of Jones College
Ingenieur Civil des Mines (1948) Louvain University, Belgium; M.S. (1950) Louisiana State University; Ph.D. (1952) University of California at Berkeley

de Figueiredo, Rui J. P., 1965. Professor in the Department of Electrical Engineering and Professor of Mathematical Sciences
S.B. (1950), S.M. (1952) Massachusetts Institute of Technology; Ph.D. (1959) Harvard University

Dennis, John E., 1979. Professor of Mathematical Sciences
B.S. (1962), M.S. (1964) University of Miami; Ph.D. (1966) University of Utah

DeSensi, Joy T., 1980. Assistant Professor of Health and Physical Education
B.A. (1967) West Liberty State College; M.A. (1969) Memphis State University; Ph.D. (1980) University of North Carolina at Greensboro

Dessler, Alexander J., 1963. Professor of Space Physics and Astronomy and Associate of Wiess College
B.S. (1952) California Institute of Technology; Ph.D. (1956) Duke University

deVecsey, Esther B., 1980. Assistant Professor of Art History
B.A. (1961), Certificate in Museum Studies (1973), M.A. (1975) University of California at Los Angeles

Deveraux, Mary L., 1981. Mellon Post-Doctoral Instructor of Philosophy
B.A. (1974) Dickinson College; M.A. (1976), Ph.D. (1981) University of Chicago

Dipboye, Robert, 1978. Associate Professor of Psychology and Associate of Baker College
B.A. (1968) Baylor University; M.A. (1969), Ph.D. (1973) Purdue University

Disch, James G., 1973. Associate Professor of Health and Physical Education and Associate of Baker College
B.S. (1969), M.Ed. (1970) University of Houston; P.E.D. (1973) Indiana University

Dix, Robert H., 1968. Professor of Political Science and Associate of Baker College
B.A. (1951), M.A. (1953), Ph.D. (1962) Harvard University

Dodds, Stanley A., 1977. Assistant Professor of Physics
B.S. (1968) Harvey Mudd College; Ph.D. (1975) Cornell University

Doody, Terrence Arthur, 1970. Associate Professor of English and Associate of Will Rice College
A.B. (1965) Providence College; M.A. (1969), Ph.D. (1970) Cornell University

Doughtie, Edward Orth, 1963. Associate Professor of English and Associate of Lovett College
A.B. (1958) Duke University; A.M. (1960), Ph.D. (1964) Harvard University

Douglas, Andrew Sholto, 1981. Assistant Professor in the Department of Mechanical Engineering
B.Sc. (1975), M.Sc. (1977) University of Cape Town, South Africa; Sc.M. (1979), Ph.D. (1981) Brown University

Dowden, Wilfred Sellers, 1950. Professor of English and Associate of Baker College
B.A. (1939), M.A. (1940) Vanderbilt University; Ph.D. (1949) University of North Carolina

Downs, Thomas D., 1971. Adjunct Professor of Mathematical Sciences
B.S. (1960) Western Michigan University; M.P.H. (1962), Ph.D. (1965) University of Michigan

Drew, Katherine Fischer, 1950. Professor of History
B.A. (1944), M.A. (1945) Rice Institute; Ph.D. (1950) Cornell University

Driskill, Linda P., 1970. Associate Professor of English and Administrative Science, Director of Continuing Studies, and Associate of Will Rice College
B.A. (1961), M.A. (1968), Ph.D. (1970) Rice University

Duck, Ian M., 1963. Professor of Physics
B.S. (1955) Queen's University, Canada; Ph.D. (1961) California Institute of Technology

Dufour, Reginald J., 1975. Associate Professor of Space Physics and Astronomy and Resident Associate of Lovett College
B.S. (1970) Louisiana State University; M.S. (1971), Ph.D. (1974) University of Wisconsin

Duke, Michael B., 1979. Adjunct Professor of Geology
B.S. (1957), M.S. (1961), Ph.D. (1963) California Institute of Technology

Duke, Reese Dale, 1966. Lecturer in Education and Director of Student Teaching
B.S. (1950) Ouachita Baptist College; M.Ed. (1954), Ph.D. (1966) University of Texas

Dunlap, William J., 1980. Adjunct Professor of Environmental Science
B.F.T. (1952) Texas A&M University; Ph.D. (1961) University of Oklahoma

Dunne, Carrin, 1975. Lecturer in Religious Studies
B.A. (1955) University of St. Thomas; M.A. (1965), Ph.D. (1970) University of Notre Dame

Dunning, F. Barry, 1972. Associate Professor of Physics and of Space Physics and Astronomy and Associate of Jones College
B.Sc. (1966), Ph.D. (1969) University College, England

Dyson, Derek C., 1966. Professor in the Department of Chemical Engineering
B.A. (1955) University of Cambridge, England; Ph.D. (1966) University of London, England

Eaker, Helen Lanneau, 1964. Lecturer in Classics and Associate of Hanszen College
B.A. (1944), Ph.D. (1955) University of North Carolina

Edwards, Edgar O., 1978. Henry Gardiner Symonds Professor of Administrative Science
B.A. (1947) Washington & Jefferson College; M.A. (1949), Ph.D. (1951) Johns Hopkins University

Eggert, Allen W., 1968. Lecturer in Health and Physical Education
B.S. (1963) Rice University; M.A. (1967) California Western University

Eifler, Margret, 1973. Associate Professor of German
B.A. (1962), M.A. (1964), Ph.D. (1969) University of California at Berkeley

Ellison, Paul V.H., 1975. Assistant Professor of Music
B.M.E. (1965) Eastern New Mexico University; M.M. (1966) Northwestern University

Engel, Paul S., 1970. Professor of Chemistry
B.S. (1964) University of California at Los Angeles; Ph.D. (1968) Harvard University

Estle, Thomas L., 1967. Professor of Physics
B.A. (1953) Rice Institute; M.S. (1954), Ph.D. (1957) University of Illinois

Ettelson, Meryl, 1976. Assistant Professor of Music
B.M. (1961), M.M. (1963) Indiana University

Eubank, Robert, 1980. Instructor of Political Science
B.A. (1968) Texas A&M University; M.A. (1979), Ph.D. (1981) Rice University

Evans, Elinor Lucile, 1964. Harry K. and Albert K. Smith Professor of Architecture
B.A. (1938) Oklahoma State University; M.F.A. (1954) Yale University

Ewing, Richard E., 1981. Adjunct Associate Professor of Mathematical Sciences
B.A. (1969), M.A. (1972), Ph.D. (1974) University of Texas

Few, Arthur A., 1970. Associate Professor of Space Physics and Astronomy and Environmental Science
B.S. (1962) Southwestern University; M.B.S. (1965) University of Colorado; Ph.D. (1969) Rice University

Fischer, Michael M. J., 1981. Associate Professor of Anthropology
B.A. (1967) Johns Hopkins University; Ph.D. (1973) University of Chicago

Fisher, Frank M., Jr., 1963. Professor of Biology
B.A. (1953) Hanover College; M.S. (1958), Ph.D. (1961) Purdue University

Fisher, G. D., 1973. Adjunct Professor in the Department of Chemical Engineering
B.S. (1957) University of Texas; Ph.D. (1965) Johns Hopkins University

Fliegel, Raphael N., 1975. Associate Professor of Music, The Shepherd Quartet, and Associate of Hanszen College

Frankowski, Ralph F., 1970. Adjunct Professor of Mathematical Sciences
B.S. (1957), M.S. (1959) DePaul University; M.P.H. (1962), Ph.D. (1967) University of Michigan

Frazier, Joe L., 1980. Lieutenant, U.S. Navy, and Assistant Professor of Naval Science
B.A. (1975) North Texas State University

Fred, Herbert L., M.D., 1974. Adjunct Professor of Health and Physical Education
B.A. (1950) Rice Institute; M.D. (1954) Johns Hopkins University School of Medicine

Freeman, John W., 1964. Professor of Space Physics and Astronomy and Master of Lovett College
B.S. (1957), M.S. (1961), Ph.D. (1963) University of Iowa

Freeman, Thomas F., 1972. Lecturer in Religious Studies
A.B. (1939) Virginia Union University; B.D. (1942) Andover Newton Theological School; Ph.D. (1948) University of Chicago

Fukuyama, Tohru, 1978. Assistant Professor of Chemistry
B.S. (1971), M.A. (1973) Nagoya University, Japan

Garcia, Charles Albert, 1974. Adjunct Instructor in the Department of Electrical Engineering
A.A. (1965) University of Florida; M.D. (1969) Tulane Medical School

Garside, Charles, Jr., 1966. Professor of History and Associate of Baker College
A.B. (1950) Princeton University; M.A. (1951) Columbia University; Ph.D. (1956) Yale University

Gehan, Edmund A., 1972. Adjunct Professor of Mathematical Sciences
B.A. (1951) Manhattan University; M.S. (1953), Ph.D. (1957) North Carolina State University

Gentle, James E., 1981. Adjunct Associate Professor of Mathematical Sciences
B.S. (1966) University of North Carolina; M.A. (1969) Louisiana State University; M.C.S. (1973), Ph.D. (1974) Texas A&M

Gesell, Thomas F., 1974. Adjunct Associate Professor of Environmental Science
B.S. (1965) San Diego State College; M.S. (1968), Ph.D. (1971) University of Tennessee

Ghazzaly, Osman I., 1972. Lecturer in Civil Engineering
B.S.C.E. (1958) University of Cairo, Egypt; M.S.C.E. (1963), Ph.D. (1966) University of Texas

Gibson, Kathleen R., 1981. Adjunct Associate Professor of Anthropology
B.A. (1963) University of Michigan; M.A. (1969), Ph.D. (1970) University of California at Berkeley

Glantz, Raymon M., 1969. Professor of Biology
B.A. (1963) Brooklyn College; M.S. (1964), Ph.D. (1966) Syracuse University

Glass, Graham P., 1967. Associate Professor of Chemistry
B.S. (1960) Birmingham University, England; Ph.D. (1963) Cambridge University, England

Godfrey, H. Lee, 1980. Lecturer in Political Science
B.A. (1966) University of Texas; J.D. (1969) University of Texas School of Law

Gonzalez, Ruben D., 1981. Dorothy Richard Starling Professor of Violin
Diploma (1962) Conservatorio Municipal Buenos Aires; Diploma of Honor (1964) Accademia Chigiana Siena, Italy

Gordon, Chad, 1970. Professor of Sociology and Associate of Hanszen College
B.S. (1957), M.A. (1962), Ph.D. (1963) University of California at Los Angeles

Gordon, William E., 1966. Professor of Electrical Engineering and of Space Physics and Astronomy, Dean of the School of Natural Sciences, and Associate of Baker College
B.A. (1939), M.A. (1942) Montclair State College; M.S. (1946), Ph.D. (1953) Cornell University

Gorry, G. Anthony, 1976. Adjunct Professor of Mathematical Sciences
B.E. (1962) Yale University; M.S. (1963) University of California at Berkeley; Ph.D. (1967) Massachusetts Institute of Technology

Gosain, Narendra K., 1981. Lecturer in Civil Engineering
B.A. (1963) University of Rajasthan, India; M.A. (1965) University of Roorkee, India; Ph.D. (1973) Rice University

Gottschalk, Arthur W., 1977. Assistant Professor of Music
B.Mus. (1974), M.A. (1975), D.M.A. (1978) University of Michigan

Grandy, Richard E., 1980. Professor of Philosophy
B.A. (1963) University of Pittsburgh; M.A. (1965), Ph.D. (1968) Princeton University

Greanias, George C., 1977. Assistant Professor of Administrative Science and Resident Associate of Wiess College
B.A. (1970) Rice University; J.D. (1973) Harvard Law School

Grob, Alan, 1961. Professor of English and Associate of Hanszen College
B.A.(1952) Utica College; M.A. (1957), Ph.D. (1961) University of Wisconsin

Gruber, Ira Dempsey, 1966. Professor of History and Associate of Hanszen College
A.B. (1955), M.A. (1959), Ph.D. (1961) Duke University

Guderian, Mack D., 1976. Lecturer in Music
B.M.E. (1966) Texas Christian University; M.Ed. (1972) North Texas State University

Hacker, Carl S., 1973. Adjunct Associate Professor of Mathematical Sciences
B.S. (1963) William and Mary University; Ph.D. (1968) Rice University

Hackerman, Norman, 1970. Professor of Chemistry and President of the University
A.B. (1932), Ph.D. (1935) Johns Hopkins University

Hallam, John S., 1981. Assistant Professor of Art History
B.A. (1970) Seattle University; M.A. (1974), Ph.D. (1979) University of Washington

Hannon, James P., 1967. Professor of Physics
B.A. (1962), M.A. (1965), Ph.D. (1967) Rice University

Hanson, Alice M., 1977. Assistant Professor of Music
B.A. (1971) Wells College; M.M. (1973), Ph.D. (1980) University of Illinois

Harcombe, Paul A., 1972. Associate Professor of Biology
B.S. (1967) Michigan State University; Ph.D. (1973) Yale University

Harkins, Carl Girvin, 1968. Adjunct Assistant Professor of Materials Science
B.A. (1960) McMurry College; M.A. (1962), Ph.D. (1964) Johns Hopkins University

Harmon, Thomas L., 1980. Lecturer in the Department of Electrical Engineering
B.S.E.E. (1965) University of Maryland; Ph.D. (1972) Rice University

Harvey, F. Reese, 1968. Professor of Mathematics
B.S., M.A. (1963) Carnegie Institute of Technology; Ph.D. (1966) Stanford University

Haskell, Thomas L., 1970. Associate Professor of History and Associate of Richardson College
B.A. (1961) Princeton University; Ph.D. (1973) Stanford University

Havens, Neil, 1964. Professor of Drama and Honorary Associate of Jones College
B.A. (1956) Rice Institute; M.A. (1959) Indiana University

Haymes, Robert C., 1964. Professor of Space Physics and Astronomy and Associate of Baker College
B.A. (1952), M.S. (1953), Ph.D. (1959) New York University

Hazelwood, Carlton F., 1970. Adjunct Professor of Physics
B.S. (1957) Texas A&M University; Ph.D. (1962) University of Tennessee Medical Units at Memphis

Hellums, Jesse David, 1960. Professor of Chemical Engineering, Dean of the George R. Brown School of Engineering, and Associate of Wiess College
B.S. (1950), M.S. (1958) University of Texas; Ph.D. (1961) University of Michigan

Hempel, John, 1964. Professor of Mathematics
B.S. (1957) University of Utah; M.S. (1959), Ph.D. (1962) University of Wisconsin

Heymann, Dieter, 1966. Professor of Geology and of Space Physics and Astronomy and Associate of Lovett College
M.S. (1954), Ph.D. (1958) University of Amsterdam, Netherlands

Higginbotham, Sanford Wilson, 1961. Professor of History
B.A. (1934) Rice Institute; M.A. (1941) Louisiana State University; Ph.D. (1949) University of Pennsylvania

Hightower, Joe W., 1967. Professor in the Department of Chemical Engineering and Associate of Baker College
B.S. (1959) Harding College; M.A. (1961), Ph.D. (1963) Johns Hopkins University

Hirasaki, George J., 1977. Lecturer in the Department of Chemical Engineering
B.S. (1963) Lamar University; Ph.D. (1967) Rice University

Hirschberg, Daniel S., 1975. Assistant Professor of Computer Science in the Department of Electrical Engineering
B.E. (1971) City College of New York; M.A., M.S.E. (1973), Ph.D. (1975) Princeton University

Holibaugh, Ralph W., 1978. Lecturer in Music and Head of Music Library
B.A. (1964) University of Cincinnati; M.A. (1975) Kent State University; M.S.L.S. (1975) University of Illinois

Holloway, Clyde, 1977. Professor of Music
B.Mus. (1957), M.Mus. (1959) University of Oklahoma; D.S.M. (1974) Union Theological Seminary

Holt, Edward C., 1956. Associate Professor of Civil Engineering, Proctor, and Associate of Richardson College
S.B. (1945), S.M. (1947) Massachusetts Institute of Technology; Ph.D. (1956) Pennsylvania State University

Howell, William C., 1968. Professor of Psychology and Administrative Science
B.A. (1954), M.A. (1956), Ph.D. (1958) University of Virginia

Hrdy, Sarah Blaffer, 1981. Visiting Associate Professor of Anthropology
A.B. (1969) Radcliffe College; Ph.D. (1975) Harvard University

Hsi, Bartholomew P., 1973. Adjunct Professor of Mathematical Sciences
M.A. (1962), Ph.D. (1964) University of Minnesota

Hsu, Laura H., 1980. Instructor of Biology
B.S. (1961) Acadia University, Canada; M.S. (1964) Cornell University; Ph.D. (1974) University of Miami

Huang, Huey W., 1973. Associate Professor of Physics
B.S. (1962) National Taiwan University; Ph.D. (1967) Cornell University

Huberman, Brian Michael, 1975. Lecturer in Art and Associate of Will Rice College
Certificate (1974) National Film School of Great Britain

Huddle, Don, 1964. Professor of Economics
B.S. (1959), M.A. (1960) University of California at Berkeley; Ph.D. (1964) Vanderbilt University

Hudson, Jackie L., 1980. Assistant Professor of Health and Physical Education
B.A. (1971) University of Texas; M.A. (1974) Purdue University; Ph.D. (1980) Temple University

Hudspeth, C.M., 1947. Lecturer in Political Science and Associate of Wiess College
B.A. (1940) Rice Institute; J.D. (1946) University of Texas

Huston, J. Dennis, 1969. Professor of English and Master of Hanszen College
B.A. (1961) Wesleyan University; M.A. (1964), Ph.D. (1966) Yale University

Hyland, Richard Preston, 1979. Assistant Professor of History
A.B. (1966), M.A. (1968) University of California at Santa Barbara; Ph.D. (1979) University of California at Berkeley

Hyman, Harold M., 1968. William P. Hobby Professor of History and Associate of Lovett College
B.A. (1948) University of California at Los Angeles; M.A. (1950), Ph.D. (1952) Columbia University

Iammarino, Nicholas K., 1978. Assistant Professor of Health Education and Resident Associate of Richardson College
B.S. (1973) University of Dayton; M.Ed. (1975) University of Toledo; Ph.D. (1978) Ohio State University

Isle, Walter Whitfield, 1962. Professor of English and Associate of Brown College
A.B. (1955) Harvard University; M.A. (1957) University of Michigan; Ph.D. (1961) Stanford University

Jaco, William H., 1970. Professor of Mathematics and Associate of Brown College
B.A. (1962) Fairmont State College; M.A. (1964) Pennsylvania State University; Ph.D. (1968) University of Wisconsin

Jansson, Birger, 1975. Adjunct Professor of Mathematical Sciences
B.A. (1946), Ph.D. (1965) University of Stockholm, Sweden

Johnson, Don Herrick, 1977. Assistant Professor in the Department of Electrical Engineering and Associate of Will Rice College
S.B., S.M. (1970), E.E. (1971), Ph.D. (1974) Massachusetts Institute of Technology

Johnson, L. Todd, 1970. Associate Professor of Accounting
B.S. (1964) Arizona State University; M.B.A. (1965), Ph.D. (1972) University of Michigan

Johnston, Dennis A., 1974. Adjunct Assistant Professor of Mathematical Sciences
B.S. (1965) Arlington State College; M.A. (1966) University of Texas; Ph.D. (1971) Texas Tech University

Jones, B. Frank, Jr., 1962. Noah Harding Professor of Mathematics
B.A. (1958) Rice Institute; Ph.D. (1961) Rice University

Jones, Robert, 1981. Assistant Professor of English
B.A. (1970) Memphis State University; M.A. (1972) Southern Illinois University; Ph.D. (1981) University of Wisconsin

Jones, Roy G., 1967. Associate Professor of Russian
B.A. (1954), M.A. (1954) East Texas State University; Ph.D. (1965) University of Texas

Jones, Samuel, 1973. Professor of Music and Honorary Associate of Lovett College
B.A. (1957) Millsaps College; M.A. (1958), Ph.D. (1960) Eastman School of Music, University of Rochester

Jost, Robert J., 1980. Adjunct Assistant Professor of Space Physics and Astronomy
B.S. (1974) Portland State University; M.A. (1977), Ph.D. (1979) Rice University

Jump, J. Robert, 1968. Professor of Computer Science in the Department of Electrical Engineering and Associate of Will Rice College
B.S. (1960), M.S. (1962) University of Cincinnati; M.S. (1965), Ph.D. (1968) Michigan State University

Kahn, Edward B., 1979. Adjunct Assistant Professor of Psychology
B.S. (1969), M.A. (1975), Ph.D. (1977) University of Houston

Karff, Samuel E., 1979. Adjunct Professor of Religious Studies
A.B. (1949) Gratz College of Jewish Studies; A.B. (1953) Harvard College; M.A.H.L. (1956), D.H.L. (1961) Hebrew Union College

Kauffmann, Robert Lane, 1976. Assistant Professor of Spanish and Associate of Hanszen College
B.A. (1970) Princeton University; Ph.D. (1981) University of California at San Diego

Keeley, Jack W., 1980. Adjunct Professor in the Department of Environmental Science and Engineering
B.S. (1957) University of Oklahoma; S.M. (1958) Harvard University

Kelber, Werner H., 1973. Turner Professor of Religious Studies
M.T. (1963) Princeton Theological Seminary; M.A. (1967), Ph.D. (1970) University of Chicago

Kendall, Richard P., 1981. Adjunct Assistant Professor of Mathematical Sciences
B.A. (1963), M.A. (1969) University of Texas; M.A. (1970), Ph.D. (1972) Rice University

Kennedy, Kenneth W., Jr., 1971. Professor of Computer Science in the Department of Mathematical Sciences and Associate of Jones College
B.A. (1967) Rice University; M.S. (1969), Ph.D. (1971) New York University

Kerner, Charles Henry, 1977. Lecturer in Architecture
B.Arch. (1948) University of Michigan

Kilpatrick, John E., 1947. Professor of Chemistry and Mathematical Sciences
B.A. (1940) Stephen F. Austin State University; A.M. (1942) University of Kansas; Ph.D. (1945) University of California at Berkeley

Kim, Dae Mann, 1970. Professor in the Department of Electrical Engineering
B.S. (1960) Seoul National University, Korea; M.S. (1965), Ph.D. (1967) Yale University

Kiperman, Anita. Lecturer in Spanish
B.A. (1957) Universidad Nacional de Buenos Aires; M.A. (1971) University of Houston

Klineberg, Stephen L., 1972. Associate Professor of Sociology and Associate of Lovett College
B.A. (1961) Haverford College; M.A. (1963) University of Paris, France; Ph.D. (1966) Harvard University

Kobayashi, Riki, 1951. Louis Calder Professor in the Department of Chemical Engineering and Associate of Will Rice College
B.S. (1944) Rice Institute; M.S.E. (1947), Ph.D. (1951) University of Michigan

Koenig, Warren, 1979. Adjunct Professor in the Department of Chemical Engineering
B.S. (1949) University of Nebraska; Ph.D. (1953) University of Washington

Kolenda, Konstantin, 1953. Carolyn and Fred McManis Professor of Philosophy
B.A. (1950) Rice Institute; Ph.D. (1953) Cornell University

Konrad, Linn B., 1980. Assistant Professor of French
B.A. (1968) University of Oslo, Norway; M.A. (1972) University of Wisconsin at Milwaukee; Ph.D. (1978) University of Minnesota

Kulstad, Mark, 1975. Associate Professor of Philosophy and Associate of Hanszen College
B.A. (1969) Macalester College; Ph.D. (1975) University of Michigan

Kurtzman, Jeffrey G., 1975. Associate Professor of Music and Master of Baker College
B.M. (1963) University of Colorado; M.M. (1967), Ph.D. (1972) University of Illinois

Lairson, David Robert, 1977. Adjunct Associate Professor of Economics
B.A. (1970), M.A., Ph.D. (1975) University of Kentucky

Lamb, Sydney M., 1981. Professor of Linguistics and Semiotics
B.A. (1951) Yale University; Ph.D. (1958) University of California at Berkeley

Lande, Arnold J., 1980. Adjunct Lecturer in the Department of Electrical Engineering
B.A. (1953) Amherst University; M.D. (1962) Western Reserve University

Lane, David M., 1976. Assistant Professor of Psychology and Associate of Lovett College
B.A. (1971) Clark University; M.A. (1973) Tufts University; Ph.D. (1977) Tulane University

Lane, Neal F., 1966. Professor of Physics
B.S. (1960), M.S. (1962), Ph.D. (1964) University of Oklahoma

Lawrie, Gerald M., 1980. Adjunct Associate Professor of Mechanical Engineering
M.B.B.S. (1969) Sydney University, Australia

Leal, Maria Teresa, 1965. Professor of Spanish and Portuguese
B.A. (1946) Pontifica Universidad Catolica, Brazil; Ph.D. (1963) Universidade de Federal de Rio de Janeiro, Brazil

Lee, Eva J., 1969. Associate Professor of Health and Physical Education, Director of Equal Employment Opportunity Programs, and Resident Associate of Jones College
B.S. (1962) North Texas State University; M.Ed. (1967) Sam Houston State University; Ed.D. (1974) Louisiana State University

Leeds, J. Venn, Jr., 1964. Professor of Electrical and Environmental Engineering
B.A. (1955), B.S.E.E. (1956) Rice Institute; M.S.E.E. (1960), Ph.D. (1963) University of Pittsburgh; J.D. (1972) University of Houston

Leeman, William P., 1977. Associate Professor of Geology and Associate of Will Rice College
B.A. (1967), M.A. (1969) Rice University; Ph.D. (1974) University of Oregon

Leland, Thomas W., Jr., 1954. Professor in the Department of Chemical Engineering and Associate of Jones College
B.S. (1947) Texas A&M University; M.S.E. (1949) University of Michigan; Ph.D. (1953) University of Texas

Levin, Donald N., 1963. Professor of Classics
B.A. (1949), M.A. (1952) Cornell University; M.A. (1954), Ph.D. (1957) Harvard University

Lewis, Edward S., 1948. Professor of Chemistry
B.S. (1940) University of California at Berkeley; Ph.D. (1947) Harvard University

Lodge, Charles D., 1981. Commander, U.S. Navy, NROTC Executive Officer, and Associate Professor of Naval Science
B.S. (1962) Rice University; M.S. (1970) U.S. Naval Post Graduate School

Loewenheim, Francis Lippmann, 1959. Professor of History
A.B. (1947), A.M. (1948) University of Cincinnati; Ph.D. (1952) Columbia University

Long, Elizabeth, 1978. Assistant Professor of Sociology and Associate of Brown College
B.A. (1966) Stanford University; M.A. (1974), Ph.D. (1979) Brandeis University

Lord, Tom F., 1971. Lecturer in Architecture
B.A. (1960) Southern Methodist University; B.D. (1960), M.A. (1965) Yale University

Lutes, Loren D., 1967. Professor in the Department of Civil Engineering
B.S. (1960), M.S. (1961) University of Nebraska; Ph.D. (1967) California Institute of Technology

Lynch, Edward C., 1970. Adjunct Professor in the Biomedical Engineering Laboratory
A.B. (1953), M.D. (1956) University of Washington

Mandel, James P., 1978. Assistant Professor of Administrative Science and Associate of Hanszen College
B.S. (1967), M.B.A. (1969), Ph.D. (1973) University of Illinois

Marcus, George E., 1975. Associate Professor of Anthropology and Associate of Richardson College
B.A. (1968) Yale University; Ph.D. (1976) Harvard University

Margrave, John L., 1963. Professor of Chemistry and Vice-President of Advanced Studies and Research
B.S. (1948), Ph.D. (1951) University of Kansas

Marowsky, Gerd H., 1980. Adjunct Professor in the Department of Electrical Engineering
B.S. (1966) Technical University, Germany; Ph.D. University of Gottingen, Germany

Martin, Joseph P., 1981. Assistant Professor of Biology
A.B. (1973) Harvard University; Ph.D. (1979) Duke University

Martin, R. Russell, 1977. Adjunct Professor in the Biomedical Engineering Laboratory
A.B. (1956) Yale University; M.D. (1960) Medical College of Georgia

Martin, William C., 1968. Professor of Sociology
A.B. (1958), A.M. (1960) Abilene Christian College; B.D. (1963) Harvard Divinity School; Ph.D. (1969) Harvard University

Mascarenhas, Briance, 1980. Assistant Professor of Administrative Science
B.A. (1975) Warren Wilson College; M.B.A. (1976) University of South Florida; M.A. (1978), Ph.D. (1980) University of California at Berkeley

Mattern, Ruth, 1981. Associate Professor of Philosophy
B.A. (1971) Carleton College; Ph.D. (1975) Princeton University

Matthews, Kathlene Shive, 1972. Associate Professor of Biochemistry and Associate of Hanszen College
B.S. (1966) University of Texas; Ph.D. (1970) University of California at Berkeley

Matusow, Allen Joseph, 1963. Professor of History, Dean of the School of Humanities, and Associate of Jones College
B.A. (1958) Ursinus College; M.A. (1959), Ph.D. (1963) Harvard University

Mauldin, Charles R., 1980. Adjunct Associate Professor of Administrative Science
B.A. (1963) Texas A&M University; M.A. (1970), Ph.D. (1972) University of Missouri

McEvilley, Thomas, 1969. Visiting Lecturer in Art History
B.A. (1963) University of Cincinnati; M.A. (1965) University of Washington; Ph.D. (1968) University of Cincinnati

McIntire, Larry V., 1970. Professor in the Department of Chemical Engineering and Associate of Hanszen College
B.Ch.E., M.S. (1966) Cornell University; M.A. (1968), Ph.D. (1970) Princeton University

McIntosh, Roderick J., 1980. Assistant Professor of Anthropology
B.A. (1973) Yale University; M.Litt. (1975), Ph.D. (1979) Trinity College, University of Cambridge, England

McIntosh, Susan Keech, 1980. Adjunct Assistant Professor of Anthropology
B.A. (1975) Girton College, University of Cambridge; M.A. (1976), Ph.D. (1979) University of California at Santa Barbara

McLellan, Rex B., 1964. Professor of Materials Science and Associate of Brown College
B.Met. (1957) Sheffield University, England; Ph.D. (1962) Leeds University, England

Meixner, John, 1968. Professor of English
B.A. (1951) City College of New York; M.A. (1953), Ph.D. (1957) Brown University

Merwin, John E., 1955. Professor in the Department of Civil Engineering and Associate of Wiess College
B.A. (1952), B.S.M.E. (1953), M.S.M.E. (1955) Rice Institute; Ph.D. (1962) University of Cambridge, England

Michel, F. Curtis, 1963. Andrew Hays Buchanan Professor of Astrophysics in the Departments of Space Physics and Astronomy and of Physics and Associate of Wiess College
B.A. (1955), Ph.D. (1962) California Institute of Technology

Middleton, David, 1981. Adjunct Professor of Mathematical Sciences
B.A. (1942), M.A. (1945), Ph.D. (1947) Harvard University

Miele, Angelo, 1964. Professor of Astronautics and Mathematical Sciences
Dr. C.E. (1944), Dr. A.E. (1946) University of Rome, Italy

Mieszkowski, Peter, 1981. Allyn R. and Gladys M. Clive Professor of Economics and Finance
B.S. (1957), M.A. (1959) McGill University; Ph.D. (1963) Johns Hopkins University

Miettinen, Hannu E., 1977. Assistant Professor of Physics
Fil. Kand. (1967), Fil. Lic. (1971) University of Helsinski, Finland; Ph.D. (1975) University of Michigan

Milburn, Ellsworth, 1975. Associate Professor of Music and Associate of Baker College
A.B. (1962) University of California at Los Angeles; M.A. (1968) Mills College; D.M.A. College-Conservatory of Music, University of Cincinnati

Miller, Dennis R., 1980. Visiting Lecturer in Music

Mitchell, O. Jack, 1966. Professor of Architecture, Dean of the School of Architecture, and Associate of Richardson College
B.Arch. (1954) Washington University; M.Arch., M.C.P. (1961) University of Pennsylvania

Mixon, John, 1970. Lecturer in Architecture
B.B.A. (1952) Stephen F. Austin State University; J.D. (1955) University of Houston; L.L.M. (1962) Yale University

Modrak, Deborah, 1974. Assistant Professor of Philosophy
B.A. (1970) George Washington University; M.A. (1971), Ph.D. (1974) University of Chicago

Moore, Walter P., Jr., 1975. Lecturer in Civil Engineering
B.A. (1959), B.S.C.E. (1960) Rice University; M.S. (1962), Ph.D. (1964) University of Illinois

Morris, Wesley Abram, 1968. Professor of English and Associate of Richardson College
B.A. (1961), M.A. (1963) University of Kentucky; Ph.D. (1968) University of Iowa

Mukamel, Shaul, 1978. Associate Professor of Chemistry
B.S. (1969), M.S. (1971), Ph.D. (1976) Tel-Aviv University, Israel

Murphy, Paul H., 1979. Adjunct Assistant Professor in the Department of Electrical Engineering
A.B. (1965) Northeastern University; M.S. (1968), Ph.D. (1970) University of Kansas

Mutchler, Gordon S., 1968. Associate Professor of Physics
B.S. (1960), Ph.D. (1966) Massachusetts Institute of Technology

Nelson, Deborah Hubbard, 1974. Associate Professor of French and Associate of Brown College
B.A. (1960) Wittenberg University; Certificat d'etudes Francaises, ler Degre (1961) University of Grenoble, France; M.A. (1964), Ph.D. (1970) Ohio State University

Nielsen, Niels C., 1951. J. Newton Rayzor Professor of Philosophy and Religious Thought
B.A. (1942) George Pepperdine University; Ph.D. (1951) Yale University

Nitzsche, Jane Chance, 1973. Professor of English
B.A. (1967) Purdue University; M.A. (1968), Ph.D. (1971) University of Illinois

Norris, Mary, 1975. Associate Professor of Music
Artists Diploma in Piano (1939) Curtis Institute of Music

Oldow, John Steven, 1978. Assistant Professor of Geology
B.S. (1972) University of Washington; Ph.D. (1978) Northwestern University

Oliver-Smith, Philip, 1969. Professor of Art History
B.A. (1937), M.A. (1950) University of California at Berkeley; Ph.D. (1969) New York University

Olson, John D., 1980. Adjunct Associate Professor in the Biomedical Engineering Laboratory
B.A. (1966) University of Colorado; B.S. (1968) University of North Dakota; M.D. (1970) Georgetown University; Ph.D. (1976) Mayo Graduate School of Medicine, University of Minnesota

Olson, John Steven, 1973. Associate Professor of Biochemistry and Associate of Hanszen College
B.S. (1968) University of Illinois; Ph.D. (1972) Cornell University

Pagnucci, Mirta, 1978. Lecturer in Italian
B.A. (1969) Northern Illinois University; M.A. (1972), Ph.D. (1981) University of Wisconsin

Palmer, Graham A., 1974. Professor of Biochemistry and Associate of Richardson College
B.S. (1957), Ph.D. (1962) University of Sheffield, England

Papademetriou, Peter C., 1968. Associate Professor of Architecture
B.A. (1965) Princeton University; M.Arch. (1968) Yale University

Papoutsakis, Eleftherios E., 1980. Assistant Professor in the Department of Chemical Engineering
Diploma of Chemical Engineering (1974) National Technical University of Athens; M.S. (1976), Ph.D. (1980) Purdue University

Parks, Thomas W., 1967. Professor in the Department of Electrical Engineering
B.E.E. (1961), M.S. (1964), Ph.D. (1967) Cornell University

Parry, Ronald J., 1978. Associate Professor of Chemistry
B.A. (1964) Occidental College; Ph.D. (1968) Brandeis University

Parsons, Spencer W., 1969. Associate Professor of Architecture
B.A. (1953) University of Michigan; M.Arch. (1963) Harvard University

Pasley, Paul Robert, 1979. Adjunct Professor of Mechanical Engineering
B.S. (1950) Louisiana State University; M.S. (1952) Rice Institute; Sc.D. (1955) Massachusetts Institute of Technology

Patten, Robert L., 1969. Professor of English and Associate of Baker College
B.A. (1960) Swarthmore College; M.A. (1962), Ph.D. (1965) Princeton University

Pearlman, Michael, 1980. Instructor of Computer Science in the Department of Electrical Engineering
B.S. (1975) Carlton University, Canada; M.S. (1978), Ph.D. (1981) Cornell University

Pearson, James Boyd, Jr., 1965. Professor in the Department of Electrical Engineering
B.S.E.E. (1958), M.S.E.E. (1959) University of Arkansas; Ph.D. (1962) Purdue University

Peeler, Thomas G., 1979. Captain, U.S. Marine Corps, and Assistant Professor of Naval Science
B.A. (1974) Southern Illinois University

Perez, J. Bernardo, 1979. Instructor of Spanish
Licenciatura (1972) Universidad de Granada, Spain; M.A. (1974) University of Iowa

Perrine, Richard H., 1975. Adjunct Associate Professor of Architecture, Assistant Librarian for Planning, Head of Reference/Collection Development Services, and University Associate of Hanszen College
B.F.A. in Arch. (1940) Yale University; M.L.S. (1961) University of Texas

Peterson, Dolores M., 1979. Adjunct Associate Professor in the Biomedical Engineering Laboratory
B.A. (1957) North Texas State University; M.S. (1968), Ph.D. (1972) University of Texas Graduate School of Biomedical Science

Pfeiffer, Paul E., 1947. Professor of Mathematical Sciences and Electrical Engineering and Associate of Brown College
B.S.E.E. (1938) Rice Institute; B.D. (1943) Southern Methodist University; M.S.E.E. (1948), Ph.D. (1952) Rice Institute

Pharr, George M., 1980. Assistant Professor of Materials Science
B.S.M.E. (1975) Rice University; M.S.M.S. (1977), Ph.D. (1979) Stanford University

Phillips, Gerald C., 1949. Professor of Physics
B.A. (1944), M.A. (1947), Ph.D. (1949) Rice Institute

Philpott, Charles William, 1964. Professor of Biology and Associate of Baker College
B.A. (1957), M.S. (1958) Texas Technological College; Ph.D. (1962) Tulane University

Pickar, Richard W., 1976. Associate Professor of Music
B.A. (1956) University of California at Los Angeles; Diploma (1957) Akademie fur Musik und darstellende Kunst, Austria; M.A. (1964) Sam Houston State University

Pier, Stanley M., 1974. Adjunct Associate Professor of Environmental Science
B.S. (1948) Brooklyn College; M.S. (1949), Ph.D. (1952) Purdue University

Piper, William Bowman, 1969. Professor of English
B.A. (1951) Harvard University; M.A. (1952) Columbia University; Ph.D. (1958) University of Wisconsin

Poindexter, Hally Beth W., 1965. Professor of Health and Physical Education and Associate of Jones College
B.A. (1947) Rice Institute; B.S. (1949) University of Houston; M.A. (1950) University of Northern Colorado; Ed.D. (1957) Columbia University

Polking, John C., 1968. Professor of Mathematics and Associate of Baker College
B.S. (1956) University of Notre Dame; M.S. (1961), Ph.D., 1966) University of Chicago

Pool, Robert E., 1981. Instructor of Mathematics
B.A. (1977), Ph.D. (1981) Rice University

Poulos, Basilios N., 1975. Assistant Professor of Art and Associate of Brown College
B.F.A. (1965) Atlanta School of Art; M.F.A. (1968) Tulane University

Preston, John, 1981. Lecturer in Architecture
B.A. (1965) Williams College; M.B.A. (1970) Harvard Graduate School of Business

Preston, Kay, 1979. Lecturer in Accounting
B.A. (1975), Master of Accounting (1976) Rice University

Procunier, James D., 1979. Assistant Professor of Biology
B.S. (1966), M.S. (1968) University of British Columbia, Canada; Ph.D. (1973) University of Calgary, Canada

Quiocho, Florante A., 1972. Professor of Biochemistry and Associate of Will Rice College
B.S. (1959) Central Philippine University; M.S. (1961) Howard University; Ph.D. (1966) Yale University

Raaphorst, Madeleine Rousseau, 1963. Professor of French
Baccalauréat ès lettres (1939) Université de Pointiers, France; Licence en droit (1943) Université de Paris, France; Ph.D. (1959) Rice Institute

Rabson, Thomas Avelyn, 1959. Professor of Electrical Engineering
B.A. (1954), B.S.E.E. (1955), M.A. (1957), Ph.D. (1959) Rice Institute

Rachford, Henry H., Jr., 1964. Professor of Mathematical Sciences
B.S. (1945), M.A. (1947) Rice Institute; Sc.D. (1950) Massachusetts Institute of Technology

Rathjen, Diana Pickett, 1972. Adjunct Assistant Professor of Psychology
B.A. (1968) University of Chicago; Ph.D. (1972) University of Texas

Richards, Gwyn, 1980. Visiting Instructor of Music, Conductor of the Rice Chorale, and Assistant to the Dean of the Shepherd School of Music
B.Mus. (1973), M.Mus. (1974) University of Michigan

Rimlinger, Gaston V., 1960. Reginald Henry Hargrove Professor of Economics and Associate of Lovett College
B.A. (1951) University of Washington; Ph.D. (1956) University of California at Berkeley

Roberts, Jabus B., Jr., 1975. Associate Professor of Physics
B.A. (1965) Columbia University; Ph.D. (1969) University of Pennsylvania

Roberts, John M., 1959. Professor of Materials Science and Associate of Hanszen College
B.A.Sc. (1953), M.A.Sc. (1954) University of Toronto, Canada; Ph.D. (1960) University of Pennsylvania

Roney, Lois, 1980. Visiting Assistant Professor of English
B.A. (1961) Stanford University; M.A. (1965) University of Chicago; Ph.D. (1978) University of Wisconsin

Rorschach, Harold E., 1952. Sam and Helen Worden Professor of Physics and Associate of Hanszen College
S.B. (1949), S.M. (1950), Ph.D. (1952) Massachusetts Institute of Technology

Rose, Beatrice S., 1977. Lecturer in Music

Rosenberg, Michael, 1977. Assistant Professor of Music
B.M. (1976) Northwestern University

Ross, David, III, 1979. Adjunct Associate Professor of Administrative Science
B.A. (1962) Yale University; M.B.A. (1970) Harvard University

Rowe, Peter G., 1972. Associate Professor of Architecture and Director of the School of Architecture
B.Arch. (1967) Melbourne University, Australia; M.Arch. in Urban Design (1971) Rice University

Rowley, Richard L., 1978. Assistant Professor in the Department of Chemical Engineering and Associate of Baker College
B.S. (1974) Brigham Young University; Ph.D. (1978) Michigan State University

Rudolph, Frederick B., 1972. Associate Professor of Biochemistry and Associate of Brown College
B.S. (1966) University of Missouri; Ph.D. (1971) Iowa State University

Saltzberg, Bernard, 1977. Adjunct Professor in the Department of Electrical Engineering
B.S. (1952), M.S. (1953) Illinois Institute of Technology; Ph.D. (1972) Marquette University

Sanborn, Hugh W., 1973. Adjunct Assistant Professor of Religious Studies
A.B. (1962) Muhlenberg College; B.D. (1967) Andover Newton Theological Seminary, Ph.D. (1975) University of Iowa

Sanders, M. Elizabeth, 1977. Assistant Professor of Political Science and Associate of Richardson College
B.A. (1964) Auburn University; M.A. (1969) Georgetown University; M.A. (1976), Ph.D. (1978) Cornell University

Sass, Ronald L., 1958. Professor of Biology and Chemistry, Honorary Associate of Hanszen College, and Associate of Jones College
A.B. (1954) Augustana College; Ph.D. (1957) University of Southern California

Sawyer, David R., 1979. Lieutenant Colonel, U.S. Army, and Professor of Military Science
B.S. (1963) Northeastern University; M.A. (1973) University of Connecticut

Schaezler, Donald J., 1979. Adjunct Associate Professor in the Department of Environmental Science and Engineering and Adjunct Associate Professor in the Department of Chemical Engineering
B.A. (1966), B.S. (1967), Ph.D. (1970) Rice University

Schnoebelen, Anne, 1974. Professor of Music
B.A. (1958) Rosary College; M.Mus. (1960), Ph.D. (1966) University of Illinois

Schreiber, Janet M., 1976. Adjunct Associate Professor of Anthropology
B.A. (1968) University of California at Los Angeles; M.A. (1970), Ph.D. (1973) University of California at Berkeley

Schroder, G.D., 1979. Adjunct Associate Professor of Biology
B.A. (1967), M.A. (1970) Rice University; Ph.D. (1974) University of New Mexico

Schroepfer, George J., Jr., 1972. Professor of Biochemistry and Chemistry
B.S. (1955), M.D. (1957), Ph.D. (1961) University of Minnesota

Schuberth, Richard, 1977. Assistant Professor of Psychology and Associate of Will Rice College
B.A. (1971) Bowdoin College; Ph.D. (1977) Brown University

Schum, David A., 1966. Professor of Psychology and Mathematical Sciences and Associate of Jones College
B.A. (1956), M.A. (1961) Southern Methodist University; Ph.D. (1964) Ohio State University

Schwarzer, Rudy R., 1974. Adjunct Associate Professor of Geology
B.S. (1963), M.S. (1966), Ph.D. (1969) Rensselaer Polytechnic Institute

Scott, David W., 1979. Associate Professor of Mathematical Sciences
B.A. (1972), M.A., Ph.D. (1976) Rice University

Scoular, David N., 1974. Lecturer in Architecture
B.A. (1964), M.Arch. (1967) Washington University; M.S.Arch. (1968) Columbia University

Sellers, James, 1971. David Rice Professor of Ethics
B.E.E. (1947) Georgia Institute of Technology; M.S. (1952) Florida State University; Ph.D. (1958) Vanderbilt University

Shalen, Peter B., 1974. Associate Professor of Mathematics and Associate of Hanszen College
B.A. (1966), Ph.D. (1972) Harvard University

Sherman, Jerome N., 1973. Lecturer in Religious Studies
B.A. (1958) Harvard College; B.H.L. (1960), M.A.H.L. (1963) Hebrew Union College; M.A. (1964) Boston University; Ph.D. (1968) University of Houston

Sims, James R., 1942. Herman and George R. Brown Professor of Civil Engineering
B.S.C.E. (1941) Rice Institute; M.S. (1950), Ph.D. (1956) University of Illinois

Sinclair, James B., 1978. Assistant Professor of Computer Science in the Department of Electrical Engineering and Associate of Brown College
B.S.E.E. (1973), M.E.E. (1974), Ph.D. (1979) Rice University

Singh, Sadanand, 1980. Adjunct Professor of Psychology
B.A. (1956), M.A. (1958) Bihar University, India; Ph.D. (1965) Ohio State University

Skaggs, Ray H., 1972. Adjunct Professor of Health and Physical Education
B.A. (1942) Rice Institute; M.D. (1945) University of Texas

Skura, Meredith, 1978. Associate Professor of English and Associate of Lovett College
B.A. (1965) Swarthmore College; Ph.D. (1971) Yale University

Smalley, Richard E., 1976. Professor of Chemistry
B.S. (1965) University of Michigan; M.A. (1971), Ph.D. (1973) Princeton University

Smith, Gordon W., 1968. Professor of Economics and Administrative Science
A.B. (1956) Washington University; Ph.D. (1966) Harvard University

Smith, Michael P., 1981. Instructor of Philosophy
B.A. (1973) University of Massachusetts; M.A. (1976), Ph.D. (1980) University of North Carolina

Smith, Richard J., 1973. Associate Professor of History and Associate of Wiess College
B.A. (1965), M.A. (1968), Ph.D. (1972) University of California at Davis

Smith, V.C., 1979. Adjunct Associate Professor in the Department of Chemical Engineering
B.S. (1967), M.S. (1968) Oklahoma State University

Soligo, Ronald, 1967. Professor of Economics
B.A. (1958) University of British Columbia, Canada; Ph.D. (1964) Yale University

Solis, R. Thomas, 1979. Adjunct Associate Professor in the Biomedical Engineering Laboratory
B.A. (1960) Texas A&M University; M.A. (1962) Oxford University; M.D. (1965) Yale University

Sosinsky, Barrie A., 1978. Assistant Professor of Chemistry
B.A. (1971) University of Illinois; Ph.D. (1974) University of Bristol, England

Spears, Monroe Kirk, 1964. Libbie Shearn Moody Professor of English
A.B., A.M. (1937) University of South Carolina; Ph.D. (1940) Princeton University

Spence, Dale W., 1963. Professor of Health and Physical Education
B.S. (1956) Rice Institute; M.S. (1959) North Texas State University; Ed.D. (1966) Louisiana State University

Stallones, Reuel A., 1977. Adjunct Professor of Environmental Science
M.D. (1949) Western Reserve University; M.P.H. (1952) University of California at Berkeley

Stanbury, David M., 1980. Assistant Professor of Chemistry
B.A. (1974) Duke University; Ph.D. (1978) University of Southern California

Stebbings, Ronald F., 1968. Professor of Space Physics and Astronomy and of Physics and Master of Jones College
B.Sc. (1952), Ph.D. (1956) University of London, England

Steihaug, Trond, 1981. Visiting Assistant Professor of Mathematical Sciences
Cand. Real (1975) University of Oslo, Norway; M.A. (1980), Ph.D. (1981) Yale University

Stein, Robert M., 1979. Assistant Professor of Political Science and Associate of Hanszen College
B.A. (1972) Ohio Wesleyan University; M.A. (1974), Ph.D. (1977) University of Wisconsin at Milwaukee

Stevens, Paul Michael, 1972. Adjunct Associate Professor in the Department of Electrical Engineering
B.A. (1954) University of Maine; M.D. (1958) University of Vermont

Stewart, Charles R., 1969. Professor of Biology and Associate of Jones College
B.S. (1962) University of Wisconsin; Ph.D. (1967) Stanford University

Stewart, John F., 1981. Visiting Associate Professor of Economics
B.A. (1971) University of California at San Diego; M.A. (1973), Ph.D. (1976) University of Wisconsin

Stokes, Gale, 1968. Professor of History
B.A. (1954) Colgate University; M.A. (1965), Ph.D. (1970) Indiana University

Stoll, Richard J., 1979. Assistant Professor of Political Science and Associate of Jones College
B.A. (1974) University of Rochester; Ph.D. (1979) University of Michigan

Storck, Roger L., 1966. Professor of Biology
B.S. (1945), M.S. (1946) Institut Fermentations-Meurice Chimie, Belgium; Ph.D. (1960) University of Illinois

Stout, Janis, 1977. Lecturer in English
B.A. (1966), M.A. (1968) Lamar State University; Ph.D. (1973) Rice University

Strassmann, Joan E., 1980. Assistant Professor of Biology
B.A. (1974) University of Michigan; Ph.D. (1979) University of Texas

Subtelny, Stephen, 1968. Professor of Biology and Associate of Brown College
B.A. (1949) Hobart College; M.A. (1952), Ph.D. (1955) University of Missouri

Swint, John Michael, 1977. Adjunct Associate Professor of Economics
B.A. (1968) California State University at Humboldt; M.A., Ph.D. (1972) Rice University

Talbot, Raymond J., Jr., 1971. Associate Professor of Space Physics and Astronomy
B.S. (1963), Ph.D. (1969) Massachusetts Institute of Technology

Taniguchi, Alan Y., 1972. Visiting Professor of Architecture
B.A. (1949) University of California at Berkeley

Tapia, Richard A., 1970. Professor of Mathematical Sciences
B.A. (1961), M.A. (1966), Ph.D. (1967) University of California at Los Angeles

Tapley, Charles R., 1975. Lecturer in Architecture
B.A. (1954), B.S. (1955) Rice Institute

Tarrance, Lance, 1979. Adjunct Professor of Political Science
A.B. (1962) Washington and Lee University; M.A. (1973) American University

Taylor, Michael E., 1976. Professor of Mathematics
A.B. (1967) Princeton University; Ph.D. (1970) University of California at Berkeley

Temkin, Larry S., 1980. Assistant Professor of Philosophy
B.A. (1975) University of Wisconsin; Ph.D. (1981) Princeton University

Thames, Howard D., Jr., 1975. Adjunct Professor of Mathematical Sciences
B.A. (1963), Ph.D. (1970) Rice University

Thompson, Ewa M., 1970. Professor of Russian
B.A. (1963) University of Warsaw, Poland; M.F.A. (1963) Sopot Conservatory of Music, Poland; Ph.D. (1967) Vanderbilt University

Thompson, James R., 1970. Professor of Mathematical Sciences and Associate of Lovett College
B.Eng. (1960) Vanderbilt University; M.A. (1963), Ph.D. (1965) Princeton University

Thomsen, Charles B., 1973. Adjunct Professor of Architecture
B.Arch. (1957) University of Oklahoma; M.Arch. (1961) Massachusetts Institute of Technology

Thrall, Robert M., 1969. Noah Harding Professor of Mathematical Sciences
B.A. (1935) Illinois College; M.A. (1935), Ph.D. (1937) University of Illinois

Tipton, Albert N., 1975. Professor of Music and Associate of Will Rice College
Artists Diploma (1939) Curtis Institute; B.M. (1952) Washington University; M.M. (1953) St. Louis Institute of Music

Tittel, Frank K., 1967. Professor in the Department of Electrical Engineering and Associate of Jones College
B.A. (1955), M.A., Ph.D. (1959) Oxford University, England

Todd, Anderson, 1949. Professor of Architecture
B.A. (1943), M.F.A. (1949) Princeton University

Tomaski, Julius W., 1981. Lieutenant, U.S. Navy, and Assistant Professor of Naval Science
B.A. (1976) University of Mississippi

Tomson, Mason B., 1977. Associate Professor of Environmental Science
B.S. (1967) Southwestern State College; Ph.D. (1972) Oklahoma State University

Topazio, Virgil William, 1965. Laurence H. Favrot Professor of French
B.A. (1943) Wesleyan College; M.A. (1947), Ph.D. (1951) Columbia University

Trammell, George T., 1961. Professor of Physics
B.A. (1944) Rice Institute; Ph.D., (1950) Cornell University

Trepel, Shirley, 1975. Associate Professor of Music and The Shepherd Quartet
B.Mus. (1945) Curtis Institute of Music

Tuggle, Francis D., 1978. Jesse H. Jones Professor of Management, Dean of the Jesse H. Jones Graduate School of Administration, and Associate of Brown College
B.S. (1964) Massachusetts Institute of Technology; M.S. (1967), Ph.D. (1971) Carnegie-Mellon University

Turner, Drexel, 1974. Adjunct Assistant Professor of Architecture
B.A. (1969) Rice University; M.S. (1973) University of Texas

Tyler, Stephen A., 1970. Professor of Anthropology and Linguistics
B.A. (1957) Simpson College; M.A. (1962), Ph.D. (1964) Stanford University

Underhill, Michael, 1979. Assistant Professor of Architecture
B.Arch. (1970) Massachusetts Institute of Technology; Master of City Planning/Urban Design (1974) Harvard University

Urrutibeheity, Hector N., 1967. Associate Professor of Spanish
Profesorado (1956) La Plata National University, Argentina; Ph.D. (1968) Stanford University

Valdivieso, Mercedes, 1973. Associate Professor of Spanish and Associate of Richardson College
Bachillerato (1946) University of Chile; M.A. (1969) University of Houston

Valkovic, Vlado, 1965. Adjunct Professor of Physics
B.A. (1961), M.A. (1963), Ph.D. (1964) University of Zagreb, Yugoslavia

Valley, John W., 1980. Assistant Professor of Geology
A.B. (1970) Dartmouth College; M.S. (1977), Ph.D. (1980) University of Michigan

Vandiver, Frank Everson, 1955. Adjunct Professor of History, Honorary Charter Associate of Hanszen College, and Honorary Associate of Brown College
M.A. (1949) University of Texas; (1963) Oxford University, England; Ph.D. (1951) Tulane University

Van Helden, Albert, 1970. Associate Professor of History
B.Eng. (1962), M.S. (1964) Stevens Institute of Technology; M.A. (1967) University of Michigan; Ph.D. (1970) London University, England

van Lohuizen, Jan Reint, 1981. Adjunct Assistant Professor of Political Science
B.A., M.A. (1974) Leiden University, Netherlands; Ph.D. (1978) Rice University

Veech, William A., 1969. Professor of Mathematics
A.B. (1960) Dartmouth College; Ph.D. (1963) Princeton University

Veletsos, Anestis S., 1964. Brown & Root Professor of Engineering
B.S. (1948) Robert College, Turkey; M.S. (1950), Ph.D. (1953) University of Illinois

Venable, James R., 1979. Adjunct Associate Professor in the Department of Chemical Engineering
B.A., M.Ch.E. (1973) Rice University

Viebig, V. Richard, Jr., 1969. Lecturer in Accounting
B.A. (1962), Master of Accounting (1977) Rice University

Vincent, Gilbert, 1981. Visiting Associate Professor of Religious Studies
B.A. (1965), M.A. (1966), Ph.D. (1980) University of Strasbourg, France

Visser, Pieter A., 1979. Adjunct Lecturer in Music

von der Mehden, Fred R., 1968. Albert Thomas Professor of Political Science, Professor of Administrative Science, and Associate of Lovett College
B.A. (1948) University of the Pacific; M.A. (1950) Claremont Graduate School; Ph.D. (1957) University of California at Berkeley

Walker, James B., 1964. Professor of Biochemistry
B.S. (1943) Rice Institute; M.A. (1949), Ph.D. (1952) University of Texas

Walker, William F., 1965. Professor of Mechanical Engineering and Associate of Wiess College
B.S. (1960), M.S. (1961) University of Texas; Ph.D. (1966) Oklahoma State University

Wallace, Kristine Gilmartin, 1966. Associate Professor of Classics
B.A. (1963) Bryn Mawr College; M.A. (1965), Ph.D. (1967) Stanford University

Walters, G. King, 1963. Professor of Physics
B.A. (1953) Rice Institute; Ph.D. (1956) Duke University

Wang, Chao-Cheng, 1968. Noah Harding Professor of Mathematical Sciences and Professor in the Department of Mechanical Engineering
B.S. (1959) National Taiwan University; Ph.D. (1965) Johns Hopkins University

Ward, Calvin H., 1966. Professor of Biology and Environmental Science
B.S. (1955) New Mexico State University; M.S. (1958), Ph.D. (1960) Cornell University; M.P.H. (1978) University of Texas School of Public Health

Ward, Joseph A., Jr., 1964. Professor of English
A.B. (1952) University of Notre Dame; M.A. (1954), Ph.D. (1957) Tulane University

Warme, John E., 1976. Adjunct Professor of Geology
B.A. (1959) Augustana College; Ph.D. (1966) University of California at Los Angeles

Waters, David L., 1976. Lecturer in Music
B.M.E. (1962) University of Houston; M.Mus. (1964) University of Texas

Watkins, Michael J., 1980. Associate Professor of Psychology
B.Sc. (1965, 1969), Ph.D. (1972) University of London, England

Wegner, Robert C., 1981. Adjunct Assistant Professor of Geology
B.A. (1967) Queens College; M.S. (1972) Lehigh University; Ph.D. (1978) Rice University

Weinberg, Armin D., 1980. Adjunct Professor of Health and Physical Education
B.A. (1966), Ph.D. (1971) Ohio State University

Weisman, Robert B., 1979. Assistant Professor of Chemistry
B.A. (1971) Johns Hopkins University; Ph.D. (1977) University of Chicago

Weiss, Kenneth M., 1981. Adjunct Associate Professor of Anthropology
B.A. (1963) Oberlin College; M.A. (1969), Ph.D. (1972) University of Michigan

Weissenberger, Klaus H.M., 1971. Professor of German
B.A. (1959), M.A. (1965) University of Hamburg, Germany; Ph.D. (1967) University of Southern California

Wells, Raymond O., Jr., 1965. Professor of Mathematics and Associate of Jones College
B.A. (1962) Rice University; M.S. (1964), Ph.D. (1965) New York University

Wheeler, Mary Fanett, 1974. Professor of Mathematical Sciences and Associate of Richardson College
B.A., B.S. (1960), M.A. (1963) University of Texas; Ph.D. (1971) Rice University

White, Kenneth J., 1972. Associate Professor of Economics
B.A. (1968) Northwestern University; M.A. (1970), Ph.D. (1973) University of Wisconsin

White, Robert A., 1981. Adjunct Assistant Professor of Mathematical Sciences
B.A. (1966) New Mexico State University; Ph.D. (1970) University of Chicago

White, Robert H., 1976. Lecturer in Biochemistry
B.A. (1968) University of Indiana; Ph.D. (1974) University of Illinois

Widrig, Walter M., 1969. Associate Professor of Art History and Associate of Richardson College
B.A. (1951) Yale University; M.A. (1956) Columbia University; Ph.D. (1975) New York University

Wiener, Martin J., 1967. Professor of History
B.A. (1962) Brandeis University; M.A. (1963), Ph.D. (1967) Harvard University

Wierum, Frederic Atherton, Jr., 1961. Professor of Mechanical and Aerospace Engineering
B.S.M.E. (1955) Wichita State University; M.S.M.E. (1959) University of Houston; Ph.D. (1962) Rice University

Wilford, Michael, 1978. Visiting Professor of Architecture
Honors Diploma (1960) Northern Polytechnic School of Architecture, England; Diploma (1967) Regent Street Polytechnic Planning School

Williams, Andrea E., 1981. Instructor of English and of Spanish and Portuguese
B.A. (1975) Yale University; M.A. (1979), Ph.D. (1981) University of California at Los Angeles

Williams, Donald L., 1973. Associate Professor of Architecture and Community Development
B.S. (1957) University of Kentucky; B.Arch. (1962) University of Illinois; Diplome d'architecture (1962) Ecoles des Beaux Arts, France; M.S. in Community Development (1970) University of Louisville

Williams, Edward E., 1978. Professor of Administrative Science and Associate of Richardson College
B.S. (1966) University of Pennsylvania; Ph.D. (1968) University of Texas

Wilson, James Lee, 1966. Adjunct Professor of Geology
B.A. (1942), M.A. (1944) University of Texas; Ph.D. (1949) Yale University

Wilson, John T., 1980. Adjunct Professor of Environmental Science
B.S. (1969) Baylor University; M.A. (1971) University of California at Berkeley; Ph.D. (1978) Cornell University

Wilson, Joseph B., 1954. Associate Professor of German
B.A. (1950), M.A. (1953) Rice Institute; Ph.D. (1960) Stanford University

Wilson, Lon J., 1973. Associate Professor of Chemistry and Associate of Richardson College
B.A. (1966) Iowa State University; Ph.D. (1971) University of Illinois

Wilson, Marsha M., 1980. Instructor of Accounting
B.A. (1974), M.P.A. (1976) University of Texas

Wilson, William L., Jr. 1972. Associate Professor in the Department of Electrical Engineering and Resident Associate of Wiess College
B.S. (1965), M.S. (1966) Cornell University; Ph.D. (1972) Rensselaer Polytechnic Institute

Windsor, Duane, 1977. Assistant Professor of Administrative Science and Assistant Dean of the Jesse H. Jones Graduate School of Administration
B.A. (1969) Rice University; A.M. (1975), Ph.D. (1978) Harvard University

Winkler, Michael, 1967. Professor of German and Associate of Richardson College
B.A. (1961) St. Benedict's College; M.A. (1963), Ph.D. (1966) University of Colorado

Winningham, Geoffrey L., 1969. Professor of Art and Master of Wiess College
B.A. (1965) Rice University; M.S. (1968) Illinois Institute of Technology

Wittenberg, Gordon G., Jr., 1979. Assistant Professor of Architecture and Associate of Richardson College
B.F.A. (1968) Trinity College, Connecticut; M.Arch. (1972) Washington University

Wolf, Richard A., 1967. Professor of Space Physics and Astronomy and of Physics
B.Eng.Phys. (1962) Cornell University; Ph.D. (1966) California Institute of Technology

Wood, Donald Ira, 1961. Professor of Education
B.A. (1942) University of San Antonio; M.Ed. (1954) Trinity University; Ph.D. (1961) University of Texas

Wright, Anthony A., 1980. Adjunct Associate Professor of Psychology
B.A. (1965) Stanford University; M.A. (1970), Ph.D. (1971) Columbia University

Young, Richard D., 1965. Professor of Economics and Mathematical Sciences
B.A. (1951), M.A. (1954) University of Minnesota; Ph.D. (1965) Carnegie Institute of Technology

Zeff, Stephen A., 1978. Herbert S. Autrey Professor of Accounting and Associate of Richardson College
B.S. (1955), M.S. (1957) University of Colorado; M.B.A. (1960), Ph.D. (1962) University of Michigan

Zimmerman, Stuart D., 1971. Adjunct Professor of Mathematical Sciences
B.A. (1954), Ph.D. (1961) University of Chicago

Zodrow, George, 1979. Assistant Professor of Economics and Associate of Lovett College
B.A., M.M.S. (1973) Rice University; Ph.D. (1980) Princeton University

Zygourakis, Kyriacos, 1980. Assistant Professor in the Department of Chemical Engineering
Diploma of Chemical Engineering (1975) National Technical University of Athens; Ph.D. (1981) University of Minnesota

Professional Research Staff

Allen, Janet, 1981. Departmental Administrator and Senior Research Scientist in Biochemistry
B.S. (1967) Massachusetts Institute of Technology; Ph.D. (1973) University of California at Berkeley

Baco, Ernesto, 1980. Research Scientist in Environmental Science and Engineering
B.S. (1978) Rensselaer Polytechnic Institute; M.S. (1981) Rice University

Bernstein, William, 1979. Senior Research Scientist in Center for Space Physics, Space Physics and Astronomy
B.S. (1944) New York University

Buchanan, J.A., 1961. Senior Research Scientist in Physics
B.S. (1970) University of Houston

Clement, J.M., Jr., 1974. Research Scientist in Physics
B.S. (1965), M.S. (1966) Cornell University; Ph.D. (1972) Rensselaer Polytechnic Institute

Fryer, G.E., 1963. Research Instrumentation Scientist in Geology
B.S. (1952) University of Manitoba, Canada

Gordy, Virginia R., 1980. Research Scientist in Environmental Science and Engineering
B.S. (1963) Abilene Christian College; M.A. (1969) University of Colorado; Ph.D. (1980) University of Houston

Hauge, R.H., 1967. Assistant Director of High Temperature Group in Chemistry
B.A. (1960) Loras College; Ph.D. (1965) University of California at Berkeley

Hill, Thomas W., 1976. Associate Research Scientist in Center for Space Physics and University Associate of Jones College
B.A. (1967), M.S. (1971), Ph.D. (1973) Rice University

Hirata, Hirohumi, 1980. Visiting Research Scientist in Biochemistry
B.S. (1969), M.S. (1971), Ph.D. (1974) Nagoya University, Japan

Kisic, A., 1973. Senior Research Scientist in Biochemistry
B.S. (1954), Ph.D. (1961) University of Zagreb, Yugoslavia

Manka, R.H., 1972. Space Scientist in Space Physics and Astronomy
B.A. (1958) Colorado College; M.A. (1961) Dartmouth College; M.A. (1965), Ph.D. (1972) Rice University

Marriott, Terry D., 1978. Scientist and Department Instrument Manager in Chemistry
B.S. (1969), Ph.D. (1976) Oklahoma State University

McGarity, John O., 1966. Technical Staff Member in Space Physics and Astronomy
B.S. (1976) University of Houston

Nathan, Vincent, 1979. Research Scientist in Environmental Science and Engineering
B.S. (1972) Tennessee State University; M.S. (1979) Texas Southern University

Nystrom, David S., 1967. Programer Analyst in Space Physics and Astronomy
B.A. (1962) Baylor University

Oehme, Delbert R., 1964. Technical Staff Member in Space Physics and Astronomy

Parish, E.J., 1974. Senior Research Scientist in Biochemistry
B.S. (1967) Southwest Texas State University; M.S. (1970) Sam Houston State University; Ph.D. (1973) Mississippi State University

Pinkerton, Frederick David, 1979. Senior Research Scientist in Biochemistry
B.S. (1969) Eastern Montana College; Ph.D. (1976) Montana State University

Reiff, Patricia H., 1976. Associate Research Scientist in Center for Space Physics and University Associate of Jones College
B.S. (1971) Oklahoma State University; M.S. (1974), Ph.D. (1975) Rice University

Smith, Wayne A., 1966. Contracts and Administrative Manager in Space Physics and Astronomy
B.S. (1958) University of Southern California

Stewart, Michael F., 1973. Technical Staff Member in Space Physics and Astronomy
B.S. (1973) Rice University

Vermilion, Janice L., 1979. Senior Research Scientist in Biochemistry
B.S. (1971) University of Illinois; Ph.D. (1976) University of Michigan

Voigt, Gerd-Hannes, 1980. Assistant Research Scientist in Center for Space Physics
Diploma of Physics and Geophysics (1970), Ph.D. (1975) University of Braunschweig, Germany

Waggett, Warren, 1978. Project Director in Environmental Science and Engineering
B.S. (1950) U.S. Coast Guard Academy; M.S. (1979) University of Houston

Watkins, Olga C., 1980. Research Associate in Psychology
B.A. (1971), Ph.D. (1977) University of London, England

Wise, J.D., 1978. Computer Specialist in Electrical Engineering
B.A. (1970), M.E.E. (1971), Ph.D. (1977) Rice University

Professional Staff of the Library

Adler, Marianne G., 1974. Head of Bibliographic Processing
B.A. (1973) Rice University; M.L.S. (1974) University of Texas; M.A. (1977) Rice University

Azzolina, David S., 1979. Social Science Reference/Collection Development Librarian
B.A. (1978) University of Pennsylvania; M.S.L.S. (1979) Columbia University

Baber, Elizabeth Ann, 1965. Catalog Librarian
B.A. (1960) Rice University; M.L.S. (1961) University of California at Berkeley

Brown, Lauren R., 1979. Special Collections Librarian
B.A. (1968) San Diego State University; M.A. (1973) University of Washington; M.L.S. (1978) University of California at Berkeley

Byrne, Tina, 1978. Director of R.I.C.E.
B.A. (1973) State University of New York at Oneonta; M.L.S. (1975) University of Texas

Carrington, Samuel M., Jr., 1967. Professor of French, University Librarian, and Associate of Jones College
A.B. (1960), M.A. (1962), Ph.D. (1965) University of North Carolina

Corwin, Dean W., 1980. Music Catalog Librarian
B.M. (1971) University of Kansas; M.S.L.S. (1977) University of Illinois

Holibaugh, Ralph W., 1975. Head of Music Library, Acting Personnel Administrator, and Lecturer in Music
B.A. (1964) University of Cincinnati; M.A. (1970) Kent State University; M.S.L.S. (1975) University of Illinois

Hunter, John H., 1979. Science Reference/Collection Development Librarian
B.S. (1971) Wiley College; M.L.S. (1974) Indiana University

Hyman, Ferne B., 1968. Social Sciences Reference Librarian/Collection Development Coordinator and University Associate of Baker College
B.A. (1948) University of California at Los Angeles; M.A. (1969) Loyola University of Los Angeles; M.S.L.S. (1969) University of Illinois

Kile, Barbara, 1971. Head of Government Documents and Microforms Department
B.A. (1967), M.S.L.S. (1968) University of Illinois

Lane, Sarah Louise, 1920. Circulation Librarian Emerita
B.A. (1919) Rice Institute; B.S.L.S. (1932) Columbia University

Lee, Li Ai, 1980. Catalog Librarian
B.A. (1975) National Taiwan University; M.A.L.S. (1978) University of Iowa

Marsales, Rita, 1973. Catalog Maintenance Librarian
B.A. (1957) Louisiana State University; M.L.S. (1973) University of Texas

Menefee, William Daviess, Jr., 1980. Humanities Reference/Collection Development Librarian
B.A. (1969) Centre College of Kentucky; M.A. (1974) Northwestern University; M.S. (1980) Columbia University; Ph.D. (1981) Northwestern University

Myers, Charles J., 1979. Engineering Reference/Collection Development Librarian
B.A. (1972) Trenton State College; M.A. (1974) Eastern Michigan University; M.L.S. (1977) Rutgers University

Niles, Judith F., 1981. Head of Acquisitions
B.A. (1966) University of North Dakota; M.A. (1968) University of Wisconsin; M.L.S. (1973) Indiana University

Parker, Nancy Boothe, 1965. Director of the Woodson Research Center and University Associate of Brown College
B.A. (1952) Rice Institute; M.S.L.S. (1965) Catholic University of America; M.A. (1979) Rice University

Perrine, Richard H., 1960. Assistant University Librarian for Planning, Head of Reference/Collection Development Services, Adjunct Associate Professor of Architecture, and University Associate of Hanszen College
B.F.A. (1940) Yale University; M.L.S. (1961) University of Texas

Prendeville, Jet Marie, 1979. Humanities and Fine Arts Reference/Collection Development Librarian
B.A. (1972) Memphis State University; M.A. (1965) University of Michigan; M.S. (1979) University of Illinois

Redmon, Alice Jane, 1962. Special Processing Librarian Emerita
B.A. (1937) University of Denver

Samuelsen, Patricia S., 1980. Head Serials Librarian, R.I.C.E.
B.A. (1978) King's College; M.L.S. (1980) University of Texas

Silversteen, Sophy, 1965. Head Serials Librarian
B.A. (1952) Rice Institute; M.S.S.W. (1954), M.L.S. (1965) University of Texas

Thompson, James C., 1981. Associate University Librarian
B.A. (1967) Princeton University; M.A. (1971), M.S.L.S. (1972) University of Wisconsin

Professional Staff of the Institute for Computer Services and Applications

Ahrens, Donna T., 1981. Programer/Analyst
B.A. (1978) Rice University

Beale, Alan R., 1976. Systems Programer
M.A. (1971) Harvard University

Berry, Betty Mae, 1979. Programer/Analyst

Caruso, Nicholas E., 1974. Programer/Analyst
B.A. (1970) Rice University

Fields, Corinne V., 1968. Manager of Programing and Data Control
B.B.A. (1950) Southern Methodist University

Garcia, Raymond A., 1979. Programer/Analyst

Gerbode, Farrell E., 1974. Assistant Director of Computer Services
B.A. (1973), M.A.M.S. (1977) Rice University

Gold, Eileen M., 1980. Programer/Analyst
B.A. (1948), M.A. (1949) Florida State University

Goodman, Sara L., 1979. Systems Programer
B.S. (1965) Brooklyn College

Huston, Priscilla Jane, 1969. Director
B.A. (1964) Mount Holyoke College

Lane, Joni Sue, 1966. Systems Programer
B.S. (1960) University of Oklahoma

Martin, Andrea M., 1979. Systems Programer
B.S.E.E. (1979) Rice University

Nichols, Clyde C., 1969. Manager, Computer Operations
B.S.E. (1965) University of Nebraska

Schafer, Richard, A., 1974. Systems Programer
B.A. (1973), M.A.M.S. (1974) Rice University

Wakefield, James F., 1978. Programer/Analyst

Williamson, Mark R., 1971. Manager, Systems Support

Woodruff, Clifford E., 1978. Assistant Director for Applications and Administration
B.A. (1962) Lamar University; M.S. (1964) Texas A&M University

Staff of the Health Service

Bond, Jody, R.N., 1979. Nurse

Brener, Daniel M., M.D., 1977. Director, Psychiatric Service
A.B. (1971) Harvard University; M.D. (1974) Baylor College of Medicine

Fullen, Dollie, L.V.N., 1959. Head Nurse

Novak, Dain, M.D. 1981. Codirector of the Student Health Service
M.B.B.Ch. (1969) University of Witwakersrand, South Africa

Schnee, Amanda M., M.D. 1981. Codirector of the Student Health Service
M.B., Ch.B. (1968) St. Andrews University, Scotland

Staff of the Athletic Department

Alborn, Raymond, 1972. Head Football Coach
B.S. (1962) Rice University

Bockeloh, Mark A., 1979. Academic Counselor
B.A. (1977) Rice University; M.B.A. (1981) University of Houston

Breckwoldt, Frederick B., 1973. Academic Counselor and Swimming Coach
B.S. (1958) Springfield College; M.E.D. (1962) University of Houston

Brown, Steve, 1973. Assistant Athletic Trainer
B.S. (1973) Texas Tech University

Butler, James E., 1977. Chief Team Physician
B.S. (1956) Sewanee College; M.A. (1957) Southwest Texas State; M.D. (1962) University of Texas

Castañeda, James A., 1961. Faculty Representative
B.A. (1954) Drew University; M.A. (1955), Ph.D. (1958) Yale University

Cortez, George, 1978. Assistant Football Coach

Eggert, Allen, 1968. Head Athletic Trainer
B.S. (1963) Rice University; M.A. (1967) California Western University

Erfurth, August F., 1960. Athletic Director
B.S. (1949) Rice Institute; M.E.D. (1961) Trinity University

Hall, David H., 1980. Head Baseball Coach
B.S. (1971) University of Texas

Hawthorne, Martha E., 1979. Coordinator of Women's Athletics
B.A. (1960), B.S. (1961), M.S. (1964) Louisiana State University

Lopez, Victor M., 1980. Women's Head Track and Field Coach
B.S. (1971) University of Houston; M.S. (1975) Texas Southern University

Mainord, Carlos, 1978. Assistant Football Coach
B.S. (1966) McMurry College; M.E.D. (1969) Texas Tech University

Marcum, Tim D., 1980. Football Coach
B.S. (1967) McMurry College; M.Ed. (1973) Texas Tech

May, John Robert, 1967. Head Coach, Track and Field
B.S. (1965) Rice University

Moore, Charles Edward, Jr., 1948. Assistant Athletic Director
B.S. (1938) Rice Institute

Plumbley, John, 1970. Golf Coach
B.S. (1948) Rice Institute: M.E.D. (1951) University of Texas

Rossley, Thomas, 1978. Assistant Football Coach
B.S. (1969) University of Cincinnati

Sexton, Anthony, 1976. Assistant Football Coach and Recruiting Coordinator
B.S. (1971) University of Cincinnati

Skaggs, Richard L., 1980. Assistant Basketball Coach
A.B. (1969) Transylvania University; M.A. (1974) Eastern Kentucky University

Sokol, Debra L., 1980. Assistant Volleyball/Basketball Coach
B.A. (1980) University of Houston

Straub, Stephen M., 1974. Head Track Coach
B.A. (1972) Rice University

Suitts, Thomas B., 1979. Head Basketball Coach
B.S. (1969), M.A. (1974), A.A. (1975) University of Alabama

Tucker, Linda, 1978. Women's Basketball/Volleyball Coach
B.S. (1969) Wayland College

Turville, Lawrence C., 1979. Men's Tennis Coach
B.S. (1971) Georgia Tech

Whitmore, William Rogers, 1950. Sports Information Director
B.J. (1942) University of Texas

Williams, Bobby, 1978. Assistant Football Coach
B.S. (1958) Rice Institute

University Standing Committees for 1981-82

The president is an ex officio member of all committees.

Committee on Admissions: Prof. S.L. Clark, *chairman;* Profs. Cheatham, M.L. Curtis, Cuthbertson, Davidson, Dunning, Haymes, Huberman, L.V. McIntire, Scott, Subtelny, E.M. Thompson, Richards, Kurtzman (college master); Prof. K.T. Brown, Richard Stabell, *ex officio;* Ray E. Simpson, Jr., Ann Pierce Arnett (alumnae); Patricia Campbell, Donald Frey (undergraduates).

Committee on Affirmative Action: Prof. E.J. Lee, *chairman;* Profs. Dipboye, J. Cooper, Ambler, Long; Laura Branch, Marian Jordan, George Oliphant, Anthony Sexton; Richard A. Nunn (alumnus); Luis R. Fraga (graduate); Sabrina Landrum, David Southwell (undergraduates).

Committee on Campus Safety: Prof. Parry, *chairman;* Profs. Barker, Bush, F.M. Fisher, Margrave, Phillips, W.L. Wilson; W. Glidden, *ex officio;* Richard Perrine, Harold Rhodes (consultants); Anita Mizusawa (graduate); Nicolaos Geeker (undergraduate).

Committee on Computers: Prof. Quiocho, *chairman;* Profs. J.D. Austin, Carrington, De Bremaecker, Jump, Mandel, Stoll, Wolf; Profs. W.E. Gordon and J.R. Thompson, Priscilla Huston, *ex officio;* Dr. Robert W. Wansbrough (alumnus); Manoj Kumar (graduate); Gordon Goetsch, David Wicks (undergraduates).

Education Council: Prof. Wood, *chairman;* Profs. Ambler, J.D. Austin, Bearden, Casey, Cooke, Davidson, Doughtie, Glass, Higginbotham, Iammarino, B.F. Jones, R.G. Jones, Levin, Nelson, P.W. Davis, Pfeiffer, Poulos, Procunier,

Urrutibeheity, Watkins, Winkler; Prof. Matusow, *ex officio;* Tara McGuire (undergraduate).

Committee on Examinations and Standing: Prof. W.F. Walker, *chairman;* Profs. Estle, Jaco, Nelson, C.R. Stewart, Stokes, Tittel, E.E. Williams, J.B. Wilson; Prof. K.T. Brown, registrar, *ex officio;* Robert Tudor, Susan Brown (undergraduates).

Faculty Council: Profs. Duck, B.F. Jones, Howell, Greanias, Abrahams, E.M. Thompson, Isle, Scott.

Graduate Council: Prof. Margrave, *chairman;* Profs. Dufour, Glantz, Kelber, L.V. McIntire, Palmer, Raaphorst, Rabson, Schnoebelen, von der Mehden, Windsor, Wittenberg; Prof. W.E. Gordon, *ex officio;* Dr. John O. Bennett (alumnus); Anita Mizusawa (Graduate Student Association president).

Committee on the Library: Prof. Isle, *chairman;* Profs. Bayazitoglu, Glass, Cuthbertson, Kulstad, Storck, Topazio, Van Helden, J.B. Walker, Winkler; Profs. Carrington, W.E. Gordon, *ex officio;* Mrs. Donald P. Mafridge (alumna); Robert Ford, Jerlyn Mardis (graduates); Gregory Wortham (undergraduate).

Committee on Public Lectures: Prof. Hyman, *chairman;* Profs. Apple, Burrus, P. Bell, Klineberg, Schroepfer, Tapia; director of information services, *ex officio;* Mrs. Robert H. Allen (alumna); Winifred Hamilton (graduate); Michael Guth (undergraduate).

Committee on Religious Activities: Prof. Nielsen, *chairman;* Profs. Apple, T.F. Freeman, Pfeiffer, J.R. Thompson, von der Mehden; Rev. Joseph H. Crosthwait (alumnus); Hope Malowitz (graduate); Melissa Hawley (undergraduate).

Research Council: Prof. N.F. Lane, *chairman;* Profs. P. Brady, Campbell, Dessler, Olson, Smalley, G.W. Smith, Spears, Tomson, Windsor; Profs. Margrave, J. Cooper, J.D. Hellums, Matusow, O.J. Mitchell, Walters, Holloway, Tuggle, *ex officio;* Mrs. Thomas L. McKittrick, Lebbeus C. Kemp, Jr. (alumni); Stephen Klaine, Jerlyn Mardis (graduates).

Rice University Athletics Committee: Prof. Castañeda, *chairman;* Profs. Burnett, Grob, Huddle, Stebbings, Chapman; Profs. W.E. Gordon and Poindexter, Augie Erfurth, Joseph Nalle, Leo Shamblin, Bobby May, Martha Hawthorne, *ex officio;* R.S. O'Connor (trustee); R.W. Noble (governor); Raymond Chilton, Jr. (alumnus); R.L. Brumley (R Association); Pamela Kelly, Michael Miller (undergraduates).

Rice University Marshals: Prof. Lutes, *chief marshal emeritus;* Prof. Wiener, *chief marshal;* Profs. J.D. Austin, J.W. Clark, H.C. Clark, Disch, Driskill, E.J. Lee, Poulos, Smalley.

ROTC Committee: Prof. S.H. Davis, *chairman;* Profs. Duck, Iammarino, Stoll, Wallace, Sawyer, G.E. Bell, Stebbings (college master); James P. Flowers (undergraduate).

Committee on Scholarships and Awards: Prof. Sinclair, *chairman;* Profs. Avé Lallemant, Casbarian, Poindexter, Sanders, Wallace; Prof. K.T. Brown, Linda Bramlett, *ex officio;* Harry Reasoner (alumnus).

Committee on Space Assignment: Prof. Akers, *chairman;* Profs. K.T. Brown, W.E. Gordon, Margrave, J.D. Hellums, O.J. Mitchell, Walters, Matusow, Tuggle, J. Cooper, Holloway, *ex officio*

Committee on Student Affairs: Prof. K.T. Brown, *chairman;* Profs. Holt (proctor), Armeniades (college master), J.W. Freeman (college master), Copeland (Student Association faculty adviser); Lynn Lednicky (Student Association president); Profs. H.C. Clark and W.E. Gordon, B.C. Hellums, *ex officio;* Allan Van Fleet (alumnus).

Committee on Student Financial Aid: Prof. Parks, *chairman;* Profs. Billups, Citron, Doughtie, Greanias, Brotzen (college master); Prof. K.T. Brown, Richard Stabell, G. David Hunt, *ex officio;* James A. Darby (alumnus); Stephen Boswell (graduate); Laura McKinzey (undergraduate).

Committee on Student Health: Prof. Van Helden, *chairman;* Profs. Abrahams, Eggert, Iammarino, Soligo, Tomson, Huston (college master); Dr. Amanda Schnee; B.C. Hellums, Daniel Brener, Dollie Fullen, *ex officio;* Dr. Richard Stasney (consultant); Dr. Lewis R. Malinak (alumnus); Jay Oliphant (graduate); Margaret Biczynski (undergraduate).

Committee on the Undergraduate Curriculum: Prof. Dix, *chairman;* Profs. Aresu, Dodds, Doody, Hannon, Leal, Lutes, Marcus, Matthews, Milburn, Scott, W.L. Wilson; Profs. K.T. Brown, W.E. Gordon, *ex officio;* James Greenwood, III (alumnus); David Pickett, Edward Keller (undergraduates).

Committee on Undergraduate Teaching: Prof. Rowe, *chairman;* Profs. Bowen, Fukuyama, Haskell, Kennedy, B.F. Jones, W.C. Martin, Merwin, Schuberth, R.J. Smith, Watkins; Prof. K.T. Brown, *ex officio;* W. Robins Brice (alumnus); Steve Wilkinson (graduate); Sumit Nanda, Brent Wilkey (undergraduates).

University Council: Prof. Hackerman, *chairman;* Profs. Akers, W.E. Gordon, Margrave, Patten (on leave 1980-82), Rimlinger, Rorschach, Brotzen, D.H. Johnson, Sass, Long, Bowen, Van Helden; Profs. J.D. Hellums, O.J. Mitchell, Walters, Matusow, Tuggle, J. Cooper, Holloway, *ex officio;* Prof. K.T. Brown, *secretary;* Balakrishna R. Iyer (graduate); Cecelia Calaby, Mohit Nanda (undergraduates).

University Review Board: Prof. Boorman, *chairman;* Profs. Burrus, Philpott, Spence, E.E. Williams; James Bishop (graduate); Charles Wampold, Melissa Tonn (undergraduates).

Chairs and Lectureships

Throughout its history, Rice University has been especially fortunate in the number of its friends and benefactors. Some of these are memorialized in the names of buildings and special physical facilities; others have generously provided for the

enrichment of the university's intellectual life by establishing chairs and lectureships either on temporary or permanent basis. Rice takes pleasure in recognizing on these pages some of these contributors to its academic excellence.

J. S. Abercrombie Chair in the School of Engineering

Agnes Cullen Arnold Professorship in Fine Arts

Herbert S. Autrey Chair in Administration

Lynette S. Autrey Chair in Humanities

Herbert S. Autrey Chair in Social Sciences

Brown and Root Chair in Engineering

George R. Brown Chair in Administration

Herman and George R. Brown Chair in Civil Engineering

Andrew Hays Buchanan Professorships in Astrophysics

E. D. Butcher Professorship

Louis Calder Professorship in Chemical Engineering

Harry S. Cameron Chair in Mechanical Engineering

Harry and Hazel Chavanne Chair in Religious Studies

Allyn R. and Gladys M. Cline Professorship in Economics and Finance

Carey Croneis Professorship in Geology

G. C. Evans Instructorships in Mathematics

W. Maurice Ewing Professorship in Oceanography

Laurence H. Favrot Professorship in French

Henry S. Fox, Sr., Chair of Instruction in Economics

Lena Gohlman Fox Chair in Political Science

Noah Harding Professorship in Mathematics

Reginald Henry Hargrove Chair in Economics

A. J. Hartsook Chair in Chemical Engineering

William Pettus Hobby Chair in American History

Jesse H. Jones Professorship in Management

Mary Gibbs Jones Professorship in History

William Alexander Kirkland Professorship in Administration

Edgar Odell Lovett Chair in Mathematics

Carolyn and Fred McManis Professorship in Philosophy

Harris Masterson, Jr., Chair in History

Andrew W. Mellon Junior Humanities Scholars

Andrew W. Mellon Professorship in the Humanities

Libbie Shearn Moody Professorship in English

W. L. Moody, Jr., Professorship in Mathematics

Stanley C. Moore Chair in Engineering

Joseph and Joanna Nazro Mullen Professorship in Fine Arts

George A. Peterkin Chair in Political Economy
J. Newton Rayzor Chair in Philosophy and Religious Thought
David Rice Chair in Ethics
The Schlumberger Chair in Advanced Studies and Research
Harry K. and Albert K. Smith Chair in Architecture
Dorothy Richard Starling Visiting Professor in Violin
Henry Gardiner Symonds Professorship in Administration
Albert Thomas Chair in Political Science
Radoslav A. Tsanoff Chair in Public Affairs
Isla and Percy Turner Professorship in Biblical Studies
Robert A. Welch Chair in Chemistry
Harmon Whittington Professorship in Administration
Harry Carothers Wiess Chair in Geology
Sam and Helen Worden Chair in Physics
Gus Sessions Wortham Professorship in Architecture
Brown Foundation — J. Newton Rayzor Lectures
W. V. Houston Lectureship
Ervin Frederick Kalb Lectureship in History
The Rockwell Lectures
The Harold E. and Margaret R. Rorschach Memorial
Lectures in Legal History
Tsanoff Lectureship in the Humanities

Information for Undergraduate Students

Curricula, Majors, and Degree Requirements

The Bachelor of Arts degree at Rice is awarded with a designated major in some field of architecture, the humanities, music, social sciences, science, or engineering. The general university requirements for the B.A. degree, as well as the options open to students in their choice of majors, are described below.

The Bachelor of Music is offered by the Shepherd School of Music. In addition, it is offered in conjunction with the Master of Music, both of which are awarded simultaneously on completion of a five-year program of professional studies.

The various engineering departments also offer the Bachelor of Science degree which, like the B.A., normally requires four years for completion.

For students interested in teaching in the secondary schools, a program of teacher training leading to state certification may be completed together with the B.A. degree. This program is administered by the Department of Education.

Programs that satisfy the requirements for admission to medical, dental, or law school are available in conjunction with various majors.

Degree Requirements and Majors

In March 1978, the faculty of the university approved changing the designation of graduation requirements, major requirements, and distribution requirements from semester courses to semester hours. The change became effective in the academic year 1978-79. Students enrolled at the university in a degree program prior to or at the beginning of the fall semester 1978 had the option of completing the university and major requirements for their degree according to either semester courses or semester hours.All students entering after fall 1978 must fulfill the semester-hour requirements. In the information that follows, as well as in the requirements for departmental majors listed under Courses of Instruction, university and departmental requirements are stated in semester hours followed in parentheses by the corresponding requirement in semester courses. No course equivalence is shown for the regulations governing the president's honor roll, academic probation, and academic suspension since these have been calculated by semester hours in the past.

University Credit Requirements

Students completing a Bachelor of Arts degree must pass a minimum of 120 semester hours (forty semester courses of at least 3 semester hours each with associated laboratories and tutorial sections). In fulfilling all university and major requirements, many students complete more than this minimum. Within their total program, students completing a Bachelor of Arts degree in any discipline other than architecture must pass a minimum of 60 semester hours (twenty semester courses of at least 3 semester hours) in addition to major requirements specified by their department. Architecture majors must pass 38 semester hours in addition to their major requirements.

To fulfill the requirements for the degree of Bachelor of Science in one of the several branches of engineering, with the exception of chemical engineering, students must pass no fewer than 134 semester hours. Students fulfilling the requirements for the Bachelor of Science in chemical engineering must pass up to 137 semester hours, depending on accreditation requirements.

For either bachelor's degree, no less than 48 semester hours (fourteen courses of at least 3 semester hours each) completed in fulfillment of the degree requirements must be on an advanced level (numbered 300 or higher). Note that the semester hour requirement and the course requirement are not exactly equivalent.

For students entering Rice in the fall semester 1980 or thereafter, more than 50 percent of the 48 semester hours at the advanced level must be completed at Rice.

Likewise, students declaring an undergraduate major in spring 1980 or thereafter must complete more than 50 percent of the advanced level requirements in their major field at Rice. This is a minimum. Within major requirements, departments may specify that a higher proportion of advanced level work must be taken at Rice.

After students have fulfilled university distribution requirements and the requirements for a designated major (see below), all remaining courses in their degree programs are free electives.

University Distribution Requirements

The university distribution requirements are based on the belief that an undergraduate education should include some acquaintance with areas of study outside the student's field of specialization. Many students fulfill most of their distribution requirements in the first two years, and because they have explored several different areas, they are better prepared to decide on a major at the end of the sophomore year.

Before graduation, each student must complete three or more semester hours (one or more courses) from at least five of the six subject categories listed below and at least twelve semester hours (four courses) from each pair of subject categories designated by a roman numeral.

I. 1. Literature and language
   2. Art and art history, music, philosophy (except logic), and religion

II. 3. Economics, history, and political science
   4. Anthropology, behavioral science, education, linguistics, psychology, and sociology

III. 5. Biological science, physical science, and engineering
   6. Mathematics, mathematical sciences, and logic

Note that not all courses offered in the above fields are acceptable for distribution.

Skills

English Competency Requirement. Every Rice student must demonstrate competency in English comprehension and composition. This requirement is satisfied by passing the English competency examination administered by the Depart-

ment of English to all entering students during orientation week. Students who fail to pass this test are required to enroll in English 103, a one-semester self-paced course in composition which carries both degree and distribution credit. Satisfactory completion of this course then fulfills the English competency requirement. English 103 is also open, space permitting, to students who have passed the English competency examination but wish to improve their writing skills further.

Physical Education. Each student must pass two semester courses in basic health and physical education. These do not count toward the semester hours (or courses) required for a degree.

Departmental Majors and Honors Programs

Each spring, on Majors Day, first- and second-year students are excused from their morning classes to visit the faculty and upperclass students in departments they are considering for their majors. Students normally designate a major in March prior to preliminary registration for the junior year. The department or title of the major is then noted on the student's transcript, and a faculty adviser is assigned in the major department. Introductory courses taken in the first two years may be counted in fulfilling the major requirements even before formal designation of a major has been made.

Students should be aware that physical limitations of some departments occasionally make it necessary to limit the number of majors admitted to a particular department.

Students are always free to change majors in the junior or senior year, although this may entail one or more additional semesters at the university.

For information on the specific requirements for any departmental major, students should consult the departmental listings under Courses of Instruction and seek the advice of a faculty member in the department.

In establishing an undergraduate major for the Bachelor of Arts degree, departments must specify a minimum of eighteen semester hours (six courses) for majors in the humanities and social sciences and twenty-four semester hours (eight courses) for majors in science. No department may specify more than 80 semester hours (related laboratories, required courses, and prerequisites included).

In establishing a departmental major for the degree of Bachelor of Science in one of the various branches of engineering, with the exception of chemical engineering, no department may specify more than 92 semester hours (required courses, prerequisites, and related laboratories included). In establishing the departmental major for the B.S. in chemical engineering, the department may specify no more than the semester hours necessary to meet the requirements of the accrediting agency, up to a maximum total of 104 semester hours (required courses, prerequisites, and related laboratories included).

Undergraduate honors programs are open to qualified students, with departmental approval, in several departments. Through small classes and seminars, independent reading or research projects, and close contact with faculty research, students in an honors program may accelerate study in their major fields and, in some cases, enter graduate courses. Information on the qualifications for admission and the content of honors programs may be found in the departmental listings under Courses of Instruction.

Areas of Study

Architecture

Students interested in architecture may choose from programs leading to either the Bachelor of Arts or the Bachelor of Architecture degree. The Bachelor of Arts requires four years of study with a major in either architecture or architectural studies. Students who have completed or will complete the four-year B.A. with a major in architecture may apply for admission to the Bachelor of Architecture program. (continued on p. 54)

SCHOOL DEPARTMENT	DEGREES OFFERED	MAJORS, OPTIONS, AREAS OF CONCENTRATION
Jesse H. Jones Graduate School of Administration	Master of Business and Public Management, Master of Accounting, Ph.D. (For B.A., see interdepartmental major in managerial studies)	Auditing and financial reporting, business entrepreneurship, finance, international management, management accounting, information systems, organizational behavior, operations research, public accounting, public management, taxation
George R. Brown School of Engineering		
Chemical Engineering	B.A., B.S., M.Ch.E., M.S., Ph.D.	Chemical engineering, nuclear engineering, polymer science, petroleum reservoir engineering, thermodynamics, biomedical engineering
Civil Engineering	B.A., B.S., M.C.E., M.S., Ph.D.	Civil engineering, structural analysis and design, structural mechanics, geotechnical engineering, environmental engineering
Electrical Engineering	B.A., B.S., M.E.E., M.S., Ph.D.	Electrical engineering; bioengineering; circuits, control, and communications systems; computer science and engineering; lasers, microwaves, and solid-state electronics
Environmental Science and Engineering	M.E.E., M.E.S., M.S., Ph.D. (For B.A. as double major, see department)	Environmental science and engineering; biological, physical, and chemical treatment processes; hydrology and water quality modeling; water resources management; aquatic biology; inorganic and organic chemistry; atmospheric physics
Mechanical Engineering and Materials Science	B.A., B.S., M.M.E., M.E., M.M.S., M.S., Ph.D.	Majors: mechanical engineering, materials science. Options: thermal sciences and energy conversion, gas dynamics, hydrodynamics and ocean engineering, stress analysis and mechanical behavior of materials, aerospace engineering, engineering science
Wiess School of Natural Sciences		
Biochemistry	B.A., M.A., Ph.D.	Biochemistry, biophysical chemistry, molecular biology
Biology	B.A., M.A., Ph.D.	Biology, physiology, comparative biochemistry, developmental genetics, ecology, cell biology, molecular biology
Chemistry	B.A., M.A., Ph.D.	Chemistry, organic chemistry, physical chemistry, inorganic chemistry, chemical physics
Geology	B.A., M.A., Ph.D.	Geochemistry, geophysics, igneous and metamorphic petrology, marine geology-oceanography, meteoritics and planetology, stratigraphy, sedimentation, sedimentary petrology, structural geology and rock mechanics, paleontology, micropaleontology, and paleoecology.
Mathematical Sciences	B.A., M.A., Master in Applied Mathematical Sciences, Ph.D.	Computer science, numerical analysis, operations research, physical mathematics, probability/statistics
Mathematics	B.A., M.A., Ph.D.	Complex analysis, partial differential equations, mathematical physics, differential geometry, topological dynamics, ergodic theory, geometric topology, algebraic topology
Physics	B.A., M.A., Ph.D.	Physics, space physics and astronomy, biophysics, nuclear energy, geophysics, chemical physics
Space Physics and Astronomy	M.S., Ph.D. (For B.A., see physics department, space physics option)	Experimental and theoretical space physics, observational astronomy, astrophysics, and atomic physics

SCHOOL, DEPARTMENT	DEGREES OFFERED	MAJORS, OPTIONS, AREAS OF CONCENTRATION
School of Architecture	B.A., B.Arch., M.Arch., M.Arch. in Urban Design, D.Arch.	Architecture, architectural studies
Shepherd School of Music	B.Mus., B.A., B.Mus./ M.Mus. simultaneously, M.Mus.	Composition, conducting, music history, performance, theory
School of Humanities		
Art and Art History	B.A., B.F.A., M.A. (to begin 1982-83)	Art history, studio art, archaeology film and photography
Education	Master of Arts in Teaching	Teacher preparatory program in twenty-two subject areas
English	B.A., M.A., Ph.D.	English
French and Italian	B.A., M.A., Ph.D. None	French language, literature, and culture Italian language and culture
German and Russian	B.A., M.A., Ph.D. B.A.	German language and literature Russian language and literature
Health and Physical Education	B.A.	Physical education; health education as teaching field only
History	B.A., M.A., Ph.D.	History
Philosophy	B.A., M.A., Ph.D.	Philosophy
Religious Studies	B.A., M.A., Ph.D.	Religious studies
Spanish, Portuguese, and Classics	B.A., M.A. None B.A.	Spanish Portuguese Classics, Greek, and Latin
School of Social Sciences		
Anthropology	B.A., Ph.D. (For B.A. in behavioral science, see interdepartmental majors, below)	Archaeology; biological, linguistic, social/ cultural anthropology
Economics	B.A., M.A., Ph.D.	Economics
Political Science	B.A., M.A., Ph.D.	Political science
Psychology	B.A., M.A., Ph.D.	Psychology
Sociology	B.A.	Sociology
Interdepartmental Majors		
MAJORS	DEGREES OFFERED	SPONSORING DEPARTMENTS
Area Majors	B.A.	Courses from two or more departments combined by the student and faculty advisers to form a coherent program with its own requirements
Behavioral Science	B.A.	Anthropology, psychology, sociology
Chemical Physics	B.A.	Chemistry, physics
Computer Science	B.A.	Electrical engineering, mathematical sciences
Legal Studies	B.A.	Economics, history, philosophy, political science
Linguistics	B.A.	German and Russian; anthropology; English; philosophy; Spanish, Portuguese, and classics
Managerial Studies	B.A.	Accounting, economics, mathematical sciences, political science, psychology
Materials Science	B.A.	Chemistry, materials science
Policy Studies	B.A.	Anthropology, economics, history, mathematical sciences, philosophy, political science, psychology, sociology

During the fifth year, the student is normally assigned to a working preceptorship with an architect or architectural firm and then returns to Rice to complete a sixth year of architectural study for the degree. (Note that the major in architectural studies does not lead to the B.Arch. program.)

The School of Architecture encourages students to weigh their educational objectives and to choose among alternative courses of study offered. Further information on these programs may be found under Architecture in the Courses of Instruction section.

Computer Science

The program in computer science is intended to prepare students for careers involving the use and design of computing systems or for graduate study in computer science. The program includes three main subject areas: (1) hardware systems, (2) software systems, and (3) formal systems. Students take courses from all three of these areas as well as related courses in engineering, mathematics, and science. The program leads to the degree of Bachelor of Arts.

The computer science program is under the direction of the Committee for Computer Science, whose members have appointments in various departments, primarily electrical engineering and mathematical sciences, and joint majors are quite common.

Detailed information on courses and degree requirements can be found in the Courses of Instruction section under Computer Science.

Engineering

The George R. Brown School of Engineering at Rice offers, through its five departments, opportunities for a variety of curriculum and degree choices. Students interested in the engineering profession may major in chemical engineering, civil engineering, electrical engineering, mechanical engineering, or materials science for both undergraduate and graduate degrees. They may also take a double major combining environmental science with another science or engineering field. These programs lead to either the B.A. or B.S. degree and may qualify students for further study leading to a fifth-year professional master's degree, a Master of Science degree, or a Doctor of Philosophy degree.

During the first two years, engineering students should consult with the chairmen of the departments of interest or with the special first- and second-year advisers appointed by each department for information and advice about details of the programs and choice of electives and about engineering as a profession.

Students may take a program of study during their first year which satisfies the first year requirements for all engineering departments. A listing of these courses and other information regarding the first two years of study is found under Engineering and Applied Science in the Courses of Instruction section of this catalog. Degree requirements and advanced courses are listed under the separate departmental listings in the same section.

The Rice Engineering Design and Development Institute (REDDI), an applied research center within the George R. Brown School of Engineering, provides opportunities for both faculty and students to participate in actual current engineering and applied science projects.

Humanities and Social Sciences

In the School of Humanities, majors are offered in art and art history, classics, English, French, German, health and physical education, history, linguistics, philosophy, religious studies, Russian, and Spanish.

The School of Social Sciences offers majors in anthropology, behavioral science, economics, political science, psychology, and sociology.

Interdepartmental majors in legal studies and managerial studies, which overlap both schools, are described below.

The requirements of each major may be found in the departmental listings under Courses of Instruction and are also available from department chairmen and from the Registrar's Office.

Legal Studies

The program in legal studies is intended to offer undergraduates an opportunity to understand more clearly the development and character of modern society and values through the study of the humanistic and social science parameters of the law and its associated institutions. It is an interdepartmental program leading to the degree of Bachelor of Arts.

Courses are drawn from the Departments of Anthropology, Economics, Environmental Engineering, History, Philosophy, Political Science, Psychology, and Sociology. The degree may be taken as a terminal degree or as preparation for law school or graduate work in one of those disciplines. Students contemplating graduate work are strongly advised to consider the possibility of a double major. Students should consult the Legal Studies section under Courses of Instruction for the list of requirements.

The administration of the program is in the hands of a committee consisting of representatives of the Departments of Anthropology, Economics, History, Philosophy, and Political Science. Professor Baruch A. Brody, chairman of the Department of Philosophy, heads this committee. Students interested in legal studies should see Professor Brody, who will assign them an adviser closely related to the area within legal studies they wish to emphasize.

Linguistics

Study in linguistics is offered at Rice in a program that emphasizes the true interdisciplinary character of this field. The focus is placed on substantive issues of language, with balanced attention to language data and to inferences to be drawn from them, for both the specific language and language in general.

The linguistics program reflects current research of the faculty on the topics of semantics and syntax, but these traditional fields are interpreted broadly so that cognitive linguistics, cognitive anthropology, and cognitive psychology are equally relevant to the constitution of an integrated approach to language phenomena. Interest centers more narrowly on the patterns that underlie a speaker's ability to interpret what is said and to produce sensible utterances. The constraints that play a role in understanding speech and that function in the production and determination of its form are current areas of study, encompassing semantics, pragmatics, presupposition, discourse, and performance. The intent is to understand the phenomenon in such a way that the results of linguistic study and the insights provided by other approaches to cognition and their methodologies are appropriate components of a single linguistic model.

Graduate degrees with specialization in linguistics are offered in three distinct degree programs: anthropology — M.A. and Ph.D.; German — M.A. and Ph.D.; and Spanish — M.A. Rice additionally offers a B.A. degree in linguistics. Each graduate degree program provides its individual emphasis and develops from a common group of courses in linguistics.

The linguistics program is administered by a Linguistics Committee consisting of linguists from the program itself and from the Departments of Anthropology; English; German and Russian; Philosophy; and Spanish, Portuguese, and Classics. Professor Copeland of German and linguistics chairs the committee. Degree

requirements and course offerings are listed under Linguistics in the Courses of Instruction section of this catalog. Students interested in linguistics should see Professor Copeland who will consult with them about specific areas of interest.

Managerial Studies

The mangerial studies program is a preprofessional program for students selecting management careers in either business or government. The program is interdepartmental and leads to the degree of Bachelor of Arts, either as a terminal degree or as preparation for graduate professional studies in accounting, law, business, or public management. Courses are drawn from the Departments of Economics, Mathematical Sciences, Political Science, and Psychology and includes accounting courses offered as a service by the Jesse H. Jones Graduate School of Administration.

The program is designed to provide students with a comprehensive understanding both of the environment in which business firms operate and of the tools employed by management in making decisions. To major in managerial studies, students must complete forty-five semester hours of approved coursework in the following subject areas: (1) accounting, (2) economics, (3) finance, (4) statistics, (5) quantitative methods, (6) computer programming, (7) business law, and (8) industrial-organizational psychology. A list of approved courses is available from the program coordinator, 110 Herman Brown Hall, or from the managerial studies program advisers in each of the participating departments.

An honors program is available in managerial studies. This program is designed (1) to provide students with the opportunity to enrich and expand their knowledge of the managerial disciplines by means of specified advanced course work and/or independent research and writing and (2) to provide recognition for students who have demonstrated unusual competency in managerial studies. Students admitted to the honors program may elect certain graduate courses in accounting and administration as part of their major requirements. In addition, the undergraduate major may be partly satisfied by course work taken for the Master of Business and Public Management and Master of Accounting degrees.

The managerial studies program is administered by a committee consisting of faculty and student representatives from the Departments of Economics, Mathematical Sciences, Political Science, and Psychology, and the Jones Graduate School of Administration. Dean Francis D. Tuggle of the Jesse H. Jones Graduate School of Administration chairs this committee. Student records for all managerial studies majors are maintained in the Jones Graduate School. The managerial studies program coordinator assigns students an adviser closely related to the area in which they intend to specialize. Students should consult with their adviser as early as possible to ensure establishment of an appropriate plan of study.

Music

The Shepherd School of Music offers three degrees: Bachelor of Music and Master of Music in composition, conducting, music history, performance, and theory and the Bachelor of Arts degree in music. Normally, four years are required for the bachelor's degrees and two years for the master's. It is also possible to elect a program that leads to the simultaneous awarding of the Bachelor of Music and Master of Music degrees after five years of study.

The final two years of the B.Mus./M.Mus. program are devoted to specialization and can be entered only upon passing qualifying examinations administered in the fifth or sixth semester.

More detailed information about the Shepherd School and the requirements for degrees is given under Music in the Courses of Instruction section of this catalog.

Natural Sciences

Majors included in this program are biochemistry, biology, chemical physics, chemistry, geology, mathematical sciences, mathematics, and physics. The requirements for each major are outlined under departmental listings in the Courses of Instruction section of this catalog.

Policy Studies

Policy studies is a liberal arts oriented interdisciplinary major focusing on policy issues that are of public interest. Evaluation and analysis of the determinants and effects of policy decisions are the central subject matter. It is a course of study concerned with theoretical issues as well as applied and prescriptive policy questions.

The policy studies major represents an area of concentration which can be taken only as a second major, complementary to a major in any university department. The intent of the major is to provide students from a wide variety of academic backgrounds with an understanding of the policy-making process and an intellectual foundation in the skills of policy makers and evaluators. Students in the fields of engineering and basic sciences considering professions in business and/or government would benefit from an understanding of how technical innovations or regulations are adopted and implemented as matters of public policy. Students in humanistic fields such as languages or English would receive systematic exposure to areas of study which have high intellectual appeal and in which their language skills might prove to be particularly valuable. Students should consult the Policy Studies section under Courses of Instruction for the list of requirements.

The administration of the program is in the hands of a committee consisting of representatives from the Departments of Anthropology (Professor Adair), Economics (Professor Rimlinger), Philosophy (Professor Brody), Political Science (Professor Stein), Psychology (Professor Dipboye), Sociology (Professor Gordon), Mathematical Sciences (Professor Scott), and History (Professor Wiener). The chairman of the committee is Professor Rimlinger. Students interested in policy studies should see Professor Rimlinger, who will assign them an adviser closely related to their field of interest.

Other Options for Undergraduate Majors

In deciding on a major, students are encouraged to select a course of study directed toward their personal goals and abilities. Several options are available besides the normal major in most departments. Further information on these may be found in the departmental listings.

1. **Areas of concentration** within departmental majors. Certain majors, including architecture, geology, German, physics, and Spanish, but not limited to these, have a choice of different areas of concentration with different course requirements within the department major.
2. **Double majors** that fulfill the major requirements of two departments. The two majors may but need not be in related fields: for example, economics/math science or biology/art and art history.
3. **Interdepartmental majors.** Interdepartmental majors are offered in chemistry with materials science and physics and in computer science through electrical engineering and mathematical sciences. Behavioral science, legal studies, linguistics, and managerial studies are majors combining courses taught by faculty from several departments.
4. **Area majors.** Instead of selecting an established departmental major or double major, students have the option of developing an area major which is closer to their particular interests and career goals. Whereas double majors must conform to the requirements of both departments, an area

major is a single major combining courses from two or more departments which form a clearly coherent program with its own major requirements.

An area major is normally initiated by the student and worked out in conjunction with faculty advisers from each of the departments involved. Together they must agree on a title, which will then designate the area major on the student's transcript, followed by the names of cooperating departments: for example, problems of the contemporary city (architecture, sociology, environmental science, and engineering). The requirements for each area major are approved by the faculty advisers and certified by the director of student advising, who are jointly responsible for the validity and acceptability of the program as a degree plan. In addition, students who elect to take an area major must also complete university semester-hour (or course) and distribution requirements.

Though students normally choose their majors at the end of the sophomore year, it is often possible to change from a departmental major to a related area major in the junior year. Students who might want to develop an area major but are uncertain which departments to approach and students who wish to change from a departmental major to an area major should consult with the director of student advising. All applications for area majors must be certified by the director of student advising before they are accepted by the registrar.

Premedical, Prelaw, and Other Preprofessional Programs

In addition to the preprofessional and professional programs offered by Rice in accounting, architecture, engineering, management, and music, a student may pursue a program which will satisfy the requirements for admission to graduate professional schools in business, dentistry, diplomacy, and foreign affairs, finance, health science, law, or medicine.

The premedical adviser counsels students interested in premedical or predental studies and other areas of the health sciences. Those interested in prelegal studies should consult the prelaw adviser. Both advisers may be contacted through their offices in the RMC courtyard. Information about a career in business or finance can be obtained from the dean of the Jesse H. Jones Graduate School of Administration.

Students who enter an accredited law school, medical school, or other professional or graduate school at the end of their junior year at Rice can arrange to receive a Rice four-year bachelor's degree by submitting to the Committee on Examinations and Standing a degree plan which fulfills all normal university and departmental requirements for the bachelor's degree. The degree plan must be submitted before students begin their graduate or professional training. Transfer credit for courses not to exceed the equivalent of ten courses of three or four semester hours are accepted if the individual courses are acceptable to the student's major department and the registrar according to normal procedures. Students who have entered Rice after their first year must complete the minimum residence and course requirements for transfer students before leaving. The Committee on Examinations and Standing reviews the degree plan submitted by each student and gives final approval of the student's admission to the program.

Premedical and Predental Programs. The entrance requirements for medical and dental colleges of the United States are limited to relatively few courses: one year each of general chemistry, organic chemistry, physics, mathematics, biology, and English and laboratories required by the foregoing science courses. Because medical and dental schools show little or no preference for any one major, students planning a medical or dental career have the opportunity to choose their major on the basis of their interests and capabilities. They should keep two objectives in mind: (1) to secure a broadly based cultural background and (2) to master the necessary skills for an alternative career. Those who elect to concentrate in the sciences or engineering will

automatically satisfy most of the entrance requirements. Students concentrating in the humanities need to make some adjustments in their study plan in order to fulfill the entrance requirements. Premedical and predental students are advised to discuss their plans with the premedical adviser.

An undergraduate major in bioengineering offered by the Department of Electrical Engineering is specifically designed for those students who want to combine a future career in the health sciences with a basic preparation in electronics, systems analysis, and control theory. A specific program in preparation for medical school is included. Details are available from the chairman of the department.

Prelaw Studies. The academic requirement for admission to law school is satisfied by all degree programs offered at Rice. While many students major in history, political science, economics, accounting, or legal studies as a base for prelaw studies, no law school specifies particular courses or curricula as prerequisite to admission. Most require only a baccalaureate degree and the Law School Admission Test.

The Prelaw Handbook, published by the Association of American Law Schools and the Law School Admission Council, states that prelegal education should develop oral and written comprehension and expression as well as creative thinking and critical understanding of human values and that no one discipline is uniquely concerned with those objectives. Therefore, prelaw students should strive for development of their own capabilities within the areas of their greatest interest. Interested students should contact the prelaw adviser early, preferably in their first year at Rice. The Prelaw Handbook and catalogs of many leading law schools are available in the Prelaw Office in the RMC courtyard.

Reserve Officers' Training Corps Programs

Rice University offers two Reserve Officers' Training Corps programs — the army and the navy. These programs seek to train college students so that upon graduation they may qualify as commissioned officers in a component of the United States Army, Navy, or Marine Corps. The Navy has two categories of midshipmen, one working toward a reserve commission and the other toward a regular commission. The Army normally awards reserve commissions; however, certain selected distinguished military students may be offered commissions in the regular Army.

Any student suspended by the university for academic failure or other cause is immediately discharged from the ROTC programs. Any student performing unsatisfactory work in military science or naval science courses or lacking satisfactory officerlike qualities may be discharged from the ROTC programs regardless of the quality of academic work. Enrollment in the ROTC programs at Rice University is normally made at the beginning of the fall term.

Courses in naval science and military science are open to all students. These courses may be counted as free electives toward satisfying degree requirements, but they may not be used to satisfy any distribution requirements or departmental major requirements. The amount of credit assigned to each course is determined by the provost, in consultation with the Committee on Undergraduate Curriculum. All such courses shall, however, count toward the determination of probation, suspension, course load, and grade point average.

Additional information regarding the ROTC programs and available scholarships is given under Military Science and Naval Science in the Courses of Instruction section of this catalog.

Teacher Certification

Programs of study are offered to fulfill the Texas state requirements for teaching certificates on the secondary level in anthropology, art, biology, chemistry, earth science, economics, English, French, German, health education, history, Latin,

mathematics, physical education, physics, political science, psychology, Russian, general science, social studies, sociology, and Spanish.

Foreign Study Programs and Programs with Other Universities

Institute of European Studies

Rice is an affiliate university of the Institute of European Studies, a system of seven centers located in Durham, Freiburg, London, Madrid, Nantes, Paris, and Vienna. Each center offers a variety of opportunities to complement Rice major programs or to develop new interests. In each case, the institute center is associated with a host university, and students take a combination of courses offered by both. Counselors and faculty from IES and the host university advise students in the selection of appropriate courses, facilitate registration at the university, arrange for university examinations, and provide transcripts to Rice. Students considering this program or any foreign studies program are urged to arrange for prior approval of transfer credit through the academic department involved and the registrar. Information about IES programs and other foreign study opportunities may be obtained from the Office of Student Advising.

C. D. Broad Exchange Program with Trinity College, Cambridge

This exchange program sponsored by the Student Aid Foundation Enterprises involves both students and faculty from Rice and Trinity College, Cambridge. Student participation, available through receipt of a competitive award, confers one year of study as a visiting student at Rice or at Trinity College. During the 1981-82 school year, a Rice student will study at Trinity, and during 1982-83, a Trinity student will study at Rice. During the fall semester of 1982, Rice students may apply to study at Trinity in 1983-84. All undergraduate students who are scheduled to be graduated after May 1984 are eligible. The deadline for applications is December 1, 1982. Similar but shorter exchanges of Rice and Trinity faculty members will also be arranged through the program. The provost will appoint the Rice faculty member for the exchange program.

Further information on the program may be obtained from Professor John S. Olson, Department of Biochemistry, Rice's coordinator for the program.

Rice-Swarthmore Exchange Program

An exchange program between Rice and Swarthmore College has been arranged for qualified students beyond the first year who are interested in spending a semester in another part of the country. Swarthmore, which is situated on a wooded campus near Philadelphia, is a nondenominational coeducational college with academic standards similar to those at Rice.

The exchange is for the fall semester only. Rice students apply in January by submitting their own letter of application and two supporting letters, one from a faculty member in their major department and one from another member of the faculty. The exchange is on a one-for-one basis with each student continuing to pay all charges and fees to his or her home school. Rice students chosen for the exchange may take with them to Swarthmore any financial aid from Rice for which they may be eligible.

Prior approval of transfer credit should be requested for each course from the registrar. Courses to be taken at Swarthmore which will apply to the student's major must also be approved by the department. Students who enroll in the normal program of four four-semester-hour courses at Swarthmore receive upon satisfactory completion sixteen semester hours (or five courses) toward their Rice degree with a notation

of specific courses which may count for fulfillment of major requirements or distribution within that block credit.

Dual Degree Program with Texas Southern University

A dual-degree program with Texas Southern University, a predominantly minority institution in Houston, enables students to attend TSU for two years, majoring in mathematics, physics, or chemistry. During the third year, if their work has been satisfactory, the students transfer to Rice to major in engineering. After five years, a student normally receives a B.S. in some branch of engineering from Rice and a B.S. in mathematics, physics, or chemistry from Texas Southern.

This program may lead to an additional year at Rice for the professional master's degree. It also prepares a student for graduate work at Rice or any other institution offering graduate work in engineering.

Program with Williams College

In 1976, a five-year program with Williams College was established leading to a B.S. degree in one of the various branches of engineering from Rice and a B.A. degree from Williams, awarded jointly after three years at Williams and two at Rice. Students applying for the program must submit applications and fulfill all the qualifications for admission to Rice as transfer students.

Academic Regulations

All undergraduate students are subject to the academic regulations of the university. The Committee on Examinations and Standing administers the rules described below. Under unusual circumstances any student may submit a written petition to the committee requesting special consideration. All correspondence with the committee should be addressed in care of the dean of undergraduate affairs.

Registration

Currently enrolled students must complete preliminary registration the first week of each semester. Unless a special tuition plan has been elected, all tuition and fees for the fall semester 1979 must be paid by August 13, 1979. Charges for the spring semester 1980 are payable December 28, 1979. Deadlines for fall 1980 and spring 1981 semesters are August 11, 1980 and December 22, 1980, respectively. A student who does not file a course program or request a delay from the registrar by the established deadline is considered withdrawn from the university by default. To be readmitted, the student must be eligible to continue and must pay a $25 reinstatement fee.

Entering students complete their preliminary registration during orientation for new students the week before classes begin in August. New students must complete, sign, and return a matriculation card in order to be allowed to register.

Each student's course registration card must be signed by his or her faculty adviser. First-year students and sophomores should have their registration approved by the faculty adviser assigned to them in their college. Juniors and seniors have faculty advisers in their major departments. Entering transfer students are assigned advisers according to their class standing. First-year students in architecture and music must also consult faculty advisers in their respective fields. First-year students in engineering must consult faculty advisers in their intended fields of engineering.

All students must file a final course registration by the end of the second week of classes. The fee for late registration during the third and fourth week is $25. No

student is allowed to register after the fourth week except with approval from the Committee on Examinations and Standing for good reason shown. A student who drops or adds one or more courses after the second week of classes but before the applicable deadlines is charged $10 for each drop/add form submitted unless the change is a result of a revision in the course offerings or class schedules of the university.

The end of the fourth week is the final deadline for late registration or for registering in additional courses. A student may drop courses as late as the end of the tenth week but must secure permission through the dean of undergraduate affairs to continue the semester with fewer than twelve semester hours (four courses). See Course Programs below.

The above regulations and fees may be suspended for a student who wishes to change majors.

Course Programs

Students at Rice normally enroll in fifteen to seventeen semester hours (five courses) each semester and thus in eight semesters complete the requirements for graduation in their major. Students wishing to register or to be enrolled at any time during the semester for less than twelve or more than twenty semester hours (less than four or more than six courses of at least three semester hours each) must petition in writing for approval from the Committee on Examinations and Standing through the dean of undergraduate affairs before filing their final registration.

A student who enters with advanced placement credits, takes an overload during the regular term, or enrolls in summer school courses may be able to fulfill the requirements for graduation in less than eight semesters. A student enrolled in fewer than five courses may make up the work in a subsequent semester or summer school or continue beyond the normal four years.

A student on academic probation is not allowed to enroll in more than seventeen semester hours (five courses). A student who receives two or more "incomplete" grades in a semester is not eligible to enroll in more than fourteen semester hours (four courses) in the semester immediately following.

Transfer Credit including Credit for Summer School Courses Not Taken at Rice

The basis for approval of transfer credit toward a Rice undergraduate degree for courses taken at another college or university is equivalence in content and semester-hour credit to a corresponding Rice course. Transfer credit for no more than fourteen semester hours (four courses of at least three semester hours each) taken during the summer at an accredited college or university other than Rice is granted if the courses are individually acceptable for transfer credit.

Students who wish to take courses at another university during an approved leave of absence or during the summer are advised to secure prior approval of transfer credit from the registrar by submitting the name of the school and the list of specific courses for which credit is requested. If courses taken elsewhere are to count as part of the student's major requirements, written approval for transfer credit must also be secured from the appropriate department.

Prior approval is recommended but not required. Courses may be submitted for transfer credit after the work has been completed. Final approval of credit is granted and entered on the student's permanent record when the registrar receives an official transcript verifying completion of the work with a grade equivalent to "C-" or better.

Students transferring to Rice from another college or university should apply to the registrar for transfer credit on the same basis.

Financial aid from Rice is not available for courses taken at another school.

Approval of Degree Plans and Majors

At the time of preliminary registration in the first week of the semester, continuing students must file a complete degree plan with the registrar and with their major department or college (first-year students only). The degree plan must be approved by the student's adviser and must include: (1) major(s), (2) courses completed to date, (3) proposed courses for each subsequent year which shows when major requirements and distribution requirements will be met, and (4) the expected date of graduation.

A student who wishes to propose a degree plan which varies from the normal requirements for the degree sought may submit it with appropriate explanation and justification to the Committee on Examinations and Standing for approval.

A student's degree plan, including the student's choice of major, may be changed at any time by filing a new, properly approved plan with the registrar.

Final Examinations

Final examinations are given in most courses, but the decision to give a final examination as a required part of the course rests with the instructor and the department.

No student may be required to take a final examination before the official examination period as scheduled on the academic calendar, nor may an instructor require that a take-home final examination be returned before 5:00 p.m. on the last day of the scheduled examination period. These restrictions do not apply to laboratory examinations.

All tests and examinations are conducted under the honor system.

Grade Symbol and the Pass-Fail Option

1	very high standing	P	pass
2	high standing	F	failure
3	satisfactory standing	WD	withdrawn without prejudice
4	low standing	INC	incomplete
5	failure	*	other

An undergraduate may register for courses on a pass/fail basis subject to the following limitations:

1. The total number of pass/fail courses taken as an undergraduate shall not exceed four.
2. The total number of pass/fail semester hours shall not exceed fourteen.
3. A student may register for only one pass/fail course in a semester.
4. No courses specifically required for the major, nor courses within the major department (or major area for area or interdepartmental majors) may be taken pass/fail.

Courses can be taken under the pass-fail option if the student files the proper form in the Registrar's Office no later than the end of the fourth week of classes. The student may convert any course so designated to a numerically graded course prior to the end of the tenth week by filing the proper form with the registrar.

A grade of "incomplete" is reported to the registrar by the instructor when a student has not been able to complete a course because of verified illness or other circumstances beyond the student's control during the semester. Such work must be completed and a numerical grade reported by the end of the fifth week of the next semester; otherwise, the "incomplete" is automatically converted to "5".

A grade of "other" may be given if a student fails to appear for the final examination after completing all the other work of a course or if the registrar has not received grades from the instructor at the time the grade reports are prepared. A

designation of "other" must be resolved promptly after the end of the semester; otherwise, it will be converted to "5".

Students with designations of "incomplete" or "other" should be aware that they may go on probation or suspension for the previous semester when these are changed to numerical grades.

President's Honor Roll

Outstanding students are recognized each semester through the publication of the President's Honor Roll. In order to be eligible, students must have number grades in a total of twelve or more semester hours, laboratories and courses of less than three semester hours included, and must not have any grade of "5" or "F". Approximately 30 percent of all undergraduates are eligible. The exact cut-off each semester is to be determined by the Committee on Examinations and Standing on the basis of grade point averages provided by the Registrar's Office. A designation of "P" does not affect a student's eligibility one way or the other, nor does it figure in the calculation of the student's grade point average for the semester. Grades in first-year physical education courses are not counted in the required number grades for twelve or more semester hours or in calculating a student's grade point average for the semester.

Academic Probation

A student is placed on academic probation if at the end of any semester:

1. the student fails more than 25 percent of his or her course program for the semester, calculated according to semester hours, or
2. the student does not earn grades of "P", "3-", or better in at least 50 percent of his or her course program for the semester, calculated according to semester hours.

Students who earn grades which would place them on probation a third time are automatically suspended from the university.

The period of probation extends to the end of the next semester in which the student is enrolled at the university. A student on probation is not permitted to be a candidate for or hold any elective or appointive office. This restriction is also embodied in the constitution of the Student Association.

Academic Suspension

A student is suspended from the university if at the end of any semester:

1. the student is failing in more than half of his or her course program for the semester, calculated according to semester hours, or
2. the student earns grades which would place him or her on probation a third time.

Provision 1 does not apply to undergraduate students at the end of their first semester at Rice.

Students who are suspended are normally required to withdraw for a period of at least one semester. Readmission after suspension is subject to approval by the Committee on Examinations and Standing.

To obtain readmission, the student should address a letter of petition to the committee at least a month before the beginning of classes and, at the same time, request two supporting letters from persons under whom the student has worked or with whom the student has been associated in the interval of the suspension. If the problems causing the previous academic difficulty appear, upon proper consultation, to have been relieved, the student is generally readmitted. In some instances, approval of readmission may be postponed, or suspension may be permanent.

If a student who has been previously suspended earns grades which would result in probation, the student is automatically suspended a second time. The period of second suspension is at least two semesters.

A student desiring special consideration with regard to readmission following suspension should petition the committee in writing.

Readmission involving Disciplinary or Other Nonacademic Considerations

Petitions for readmission following suspension, voluntary withdrawal, or a leave of absence beyond two years, which involve disciplinary or other nonacademic considerations, may be subject to review by the proctor before final approval by the Committee on Examinations and Standing.

Voluntary Withdrawal and Readmission

A student may withdraw voluntarily from the university at any time during the semester up until the last day of classes and, if in good academic standing at the time of withdrawal, the student is normally readmitted upon written application to the Committee on Examinations and Standing.

Any student desiring to withdraw should inform the college master in person and give written notification of withdrawal to the dean of undergraduate affairs, who will notify other offices of the university as necessary. If the student withdraws within five weeks of the final examination period, class grades as of the date of withdrawal are considered in determining eligibility for readmission. Students who fail to give notice of withdrawal should expect to receive failing grades.

Leave of Absence

A student may request a leave of absence from the university by applying in writing to the Committee on Examinations and Standing at any time prior to the first day of classes in the semester which marks the beginning of the leave. Leave from the university after the beginning of the semester is considered a voluntary withdrawal.

To be readmitted following an approved leave of absence of not more than four semesters, students need only notify the dean of undergraduate affairs of their intention to return at least one month before the beginning of the semester. After four semesters, they should apply in writing to the Committee on Examinations and Standing, as in the case of a voluntary withdrawal.

Approval of a leave of absence is always contingent on the student's satisfactory completion of course work in the semester preceding the leave; otherwise, the approved leave may be converted to suspension.

Graduation

To be recommended for any bachelor's degree, students must have earned grades of "3" or better in at least 50 percent of the work prescribed for the degree, including grades of "3" or better in at least 50 percent of the advanced work in their major field, calculated by semester hours.

Students entering Rice in fall 1980 or thereafter must have earned grades of "3" or better in at least 50 percent of the work taken at Rice in fulfillment of the B.A. or the B.S. degree in any one of the branches of engineering.

Likewise, students declaring an undergraduate major in spring 1980 or thereafter must have earned grades of "3" or better in at least 50 percent of the advanced work in their major field taken at Rice.

A student must complete a total of at least 120 semester hours, including 48 semester hours (fourteen courses of at least 3 semester hours each) in advanced courses, in order to qualify for a Bachelor of Arts degree. Note that the semester hour

requirement and the course requirement are not exactly equivalent. Students enrolled in a program leading to a degree of Bachelor of Science in one of the various branches of engineering should check with the appropriate department concerning graduation requirements.

Students must be registered with the university in the semester immediately preceding the awarding of their degrees. Students who have completed their degree requirements in the summer or fall prior to that semester or who are completing their senior year at another college or university by special arrangement with the Committee on Examinations and Standing must register on campus or by mail for a no-tuition course, DGRE 498b, in order to be listed as degree candidates. They are charged a $50 registration fee and a diploma fee.

The Committee on Examinations and Standing reviews each student's record at the time of graduation and recommends to the faculty outstanding students to be granted degrees *cum laude, magna cum laude,* or *summa cum laude.*

Rice Tutorial Program

Departments with major teaching assignments in introductory courses provide tutoring to first-year students having academic difficulty. Each participating department names a faculty tutor who is responsible for organizing tutoring activities and assigning students who need tutoring to groups or individual tutors. Assignments are made on a mutually agreeable basis after consultation.

Anyone may recommend or request tutoring for an individual first-year student. Students who feel they need help may request it themselves. The normal procedure is to consult with the course instructor or the department tutor first; however, the college liaison associate and the program coordinator are available for consultation and assistance.

Each residential college selects a faculty associate who has agreed to serve in a liaison capacity. The faculty member seeks ways to aid communication and help advise first-year students who may need tutoring. The entire tutoring program is under the supervision of the director of student advising.

Information concerning the tutorial program may be secured from the Office of Student Advising and Student Activities.

Admission of New Students

From its beginning, Rice University has sought to maintain an academic program of the highest excellence for a small body of students. This number has grown with the expansion of the university's resources over the past decade, but the total number of students admitted to Rice still remains relatively small — approximately 550 students in each first-year class.

In making its selections, the Admissions Committee attempts to seek out and identify students who have demonstrated exceptional ability and the potential for personal and intellectual growth. There is no discrimination whatever on the basis of sex, race, ethnic background, age, or physical handicap. Decisions are based not only on high school grades and test scores but also on such qualities as leadership, participation in extracurricular activities, and personal creativity. The university's aim is diversity rather than uniformity, and it believes that students learn from each other and from the life of the residential colleges, as well as from their classes and laboratories.

Students are selected on a competitive basis under admissions quotas in (1) architecture, (2) humanities and social sciences, (3) engineering, (4) music, and (5) science. Applicants should give careful consideration to the category under which they wish to be considered. Students, however, are free to change from one of these areas to another, after consultation with their adviser. Only architecture and music have strictly limited enrollments. Occasionally, physical limitations of other departments may make it necessary to limit enrollment of majors.

There are four basic measures used in admissions: (1) scholastic record as reflected by the courses chosen and the quality of performance, (2) scores on the Scholastic Aptitude and Achievement Tests administered by the College Board, (3) evaluations made by teachers and counselors, and (4) personal interviews and the student's statements in the application about his or her interests, experience, and goals. The Admissions Committee is particularly interested in any information that can give insight into the extracurricular areas of development and such unmeasurable factors as motivation, intellectual curiosity, and character.

1. **The High School Record.** The completion of not less than sixteen acceptable units is required. The record must include the following units:

English	4	Laboratory science	2
Social Studies	2	(biology, chemistry, physics, etc.)	
Mathematics (algebra, geometry)	3	Additional credits in above-	3
A foreign language	2	listed subjects	
		Total 16	

Courses in chemistry, physics, and trigonometry are required of applicants for the engineering and science divisions.

2. **Entrance Examinations.** The required entrance examinations are administered by the College Board. Formal arrangement for applying to take the College Board examinations, as well as for paying fees, is a matter between the applicant and the College Board. The College Board bulletins and test applications are available from high school counseling offices. They may also be obtained in the Rice Admissions Office.

The following examinations are required according to the curriculum selected:

A. Humanities, Social Sciences, Architecture, and Music

(1) Scholastic Aptitude Test
(2) Three Achievement Tests as follows:
  (a) English composition *
  (b) any two of the following:
    A foreign language
    American history
    European history and world cultures
    Literature
    Mathematics
    A science

B. Science and Engineering

(1) Scholastic Aptitude Test
(2) Three Achievement Tests as follows:
  (a) English composition *
  (b) Mathematics (Level I or Level II)
  (c) Chemistry or physics

*with or without essay

The courses of study and majors offered may be found on pages 103-275.

3. **Evaluations from High School Counselors and Teachers.** Rating sheets submitted by the applicant's high school teachers and counselors are considered in connection with every application.

4. **Personal Interviews.** Interviews are an integral part of the admission procedure. They enable the Committee on Admissions to reach a decision based on nonacademic, as well as academic, aspects of the candidate's development. The candidate should arrange for an interview in compliance with the admissions

calendar on page 69. Campus interviews will be held at 109 Lovett Hall between the hours of 9:00 A.M. to 4:00 P.M. Monday through Friday, and until 11:30 on Saturday mornings. (Summer schedule: Monday through Friday, 9:00 A.M. to 4:00 P.M.) Applicants who cannot visit the university or who are unable to meet with a traveling member of the admissions staff may be interviewed by alumni interviewers located throughout the United States and in several foreign countries. If an applicant cannot be interviewed by one of these methods, the interview is waived. Candidates for admission to the Shepherd School of Music must arrange for an audition and theory test with the music faculty. Architecture applicants should interview with a faculty member in the School of Architecture and submit a portfolio.

Early Decision Plan

The Early Decision Plan is open to candidates for admission who regard Rice University as their first choice and will await the outcome of their application to Rice before applying elsewhere.

Students applying for the fall semester 1982 or 1983 under the Early Decision Plan must complete the required College Board examinations on or before the June testing date. Applications for admission may be filed between July and October 1. Admission notices will be mailed on November 15.

Requirements for admission are not altered by an early decision. Those accepted are expected to complete the remainder of their high school work with superior performance.

Early Decision candidates should apply for financial aid using the Early Version of the Financial Aid Form (FAF). Those applying by November 1 will be notified by November 15. Late filers will be notified as soon as their information is processed.

Action on some applications may be deferred until the Regular Decision period if the Admissions Committee does not have adequate grounds for an affirmative decision in November. An additional semester of the high school record and additional College Board scores from the November, December, or January tests may be added for later consideration. The applicant would, of course, be released from the pledge to apply only to Rice.

An applicant offered admission under the Early Decision Plan must make a $100 registration deposit within thirty days in order to hold his or her place in the incoming class. This deposit is nonrefundable after May 1. Those who wish to reserve a room on campus must make an additional $50 deposit.

Interim Decision Plan

Applicants who complete their SAT and Achievement Tests by December and who file the application for admission before December 1 may be considered in the Interim Decision Plan and notified of the outcome by February 9.

Applicants offered admission under this plan must make a $100 nonrefundable registration deposit by March 10. Those who wish to reserve a room on campus must make an additional $50 deposit.

Regular Decision Plan

Regular Decision applications completed by February 1 are considered before April 10. Applications received after February 1 are considered only after all earlier applications. Candidates who apply after February 1 must do so in full knowledge that they are in a highly speculative position.

Applicants not accepted under the guidelines for Early Decision and Interim Decision are normally advised to keep their applications alive until all applicants can be considered. Regular Decision applicants who are offered admission should make a $100 registration deposit by May 1 to reserve their places in the incoming class.

This deposit is not refundable after May 1. Those who wish to reserve a room on campus must make an additional $50 deposit.

Financial aid applicants for Interim and Regular Decision should consult the calendar on page 70 for deadlines and notification dates. Late filers will be notified as soon as their information is processed.

Admissions Calendar

EARLY DECISION	INTERIM DECISION	REGULAR DECISION	TRANSFER
Application by October 1	Application by December 1	Application by February 1	Application by April 1 for fall; November 1 for spring
Interview by October 15	Interview by January 1	Interview by February 1	Interview by April 1 for fall; November 1 for spring
Required SAT and Achievement Tests in the junior year by June test date	Required SAT and Achievement Tests completed by the December test date	Required SAT and Achievement Tests completed by the January test date	Required SAT if never previously taken
Notification of admission mailed November 15	Notification of admission mailed February 9	Notification of admission mailed April 10	Notification in mid-May or December
Financial Aid Form (Early Version) filed by November 1; Financial Aid notification by November 15	Financial Aid Form filed by January 15; Financial Aid notification by February 9	Financial Aid Form filed by March 1; Financial Aid notification by April 10	Notification when admitted; allow one month after filing Financial Aid Form
Deposit within thirty days nonrefundable after May 1	Deposit within thirty days nonrefundable	Deposit refundable until May 1 (candidates reply date)	Nonrefundable $100 deposit

No application fee is required of candidates for admission to Rice.

The $50 room deposit is due on the same date as the registration deposit. The room deposit may be refunded or credited to the applicant's account until such time as a room is assigned to the applicant.

Advanced Placement

Entering first-year students who have done work well beyond the usual high school courses in certain subjects and who score "4" or "5" on the Advanced Placement College Board examinations prior to matriculation at Rice are given university credit toward graduation for appropriate Rice courses satisfying distribution or free elective requirements. Acceptance of such credit in fulfillment of a student's major requirements is subject to approval by the department in question. Credit for specific courses at Rice depends upon which advanced placement examination was successfully completed.

Students who make a high score on the College Level Examination Program (CLEP) test may, at the discretion of the department, receive advanced placement and degree credit in chemistry or biology. No degree credit for introductory courses on the basis of CLEP scores is granted to students who have taken more advanced college work in the subject.

During orientation week at the beginning of the academic year, entering students may take advanced placement tests administered by various departments at Rice. On the basis of these tests, students may be advised to register in courses beyond the introductory level. Degree credit is not given for these tests.

Transfer Students

Rice University encourages application from students with superior records who wish to transfer from a junior college or a four-year college or university. Interested students should request a transfer application form from the Office of Admissions.

Applications for admission in the fall semester should be filed before April 1 and be accompanied by official transcripts of all high school and college work completed to date and courses in progress. Notification of admission is mailed in mid-May. Applications for admission for the spring semester with the appropriate transcripts must be filed by November 1. Notification of admission is mailed by December 10.

The criteria used in evaluating transfer applications are essentially the same as those applied to applicants for the first-year class, except that special emphasis is given to performance at the college level. Scholastic Aptitude Test scores are required. If candidates have not previously taken College Board tests, they must take the Scholastic Aptitude Test no later than March or April if they wish to apply for admission in the fall. Achievement Tests are not required.

Transfer students must be registered in residence at Rice for at least four full semesters during the fall or spring terms and must complete not less than fifty-two semester hours (sixteen courses of three or more semester hours each) for a Rice degree.

For further information or application forms, prospective candidates for admission as undergraduates should communicate with the Office of Admissions. When requesting application forms, candidates should clearly indicate that they are prospective transfers from another college.

Visiting Students

Students who wish to spend a semester or a year at Rice taking courses for credit to be applied toward their undergraduate degree at another school should apply for admission as visiting students through the Office of Admissions. The student's application should be accompanied by an official transcript of college work to date and a letter from the student's academic dean or registrar agreeing to grant transfer credit subject to satisfactory performance.

Visiting students are assigned membership in a college during their stay and are charged the same fees as other undergraduates. In a few classes where enrollment is limited because of space or other considerations, candidates for Rice degrees have priority over visiting students. Visiting students are eligible for a Guaranteed Student Loan if they are taking at least six semester hours.

Class III Students

Class III standing at Rice University designates students with an undergraduate or graduate degree from an accredited college or university who are taking courses for credit but not in a specific degree program. The university keeps a permanent record of such courses and sends a transcript of that record anywhere on request from the student. Courses taken as a Class III student may be used to prepare for advanced degree work or to satisfy requirements for admission into a graduate program. However, a graduate degree may not be earned through the Class III program nor may such work be credited toward requirements at Rice until the student has applied to the appropriate department, been recommended for admission, and been officially admitted by the Graduate Council.

Although most undergraduate courses and some graduate courses are open to Class III students, in classes and laboratories where enrollment is limited because of space or other considerations, candidates for Rice degrees have priority over Class III students.

Application for admission as a Class III student should be submitted to the Office of Continuing Studies. For information on tuition and fees for Class III students, see page 73. Financial Aid is usually not available for Class III students, except for a Guaranteed Student Loan with at least six semester hours. Deadlines for applications to the Class III program are November 15 for admission to spring semester courses, May 1 for summer admission, and August 1 for fall courses.

Admission of High School Students to Take Courses for Credit

Accelerated high school juniors and seniors who have taken all the courses in a given discipline available to them in high school or who have completed their high school graduation requirements may request admission to Rice for the purpose of taking one or more university level courses on the same basis as Rice undergraduates. Such courses are graded for credit, and the university sends a transcript of this record on request by the student to any college or university. If the high school student is later admitted to Rice, any such courses are counted toward the student's undergraduate degree at Rice.

Tuition for such courses is $140 per semester hour plus a $50 registration fee, the total not to exceed $1,600. These charges are for 1981-82 and are subject to change in subsequent years. Application for admission should be made to the Admissions Office. Financial assistance is not available for this program, except for a Guaranteed Student Loan with at least six semester hours.

Auditors

Any interested person, including currently enrolled students, may audit one or more courses at Rice by securing permission of the instructor and by registering as an auditor with the registrar. The university grants no academic credit and keeps no permanent records of courses attended by auditors.

Currently enrolled students may audit courses without charge. Rice alumni may audit as many courses as they wish for a fee of $25 per semester. All others are charged $50 per course per semester for the privilege of auditing.

Student Housing

Prospective students should indicate on the application for admission whether or not they desire to reside on the campus. Information about residence in the colleges and room application forms accompany the notice of admission sent to each new undergraduate. Room reservations cannot be made prior to notification of admission.

At present, Rice University has the capacity to house about 70 percent of its undergraduate students in the residential colleges on campus. Although the majority of students desiring to live in the colleges can be accommodated, demand exceeds the available number of rooms. Every effort is made to provide housing in the colleges for all incoming first-year students who wish to live on campus, but continuing students cannot be promised space and must draw for rooms according to the priority system in each college. No student is required to live on campus. Off-campus members are encouraged to eat in their colleges and to participate in college activities.

Correspondence from new students regarding housing in the residential college should be addressed to the Office of Admissions. Information concerning off-campus housing is available from the Office of Student Advising and Student Activities.

Tuition, Fees, and Expenses

The tuition and fees for undergraduate students are set forth below for academic year 1981-82 only. These charges are subject to change in subsequent years as the operating expenses of the university change.

Tuition

The tuition for undergraduate students in 1981-82 is $3,200 per year, payable $1,600 prior to the beginning of each semester.

Part-time students taking fewer than four courses by special permission of the Committee on Examinations and Standing are billed at the part-time rate of $140 per semester hour for the courses in which they are enrolled plus a $50 registration fee, the total tuition and registration fee not to exceed $1,600 per semester.

The tuition charge for Class III students is $140 per semester hour plus a $50 registration fee, the total not to exceed $1,600 per semester.

Students completing their degree requirements in the summer or fall prior to the awarding of the degree or students completing their senior year at another university by special permission of the Committee on Examinations and Standing are charged a $50 registration fee and a diploma fee for the spring semester. (See Graduation, page 65.)

Any undergraduate who withdraws or takes an approved leave of absence and is then readmitted to the university is charged the tuition in effect during the semester in which he or she returns.

Fees

All undergraduate students and candidates for a second bachelor's degree are charged the following annual fees, payable in full at the time of the student's first tuition payment for the year or any portion of the year. An exception is the Health Service fee, which is paid in two installments, half before the beginning of the fall semester and half before the beginning of the spring semester (see pages 85-86 for discussion of health insurance).

Subsidies to student activities	$33.80
Tickets to athletic events	4.00
College fee	35.00
Health Service fee	104.00
Total basic fees	$176.80

Special Charges

Orientation week room and board (required for all new students)	$40.00
Diploma fee (for graduating students only)	25.00
ROTC	25.00
Late payment/late registration fees	25.00
Late course change	10.00
Late application fee for class III	50.00

Refund of Tuition and Fees and Appeal Procedure

A student who withdraws during the first two weeks of the semester is not charged tuition or fees for that semester. A student who withdraws during the third week is charged 30 percent of the semester's tuition. The amount of the refund is

reduced by 10 percent at the beginning of each successive week. No refund is made for withdrawals after the ninth week. There is no refund of fees or special charges after the second week of classes in the semester. The $100 registration deposit paid by incoming students is not refunded at any time if the student withdraws. There is no partial refund of fees paid for the full year for withdrawals or leaves of absence in the spring semester.

Student requests for special consideration in connection with waivers, refunds, or adjusted payments on tuition, fees, and other charges, which cannot be satisfactorily resolved between the student and the Cashier's Office, should be forwarded in writing to the Office of the Vice-President for Administration by way of the dean of undergraduate affairs. The dean will confer with the student if possible and inform the vice-president or a member of the vice-president's staff concerning any special circumstances before a decision is reached.

Teacher Certification Program Fees

All students enrolling in either the apprenticeship plan or the internship plan are charged a $100 registration fee for each semester or summer period.

Delinquent Accounts

No student in arrears in any financial obligation to Rice University as of the date announced for the completion of registration for any semester can be registered. No certificate of attendance, diploma, or transcript of credit is issued at any time for a student whose account is in arrears.

Students who have not made satisfactory arrangements with the cashier for payment of current charges or have moved on campus without executing a satisfactory room contract may be discharged from the university.

Transcripts

Transcripts are issued on request made to the Office of the Registrar. No transcript is issued without consent of the individual whose record is concerned. Each student is entitled to two free transcripts. There is a charge of $1 for each additional copy, payable in advance. Those requesting transcripts by mail should include payment with the request.

Living Expenses

Residence fees, to cover costs of dining halls and operation of residences, are established from year to year as requirements dictate. For 1981-82, the yearly room and board charge for residence in a residential college is $2,900. This charge provides room and three meals per day excluding the evening meals on Saturdays and Sundays. Meals are not served during the Thanksgiving holidays, midyear, fall, and spring midterm recesses, and the spring holidays. When securing room assignments for the academic year to follow, each student is required to make a room deposit of $50. To assure reservation of space, current students must make room deposits by the date established in the various colleges, but no later than April 15. New students are required to make a similar deposit prior to May 1. These deposits are not returnable but are applied against the following semester's charges. The balance of the residence fee is payable in installments. The exact amounts and due dates are stated in the residential college agreement that each on-campus resident is required to sign.

Students dismissed through the action of duly constituted authority within the university from the college or the university for academic or disciplinary reasons shall be entitled to a prorata refund or credit of room and board payment or charges. Students terminating their residence in the college for any other reason shall be entitled to a prorata refund or credit of the yearly payments or charges less a

withdrawal fee of $50 for those who announce in writing their intention not to occupy their space in the college after May 1 and before August 15 for fall semester and before December 1 for spring semester. A withdrawal fee of $75 will be assessed for those withdrawing after August 15 and December 1. The student hereby agrees that the foregoing withdrawal shall be liquidated damages for breach of this agreement, and the applicable fee as determined from the above will be deducted from the refund. Prorata refunds or credits for room and board shall be determined on the basis of regular operating school days, i.e., first day of class through last day of finals. (In the event that the prorata amount is less than $75, the withdrawal fee shall equal the prorata amount.) Termination of residence shall be the date that the student informs the master in writing that the student is no longer a resident in the college or the date that the space was effectively made available for occupancy by another student, as certified by the college master and the vice-president for administration or his designate, whichever date is later. Any personal belongings of the student remaining within the room after such space is certified to be available shall be disposed of by the university.

Modifications of the policies concerning refunds shall be made only in exceptional cases. Requests for such exceptions must be made in writing to a committee composed of the master of the college concerned, the dean of undergraduate affairs, and the vice-president for administration by application to the college master.

All items included, the young man or woman entering Rice University in August 1981 and living on campus needs to have available about $7,500 the first year. For a student living at home, the cost is about $6,250.

Financial Aid

The financial aid program at Rice University seeks to provide assistance as needed in meeting the basic costs of attendance to all students who are admitted. Through grants, low interest loans, campus work opportunities, or a combination of these programs, Rice attempts to give the students sufficient aid to meet educational expenses.

The financial aid program is funded from many sources. Rice University receives from alumni and friends contributions which are used to initiate and maintain scholarships and loan funds. Other funds available to the students are federal programs, both grant and loan, the state grant program, and the Rice University tuition grant and loan appropriation from endowment income.

Awards are based primarily on financial need.

The college will publish budgets that state total student expenses realistically, including, where applicable, maintenance at home, community expenses, personal expenses, and necessary travel.

Parents are expected to contribute according to their means, taking into account their income, assets, number of dependents, and other relevant factors. Students themselves are expected to contribute from their own assets and earnings, including appropriate borrowing against future earnings.

A brochure entitled *Rice: Financial Assistance Opportunities* explains the program of assistance in detail. Students may secure a copy from the Office of Admissions or the Office of Financial Aid.

The determination of need is based on information supplied through the College Scholarship Service. Need is defined as the amount required to meet the difference between the student's total educational expenses and the family's resources.

Application

To apply for financial assistance, the candidate must file a Rice University financial aid application with the university as well as the Financial Aid Form (FAF) with the College Scholarship Service. When Rice University receives both forms, the applicant is considered for all appropriate assistance administered by the university including grants, scholarships, loans, and work.

Early Decision candidates may obtain the Financial Aid Form from Rice University. This form and the application for financial aid must be filed by November 1. Interim Decision candidates must file the Rice University financial aid application and the Financial Aid Form by January 15, and Regular Decision candidate must file the Financial Aid Form by March 1 in order to receive notification of awards at the same time as notification of admission.

Financial aid awards are made on an annual basis and are payable as indicated on the award sheet.

Continuing students must file the Rice University financial aid application with the university and the Financial Aid Form with the College Scholarship Service by June 1 (December 1 for second semester only). Since awards are based on need which may change from year to year, the amount of assistance is reviewed and adjustment made each year as related to the current need.

Financing

In some cases, meeting the costs of higher education in a private university is difficult even though the usual financial analysis indicates no need for financial aid. It is understood that even though a family's assets may be adequate to afford the cost of tuition, fees, and room and board without financial aid, payment of relatively large sums at stated times may require rearrangement of family planning that results in hardships or sacrifice. Rice University offers two payment plans to permit financing of educational costs. Both require very low interest charges.

A short-term, ten-pay plan permits division of the annual university charges over ten months. Arrangements are made through the Cashier's Office, from which details and applications may be obtained.

Longer term financing is available through the Guaranteed Student Loan program to those for whom lump sum payments would require undue hardship.

Guaranteed Student Loans (GSL) are normally available to almost any undergraduate student, regardless of financial need. A GSL may be obtained from a bank, credit union, savings and loan association, or Rice University. An initial GSL may not be made by Rice University to an undergraduate unless a statement of loan refusal from a commerical lender is provided.

An undergraduate may borrow up to $2,500 each year to a total of $12,500 for five years. An insurance premium of one-quarter of one percent will be collected at the time of disbursement.

No interest charges will be made as long as the student remains enrolled at least half time at Rice University. Repayment of the loan, together with a 9 percent interest charge, will begin six months after termination of at least half-time enrollment at Rice. Up to ten years may be allowed to repay the loan, unless the required minimum of $90 per quarter will repay the loan in a shorter period of time.

Payments may be deferred for up to three years for service in the Armed Forces, Peace Corps, or full-time volunteer programs conducted by ACTION (which includes VISTA, University Year for ACTION, ACTION Cooperative Volunteer Programs, Volunteers in Justice, and Programs for Local Service) or in a tax exempt organization comparable to the Peace Corps or to VISTA or as an officer on full-time duty in the Commissioned Corps of the U.S. Public Health Service. In addition, deferment is available for a return to full-time study at an eligible institution, or to pursue a course of study under a graduate fellowship program approved by the

Commissioner of Education or while temporarily totally disabled or unable to secure employment because of providing care required for a spouse who is so disabled. Also, deferment can be obtained for up to two years while serving an internship required to begin professional practice or service. A single deferment for a period of not more than one year may be provided for students who are unable to secure full-time employment.

GSL applications are available in the Rice University Financial Aid Office.

Student Loan Funds

A few endowments have been established for student loans primarily as memorial tributes. Others are welcome. These funds are basically part of the normal financial aid program. They are used also, however, for emergency loans to students who experience unexpected financial problems during a term.

Karl Bailey-William Carroll Memorial Loan Fund
Frank McFadden Caldwell Loan Fund
Bing Crosby Loan Fund
John J. Deering Loan Fund
Louise Adele Drenkle Loan Fund
Mary Alice Elliott Loan Fund
Gulf Oil Educational Foundation Loan Fund
Houston Bridge League Loan Fund
Leo M. Levy Memorial Loan Fund
Benjamin S. Lindsey and Veola Noble Lindsey Memorial Loan Fund
Lora B. Peck Loan Fund
Rice Institute Loan Fund
Rice University Guaranteed Student Loan Fund
Students Memorial Loan Fund
Owen Wister Literary Society Alumnae Loan Fund

Student Employment

Employment is available to students interested in working part time during the academic year. These work opportunities are available both on campus and off campus. Students seeking employment should apply directly to the Financial Aid Office.

Vocational Rehabilitation

The Texas Rehabilitation Commission offers assistance for tuition and non-refundable fees to students who have certain disabling conditions if their vocational objectives have been approved by a TRC counselor. Examples of such conditions are orthopedic deformities, emotional disorders, diabetes, epilepsy, and heart conditions. Other services are also available to assist the handicapped student in becoming employable. Application for such service should be made at the Texas Rehabilitation Commission. Students with visual handicaps should contact the Texas State Commission for the Blind.

Undergraduate Scholarships and Awards

Alumni and friends of Rice University have generously endowed many awards and scholarships to assist students. Some of these are awarded on the basis of need

as well as academic performance, but a number of scholarships and prizes are given on the basis of academic performance alone.

Students do not apply for these awards and scholarships. Every student is automatically considered for an award or scholarship on the basis of entrance qualifications or performance at Rice, together with evidence of financial need submitted to the Financial Aid Office as these or other qualifications may be appropriate. Further information on the donors, the number and purpose of individual awards, and the names of their most recent recipients is available from the Financial Aid Office or from the Office of the Dean of Undergraduate Affairs.

General Awards and Scholarships

Achievement Rewards for College Scientists Foundation Scholarship
Joe L. and Barbara Allbritton Scholarship
Florrie Ethel and M. E. Andrews Scholarship
Samuel S. Asche Scholarship
Max Autrey Memorial Scholarship
Axson Club, Ellen Axson Wilson Scholarship
Axson Club, Katie B. Howard Scholarship
Axson Club, Special Scholarship Honoring Mrs. A. S. Foote
Axson Club, Pauline M. Crouch Scholarship
Graham Baker Studentship
James A. and Alice Graham Baker Distinguished Scholarship
James A. and Alice Graham Baker Honor Scholarships
James Foulds Barbour Scholarship
Eric and Arabella Beall Scholarship
H. Leroy Bell Scholarship
Board of Governors Scholarships
Beverly and Donald Bonham Scholarship
Fetabel Denton Briggs Memorial Scholarships
Mildred C. Brinn Scholarship
C. D. Broad Exchange Program Award with Cambridge
Brown and Root Officers Scholarships Honoring George R. Brown
Clyde and Ethel Butcher Scholarship
Chapman-Bryan Memorial Scholarship
Chinese Professional Club Scholarship
Class of 1921 Scholarship
Class of 1929 Scholarship
Class of 1930 Scholarship
Class of 1931 Scholarship
Arthur B. Cohn Prize Scholarships
College Bowl Champions Scholarship
College Women's Club Scholarship
William Arthur Combs Scholarship
Continental Airlines Foundation Scholarship
Millie Tutt Cook Scholarship
Daughters of the American Revolution, John McKnight Alexander Scholarship
Daughters of the American Revolution, Fannie Bess Emery Montgomery Scholarship
Daughters of the American Revolution, Lady Washington Texas Centennial Award
Thomas A. and Pauline M. Dickson Scholarship
Thomas P. and Maude Seeger Dow Scholarships
Thomas Flaxman Scholarship
Thomas R. and Julia H. Franklin Scholarships

General University Scholarship Fund
Mary Parker Gieseke Scholarship
Richard L. Grider Scholarship
Harold B. Hamilton Scholarship
Annette Schreiber and Bruce Hill Scholarship
William Clifford Hogg Fund Scholarships
Hohenthal Scholarships
Washington Cone Holliman Scholarship
Mercer T. Ingram Scholarship
M. M. Feld and J. P. Hamblen Interfaith Charity Scholarships
Meredith H. James Scholarship
Jameson Fellowship for American Decorative Arts
Alfred R. and Eleanor H. Johnson Scholarship
Gaylord Johnson Scholarship
Jones College Scholarship
Grant William Jordan and Cora Jordan Memorial Scholarships
Louise S. Koehler Scholarships
Julia Merle and Roy Lay Scholarship
Patrons of E. L. Lester and Company Scholarship
Lottman Scholarship
Margaret Brokaw McCann Scholarship
John Charlton McCoy Scholarship
J. L. C. McFaddin Scholarship
W. P. H. McFaddin Scholarship
Emma S. McGree Scholarships
Byron Meredith Scholarship
Achille and Malline Meyer Memorial Scholarship
Elizabeth Morford Scholarship
Motheral-Neilan Scholarship
Rice Sponsored National Merit Scholarships and National Achievement Scholarships
Ida R. and Hanna E. Nussbaum Scholarship
Rebecca Raphael and Lilly G. Nussbaum Scholarship
Charles Breckenridge Parkhill Scholarship
Raymond Pearson Scholarship
Emanuel and Mose Raphael Scholarship
Robert H. Ray Memorial Scholarships
Ernest R. Rechel Memorial Scholarships
William J. Reckling Memorial Scholarship
Rice Service Award
Richardson Scholarships
Daniel Ripley Scholarship
Edith Ripley Scholarships
James M. and Sarah Rockwell Scholarships
Catherine Withers Roper and Benjamin E. Roper Memorial Scholarship
Willie Rowell and Ruth Andrews Scholarship
The Roy Scholarships
Kathleen Elaine Schlotterbeck Memorial Scholarship
Anita and Campbell Sewall Scholarship
Mr. and Mrs. Samuel T. Sikes Scholarship
Society of Rice University Women Scholarship
Southland Paper Mills Foundation Scholarship
Richard D. Steed Scholarships
Special Students Assistance Grant

Sara Stratford Scholarship
Teagle Foundation Scholarships
James U. and Margot Teague Scholarship
Susie Smith Vandiver Scholarship
Herschel M. Vaughan Student Scholarship
John B. Warren, Jr., Scholarships
Abe and Rae Weingarten Scholarship
Harris Weingarten Scholarship
Robert A. Welch Foundation Undergraduate Scholarships
Elizabeth Aldridge Wells Scholarship
Blanche White Honor Scholarships
Charles K. and Maidie Autry Wilbanks Student Fund
Willoughby C. Williams Scholarship

Awards and Scholarships in Departmental Disciplines

Accounting and Administrative Science

Leo M. Acker Memorial Scholarship
Atlantic-Richfield Scholarships
Financial Executives Institute Award
E.F. "Gene" Florian Scholarship
Foley Brothers Scholarship
Deloitte Haskins & Sells Foundation Scholarship in Accounting
John T. McCants Scholarship in Accounting
Texas Society of Certified Public Accountants Accounting Excellence Award

Architecture

Alpha Rho Chi Award in Architecture
American Institute of Architects School Medals
Edward B. Arrants Award in Architecture
James H. Chillman, Jr., Prizes
John Crowder Memorial Scholarship
M. N. Davidson Fellowships
Featherlite Scholarship in Architecture
Jesse H. Jones Scholarship in Architecture
William Ward Watkin Traveling Fellowship

Art

Art Supply Award
PALS Art Awards
Christine Croneis Sayres Memorial Art Award
Texas Art Supply Company Award

Athletics

George R. Brown Football Awards
Emmett Brunson Award
Walter W. Fondren, Jr., Memorial Scholarship
Joyce Pound Hardy Award
Joe F. Lipscomb Freshman Award
George Martin Award
T. S. Martino Scholarship
Dell Morgan Award
Jess Neely Football Awards
Robert Pilcher Quin Award

Hugh C. Welsh Scholarship
Billy Wohn Award
Women's Athletic Awards

Chemistry
Eastman Kodak Scholarships
Z. W. Salsburg Memorial Awards
Harry Boyer Weiser Scholarship

Economics
Blanche Randall Haden Scholarship

Education
Millie Tutt Cook Scholarship

Engineering
Herbert Allen Merit Award
American Institute of Chemical Engineers, South Texas Section, Scholarship
R. C. Baker Foundation Scholarships
Brown Scholarships in Engineering
Ralph Budd Award
Champlin Petroleum Company and Engineering Scholarship
Gerard A. Dobelman Memorial Scholarship
Steven G. Dobelman Memorial Scholarship
Fluor Ocean Services Scholarship
Lillian Haynie Scholarship
Houston Engineering and Scientific Society Scholarship
Jacobs Engineering Group, Inc., Scholarship
Kemper Foundation Engineering Scholarships
A. C. Lederer, Jr., Scholarship in Civil Engineering
Mason G. Lockwood Engineering Scholarship
H. A. Lott, Inc., Scholarship
W. L. Moody, Jr., Scholarships in Engineering
National Society of Professional Engineers Scholarship
Rice Engineering Alumni Outstanding Engineering Student Awards
Dwane M. Rivers Scholarship in Engineering
Louis J. Walsh Scholarships/Fellowships in Engineering
James S. Waters Creativity Award

French
Pi Delta Phi André Bourgeois Award
William J. Reckling Memorial Scholarship

Geology
Torkild Rieber Award
L. P. Teas Scholarship

German
Max Freund Prize in German

History
Mary Hayes Ewing Publication Prize in Southern History
Barbara Field Kennedy Prize in American History
Captain Charles Septimus Longcope Award

Military Science
American Legion Scholastic Excellence Awards
Armed Forces Communications and Electronics Association Awards
Alan Kyle Award
Society of American Military Engineers Award
Superior Cadet Decoration Awards

Music
Elva Kalb Dumas Prize in Music
Erwin and Emily Heinen Prize in Music
Joseph A. and Ida Kirkland Mullen Scholarships
Sallie Shepherd Perkins Prize
Burt Duke Raiza Piano Prize
James L. Shepherd III Memorial Award
Shepherd Society Awards and Scholarships
Dorothy Richard Starling Scholarships
Ann Wakefield Memorial Award

Naval Science
Jesse H. Jones Naval Scholarships
Navy League Award
Society of American Military Engineers Award
Armed Forces Communications and Electronics Association Awards

Physical Education
G. L. Hermance Award in Physical Education

Physics
Claude W. Heaps Prize in Physics
H. A. Wilson Award

Political Science
Charles Breckenridge Parkhill Scholarship in Political Science

College Awards
Marie Alexander Leadership Award
Donald R. Baker Scholarships
H. E. Bray Freshman Award
Jones College Scholarships
Richardson College Master's Award for Excellence in Scholarship
Z. W. Salsburg Award
Jackie Schnell Memorial Scholarship
Corrinne and Radoslav Tsanoff Sophomore and Junior Prizes
Olga Keith Wiess Award
Harry Carothers and Olga Keith Wiess Scholarship

In addition to the above awards, Rice is invited to nominate students for several scholarships and fellowships which provide funds for foreign study and travel or later graduate work. Final selections for these awards are made nationally or regionally.

Edwin, Frederick, and Walter Beinecke Memorial Scholarship
Danforth Fellowships
Fullbright-Hays Scholarships

Latin American Scholarship Program of American Universities, Inc. (LASPAU) Scholarships
Luce Scholarships
Marshall Scholarships (British)
Rhodes Scholarship (British)
Silver Medal of the Royal Society for the Encouragement of Arts, Manufactures, and Commerce (British)
Harry S. Truman Scholarships
Thomas J. Watson Fellowships
Woodrow Wilson Doctoral Dissertation Fellowship in Women's Studies
Zonta International Amelia Earhart Aerospace Award

Honor Societies

The Phi Beta Kappa Society was founded in 1776 at the College of William and Mary for the purpose of recognizing intellectual achievement and the love of learning among students in the liberal arts and sciences. The Rice University chapter was formally installed on March 1, 1929.

Phi Lambda Upsilon, an honorary chemical society, promotes high scholarship and original investigation in all branches of pure and applied chemistry. The Rice chapter was installed in 1927.

The Pi Delta Phi Society, organized to interest students of French in competing for high standing in scholarship, authorized in May 1930 the formation of the Theta chapter of Rice.

The Society of Sigma Xi, for the promotion of research in science, established the Beta of Texas chapter at Rice on March 23, 1938.

The Tau Beta Pi Association, organized to interest engineering students in competing for high standing in scholarship, created the Gamma of Texas chapter at the university on December 18, 1940.

Delta Phi Alpha was founded to promote an interest in the German language and literature. The National Council authorized the Gamma Xi Chapter at Rice in April 1949.

Sigma Delta Pi was founded to promote an interest in the Spanish language and literature. The Rice University chapter was installed on May 14, 1953.

Tau Sigma Delta is a national honor society in architecture and applied arts. The Tau Chapter was established at Rice on May 7, 1961.

Eta Kappa Nu was founded in 1904 at the University of Illinois for electrical engineering students not just to stimulate and reward scholarships but to assist and encourage its members to grow professionally throughout their entire lives. The Rice chapter was installed January 1981.

Student Life

Student Responsibility

Each Rice student is expected to observe standards of conduct consistent with respect for the law, the fulfillment of contractual obligations, consideration for the rights of others, and a high level of personal integrity. Though the university does not intend to supervise the personal lives of its students, all members of the university community are encouraged to be aware that their behavior both on campus and off campus may reflect upon the university.

The student government, the judicial system, and the honor system depend on a willing exercise of responsibility and honor on the part of everyone.

The university reserves the right to require the withdrawal of any student whose conduct may be judged clearly detrimental to the best interests of either the student or the university. Such action is taken only after careful consideration by the appropriate branches of the student government and/or the faculty and administration.

No individual or group may use the name of the university or one of its colleges without prior approval of the university and the college.

The Honor System

One of the oldest and proudest traditions at Rice is its honor system administered by a student Honor Council whose members are elected annually by the student body. Adopted by a vote of the student body in 1916, the system has remained essentially unchanged except for changes in the procedures and membership of the Honor Council.

All written examinations and any specifically designed assignments are conducted under the honor code. The student body, through its commitment to the honor system, accepts responsibility for assuring the validity of all examinations and assignments conducted under the system. The Honor Council is responsible for investigation of all reported violations and for trial in those cases when the facts warrant. The proctor reviews the results of investigations and trials and acts upon recommendations for penalties. The Honor Council conducts a continuing program to orient new students and faculty to the responsibilities and privileges of the system.

Residential Colleges

Every undergraduate student, whether living on campus or not, is a member of one of eight residential colleges. Richardson and Wiess are men's colleges; Brown is a women's college. Baker, Hanszen, Will Rice, Jones, and Lovett are coeducational.

Each college is a self-governing group of students whose elected officers and representatives are responsible for directing a variety of cultural, social, and athletic activities as well as maintaining good order in the college. While uniformity among the colleges has never been sought and each college has developed its own particular interests and character, all seek to foster fellowship among their members and a mature sense of honor, responsibility, and sound judgment.

Each college has a faculty master and comaster, who occupy a house adjacent to the college. The master has an overall responsibility for all aspects of student life in the college, being particularly responsible for encouraging broad cultural and intellectual interests among the members and for promoting individual self-discipline and effective self-government within the college. Other members of the faculty are invited, upon agreement of the student members and the master, to become resident and nonresident associates of the college. Faculty associates act as advisers to the members and participate in the camaraderie and activities of the college. Several colleges also have nonfaculty university associates and community associates from the Houston area, drawn from various professions.

Upon acceptance by the university, each undergraduate student is designated a member of one of the colleges. Two students who are entering Rice for the first time may ask to be assigned to the same college but may not designate which college. Men and women also may indicate a preference for a men's, women's, or coed college but may not designate which college. A new student may request membership in the same college as a close relative. No other choice of college is allowed.

The buildings of each college include a dining hall and living rooms, which are available to both resident and nonresident members, and living quarters for approximately 215 students from all classes of the university and all academic disciplines. At present, on-campus residential space is available for most of the first-year students who request it, but space is not assured until receipt of formal notification. Continuing students draw for the available space by the priority and lottery system established in each college since the demand exceeds the available space.

The College Food Service provides nineteen meals per week, excluding evening meals on Saturday and Sunday. Breakfast and lunch meals are cafeteria service, and dinner is seated, family style. No meals are provided on designated holidays and recesses. Various services provided by the College Food Service for students living in the colleges include (1) assistance with special diets prescribed by a physician, (2) sack lunches for students who must miss a meal due to a job conflict, (3) sick trays for students when requested by the Student Health Service, and (4) alternate menu entree, whenever possible, in accordance with students' religious practices.

College Courses

As one of their important activities, individual colleges sponsor courses and workshops open to all students. College courses are initiated by students in the colleges during the semester before they are offered. Following approval by the master and faculty associates of the college and by the dean of undergraduate affairs, they are accepted for academic credit on the same basis as departmental courses and listed by the registrar each semester during preliminary registration. If a college course falls within a definite departmental field, it can, with written approval of the departmental chair, count as part of the distribution requirements in the category to which that field is assigned.

College workshops carry no academic credit and do not appear on a student's permanent record. Generally designed for instruction in practical skills, they may meet on a regular schedule throughout the semester or be offered as short courses.

By expanding the course offerings of the departments, college courses promote the academic involvement of the colleges and provide opportunity for interdisciplinary topics of particular interest to students.

Student Government

All undergraduates are members of the Rice Student Association, which is governed through the Student Senate, composed of the president, two vice-presidents, the secretary-treasurer, the eight college presidents, and additional representatives of on-campus and off-campus students.

Alleged violations of university or college rules are handled in accordance with the University Code of Judicial Procedure. In most cases, original jurisdiction is assigned to student courts, appeal from whose verdict may be made to the college master, the proctor, or the University Review Board as appropriate. Final appeal is to the president of the university. The Honor Council, which is composed entirely of students, administers the honor system and conducts hearings and trials for alleged offenses against it. The university retains ultimate authority in all matters of discipline and over all actions affecting its educational function or the safety and well-being of members of the university community.

The Student Association annually presents two coveted awards, one to a student and one to a faculty or staff member. The Rice Service Award, a memorial to Hugh Scott Cameron, first dean of students at Rice, is a bronze medallion awarded to currently enrolled or former members of the Student Association who have rendered distinguished service to the student body. Selection is made by a committee of faculty and students appointed by the association. The Mentor Recognition Award recog-

nizes extraordinary service to the student body by a current member of the faculty or staff.

Student Activities

In addition to the many activities of the residential colleges, various campuswide organizations and activities give students a wide range of choices for extracurricular interests. The official publications include the *Thresher,* the student newspaper; the *Campanile,* the university annual; and the *Rice Literary Review.* The Rice Program Council sponsors various programs of current interest to the student body. A campus radio station, KTRU, is operated by students on an eighteen-hour, seven-day-a-week schedule broadcasting FM stereo.

A large number of student organizations provide for special interests, such as the Black Student Union, the Rice Association of Mexican American Students, the Chinese Student Association, Rice Democratic Caucus, and Young Republicans. There are sports clubs for sailing, karate, rugby, scuba diving, bicycling, etc. A student debate society, a premed society, and a prelaw society serve other student interests.

Many organizations are associated with special academic and professional disciplines, such as foreign language clubs, the Architectural Society, the student affiliate of the American Chemical Society, and the student branches of the American Institute of Chemical Engineers, the American Institute of Physics, the American Society of Civil Engineers, the American Society of Mechanical Engineers, the Association for Computing Machinery, and the Institute of Electrical and Electronic Engineers. The Army and Navy ROTC students have the Chevron and the Sextant, respectively, to represent their special interests.

The Rice Players is an extracurricular theater group composed of Rice students and faculty. The Players present at least four productions each year. Recent productions include: Bertolt Brecht's *The Caucasian Chalk Circle,* Edward Albee's *Seascape,* and Lanford Wilson's *5th of July.*

The Players welcome participation by anyone interested in any aspect of theatre production or management.

Women students may join one of the two literary societies—the Elizabeth Baldwin Society or the Owen Wister Society. The Rally Club is a special service organization for men.

Rice students are affiliated with a number of denominational religious organizations. These include the Baha'i Association, Baptist Student Union, Canterbury Association, Christian Science Organization, Hillel Society, Lutheran Student Association, Newman Club, United Campus Christian Fellowship, and Wesley Foundation. These organizations are represented on the Student Interfaith Council, a group chartered by the Student Association.

The Student Health Service

All students pay a health service fee which covers both the Health Service and the Rice Counseling and Psychiatric Service. There is a Student Health Service on campus, housed in the north wing of Hanszen College. This facility is staffed by two physicians from 8:30 A.M. until 2:30 P.M. From 2:30 P.M. until 5:00 P.M., the nurses will continue to screen patients and provide first aid and some limited medical care. After hours emergency room services, hospital facilities, and referral to specialists are all available through Park Plaza Hospital.

The university offers to the students a rather comprehensive insurance plan which covers the student for twelve months beginning with the fall semester. The university strongly recommends that students have coverage either through this plan or through their parents' insurance plan. It is *mandatory* that *all foreign students* have adequate coverage. Proof of this coverage must be brought to the Cashier's

Office prior to registration. If not deemed adequate, the university plan must be purchased. The cost of the plan is $160 per year.

The university Psychiatric Service, which is staffed in cooperation with the Department of Psychiatry, Baylor College of Medicine, provides help to students with many types of problems. The health service fee includes this service, although the Psychiatric Service is independent of the Student Health Service. Consultation and brief psychotherapy are available without additional charge. When it is clear that more prolonged counseling or treatment is necessary, the individual may be referred to a private physician or a clinic at his or her own expense or as covered by health insurance. An appointment may be made directly by a student either by phone or in person at the office of Psychiatric Service in Lovett Hall. Provisions have been made for emergency situations that occur outside office hours. The confidential relationship between doctor and patient is carefully maintained as necessary to the effectiveness of the services.

Nonstudent spouses of students, both graduate and undergraduate, may participate in both Health Service and Psychiatric Service if they pay the $104 Student Health fee. The spouse must obtain an ID and have it validated through the Cashier's Office once the Health Service fee has been paid.

Brochures describing the Health Service, Psychiatric Service, and student health insurance are available in the Health Service Office and in the Office of Student Advising and Student Activities.

The Fondren Library

The Fondren Library is comprised of 1,100,000 volumes plus 1,200,000 microforms and 10,000 serial titles in the fields of art, architecture, history, literature, music, philosophy, foreign languages, economics, social sciences, natural sciences, and engineering. The library is also a depository for United States Government documents and for United States patents. It has a strong collection of federal publications. Rare books, manuscripts, and university archives are housed in the Woodson Research Center.

The Fondren's open shelf policy enables students to locate materials easily and to browse through related volumes. Required and recommended library reading materials for courses are available in the Reserve Reading Room. The reference/collection development librarians provide assistance in the use of library materials and in computer searches of over one hundred subject data bases. Special facilities such as individual study carrels, group study rooms, record listening booths, microform reading carrels, typewriters, and photoduplicating equipment are available in the library.

The Rice Memorial Center

The Rice Memorial Center, built through the generosity of friends and alumni, was dedicated on Homecoming weekend of the fall of 1958. The center and chapel comprise a memorial to Rice alumni who have died in the service of their country. The chapel is utilized for regular nondenominational religious services directed by a committee of students and faculty.

The center serves as a gathering place for students and provides space for the Office of Student Advising and Student Activities, the Association of Rice Alumni, the Student Association and various student organizations and publications. The Campus Store, Sammy's (snack bar and cafeteria), Willy's Pub, and ballroom facilities are also located in the RMC.

Career Planning and Placement Office

The Career Planning and Placement Office offers career counseling, individually and in groups, to assist undergraduate, graduate students, and alumni in finding or changing employment. Placement facilities are available for students and alumni to be interviewed for prospective employment by representatives from business, industry, and schools and to be interviewed for advanced study by representatives from universities and professional schools. Listings and contacts for permanent, part-time, and summer employment opportunities are available, as well as information on qualifications for various professions and occupations.

Intercollegiate Athletics

Rice is a charter member of the Southwest Athletic Conference and a member of the Association for Intercollegiate Athletics for Women. Rice athletes participate in all sports sponsored by the Southwest Athletic Conference (baseball, basketball, golf, swimming, tennis, and track) and those included in the Association for Intercollegiate Athletics for Women (basketball, golf, swimming, tennis, track, and volleyball, with possible additions). Football games are played in the seventy-thousand-seat Rice Stadium, tennis in the Jake Hess Tennis Stadium, basketball and volleyball on the Autry Court in the Rice Gymnasium, and track in the Rice Track Stadium. Other facilities include an indoor swimming pool; handball, racquetball, and squash courts; gymnastic rooms; and baseball, soccer, and other playing fields.

Intramural Sports

The Department of Health and Physical Education offers a supervised program of intramural sports for all students. An individual may participate in individual, dual, and team sports. Any interested students may form teams for the wide variety of tournaments. A student must compete in the university intramural tournaments to become eligible to represent his/her college in the college team sports tournaments which follow the open tournaments. In the past few years, over 4,000 entries from the studnet population have participated in 40 tournaments. (Students participate at their own risk.)

Sports Clubs

The Department of Health and Physical Education administers a Sports Club Program. A sports club is a special interest group organized to engage in and promote interest in a recreational physical activity. Clubs are organized in bowling, fencing, field hockey, lacrosse, martial arts, rifle and pistol, rugby, soccer, sailing, scuba, volleyball, and water polo. These groups are formed to increase individual and team skills through a continuing instructional and competitive program. Club activities are supported by individual contributions, membership dues, university funds, and fund-raising activities. (Students participate at their own risk.)

Student Automobiles

All student automobiles must be registered with the Traffic Division of the Rice University Police Department. Students must park in assigned areas and observe university regulations, subject to tow away and/or fines assessed by the university. Copies of the University Traffic and Parking Regulations, which detail student privileges and responsibilities, may be obtained from the Traffic Division of the University Police, located in Abercrombie Laboratory.

Information for Graduate Students

Since the opening of the university in 1912, the importance of graduate study and research as a principal means of advancing knowledge has been recognized. The first Doctor of Philosophy degree was awarded in 1918 in mathematics. Since that time, the graduate area has been expanding through the basic sciences, the humanities, engineering, the social sciences, architecture, music, and administration and includes interdepartmental areas. The number of graduate programs has steadily increased, and advanced degrees are now offered in thirty fields of study.

Graduate programs fall in two broad categories. Research programs lead to the Doctor of Philosophy, the Master of Arts, or the Master of Science degrees and are preparation for careers in research, university teaching, or related activity. Professional master's programs prepare students for specific areas of employment and lead to such degrees as the Master of Accounting, Master of Architecture, Master of Business and Public Management, Master of Chemical Engineering, Master of Civil Engineering, Master of Electrical Engineering, Master of Environmental Engineering, Master of Environmental Science, Master of Materials Science, Master in Applied Mathematical Sciences, Master of Mechanical Engineering, Master of Music, and Master of Arts in Teaching.

Two joint graduate programs are also available to Rice students: (1) a course of study with Baylor College of Medicine is available for those who seek both the Ph.D. and M.D. degrees; and (2) students may earn the M.A. in history at Rice concurrently with a law degree from the law school at the University of Houston or Texas Southern University.

Research Degrees

The degree of Doctor of Philosophy is awarded for original studies in accounting, anthropology, architecture, biochemistry, biology, chemical engineering, chemistry, civil engineering, economics, electrical engineering, English, environmental science and engineering, French, geology, German, history, materials science, mathematical sciences, mathematics, mechanical engineering, philosophy, physics, political science, psychology, religious studies, and space physics and astronomy. Various areas of specialization are available within these fields of study.

The degree of Master of Arts is available in the various humanities listed plus Spanish and in scientific fields of study, including the social sciences. The Master of Science degree may be obtained in the fields of chemical, civil, electrical, or mechanical engineering, environmental science and engineering, materials science,

and space physics and astronomy. The Master of Architecture and the Master of Architecture in Urban Design are also offered.

Interdisciplinary and Cooperative Programs

Interdisciplinary Graduate Programs

Opportunities are available for interdisciplinary study in various aspects of systems theory, solid-state electronics and materials science, and bioengineering. For applications or additional information, contact the chairman of one of the participating departments as follows: for systems theory, the Department of Chemical Engineering, Economics, Electrical Engineering, or Mathematical Sciences; for solid-state electronics and materials science, Chemistry, Electrical Engineering, Mechanical Engineering, or Physics; for bioengineering, Electrical Engineering.

Joint Graduate Programs with Baylor College of Medicine

Joint programs with the Baylor College of Medicine are designed to provide educational experiences of high quality leading to research careers in medicine. Such programs can be worked out individually through various departments.

Joint Graduate Program in History and Law

This selective program combines graduate work in legal and constitutional history at Rice University with professional work in law at the Bates College of Law, University of Houston, or at the Law School of Texas Southern University. Students in their first or second year of law school may apply for admission to Rice through their law school. Participants spend one year at Rice in the Master of Arts program concentrating on legal and constitutional history. After completing this year of residence and all requirements for the M.A. except the thesis, the student returns to law school to finish his or her legal studies. During the last year of law school, the student completes a suitable M.A.-level research thesis on a topic in legal and/or constitutional history selected with the approval of the law school instructor and the student's Rice history adviser. The student who completes this program receives a law degree from his or her law school as well as an M.A. in history from Rice.

Requirements for Research Degrees

General Requirements. The Doctor of Philosophy degree is awarded after successful completion of a program of advanced study and an original investigation reported in an approved thesis. Normally, three or more years of study are required after admission to graduate study. At least sixty semester hours of this study must be done as a full-time student. As final evidence of preparation for this degree, the candidate must pass a public oral examination.

Normally, all graduate students are assigned a limited amount of teaching as part of their training for advanced degrees.

The Master of Arts, Master of Architecture, or Master of Science degree must be obtained after completion of at least thirty semester hours of study, including the thesis or project report, twenty-four of which must be in residence at Rice. At least one semester of this study must be done as a full-time student. Programs generally include original work embodied in a thesis, and the candidate's preparation is evidenced by a public examination. Although students with exceptional qualifications may complete the master's in one year, most students need three or four semesters of study and research. In many departments, students are eligible for a master's degree without submitting a thesis if they have been admitted to candidacy for the doctoral degree prior to March 1 of the year in which the degree is to be awarded.

More specific information about requirements for advanced degrees in each field of study is given under department headings in the section of this catalog describing course offerings, which begins on page 103. Normally, only grades of "2" ("B") or better are acceptable to fulfill graduate degree requirements. Graduate students may take courses on the "pass/fail" basis only with departmental approval.

Students may pursue their graduate research projects during the summer months by enrolling in appropriate summer study and research programs. The tuition fee is waived for full-time continuing students.

Language Requirements. Foreign language requirements for the master's and doctoral degrees are established by the individual departments according to the need for foreign languages in the conduct of research and scholarship in their respective fields.

Approval of Candidacy. A student seeking the master's or doctoral degree must submit a petition through the departmental chairman to the Graduate Council for the approval of candidacy. The chairman must certify that the applicant has fulfilled the departmental requirements and provide a transcript or other evidence that the work within the department is of high quality.

The final oral examination can be given only after the candidacy has been approved by the Graduate Council.

Applications for the approval of candidacy for the doctoral degree must be filed in the Office of Advanced Studies and Research prior to November 1 and for the master's degree prior to March 1 of the academic year in which graduation is expected. The approval is valid for two years for the M.A. degree and four years for the Ph.D. degree (some departments set a time limitation of less than four years). This schedule assures adequate time for preparation, review, and revision of the thesis which documents the actual scholarly research project the student has pursued. A student must have been approved for candidacy for the Ph.D. before the beginning of the seventh semester of residency at Rice in order to be eligible for continued financial support. Appointments and support of graduate study are not continued for more than four years except in legitimate cases approved by the Graduate Council.

Oral Examinations. A committee for the oral examination is named by the Graduate Council at the time candidacy is approved. The Ph.D. oral committee consists of at least three members of the Rice faculty: the thesis director, one other member from the department, and one member in a related field outside the department. Additional qualified committee members may be selected with the approval of the Graduate Council. Candidates are responsible for informing the members of their committee of the nature of the research and its progress; before March 15, the members of the committee should review and approve the thesis in preliminary form in order for the candidate to be eligible to receive the degree in the May commencement.

The oral examination may be scheduled at any time prior to the beginning of examination week in either semester. For the Ph.D. degree, the examination must be announced in the university calendar. In appropriate circumstances, an oral examination for the Ph.D. may be scheduled during the summer, and the posting of notice of the time and place on the bulletin board of Fondren Library the preceding week is acceptable as the public announcement. For the master's degree, public notice of the oral examination should be posted on the departmental bulletin board one week in advance.

The length of the examination and the character of the subject matter on which the candidate will be examined are left to the judgment of the committee. Should the

candidate fail, the chairman may schedule a second examination. In the event of a second failure, the student is required to withdraw from the university. Following the successful passing of the oral examination in defense of the thesis, three copies of the dissertation must be submitted to the Office of Advanced Studies and Research no later than one year from the date of the examination.

Thesis Regulations and Procedure. The thesis, which is the principal record of work for an advanced degree, will be permanently preserved in the library. Directions are provided for the standard thesis form, which must be followed in detail. Copies of these instructions may be obtained from the Office of Advanced Studies and Research upon approval of candidacy. Students submitting a dissertation for the Doctor of Philosophy degree must fill out a Survey of Earned Doctorates form and a University Microfilm contract. Fees for the microfilming and binding of the dissertation are to be paid to the cashier prior to submission of the three copies to the dean. The deadline for acceptance of the thesis by the dean is noon of the next-to-the-last Friday preceding commencement.

Professional Degrees

Rice University offers several advanced degree programs which prepare students for positions in fields such as accounting, business and public management, architecture, mathematical sciences, engineering, secondary education, and music.

Requirements for professional master's degrees usually include the successful completion of ten or more courses at the graduate level. Candidates for the nonthesis professional master's degree are not required to take an oral examination, although some departments may give a final oral, but all students for this degree must petition for approval of candidacy prior to March 1 of the year in which they anticipate graduation. The specific requirements for each professional master's degree and the regulation of these programs are normally the responsibility of the departments involved and the Graduate Council. Some information on individual departmental requirements is given below; further details are presented in this catalog under the departmental listings in the Courses of Instruction section.

Accounting and Administrative Science

The Jesse H. Jones Graduate School of Administration offers two professional degrees, the Master of Business and Public Management and Master of Accounting, as well as the Doctor of Philosophy. Applicants to these programs must submit scores on the Graduate Management Admission Test (GMAT), all college transcripts, and three letters of recommendation. Application materials may be obtained from the Office of the Dean, Jesse H. Jones Graduate School of Administration.

Admission to the Jones Graduate School is open to undergraduates from Rice or other universities, regardless of undergraduate major, but is highly selective and limited to those who have performed with distinction in their previous academic work and on the GMAT. Exceptional students from Rice and other cooperating universities may be admitted to the Jones Graduate School after completion of their junior year.

No specific undergraduate course work is required for admission to either master's degree program. However, undergraduates contemplating graduate work in accounting or administrative science are encouraged to take course work in principles of accounting, principles of microeconomics, and business data processing. College mathematics through calculus is helpful.

Completion of either degree program requires two academic years. To qualify for either degree, the student must maintain a "2" ("B") average and may be required to pass a special examination during the last semester in residence. There is no thesis requirement, although there is a thesis option in the Master of Accounting degree.

For further information regarding these programs, consult the section for the Jesse H. Jones Graduate School of Administration (Accounting and Administrative Science) in the Courses of Instruction listing.

Architecture

An applicant for admission to the professional master's degree program in architecture should write to the dean of the Rice University School of Architecture for specific information about the program for which the applicant would be qualified by education and experience. Completed application materials include the Rice University Application for Graduate Study form, transcript(s), Graduate Record Examination scores, a portfolio of the applicant's work, and a minimum of three letters of recommendation. Candidates are evaluated on the basis of their academic records and the quality of the design portfolio.

Education

The Master of Arts in Teaching is a professional degree program for students wishing to qualify for secondary school teaching following a liberal undergraduate education. The degree involves one academic year and two summers of satisfactory graduate work consisting of (1) course work in the field of teaching and in the candidate's two subject matter fields and (2) a teaching internship.

Admission to the graduate education program at Rice is open to Rice graduates and to appropriately prepared students from other universities who have received a bachelor's degree and who present evidence of scholarly ability and motivation. Applicants are expected to take the Aptitude Test and appropriate Advanced Tests of the Graduate Record Examination Program. Applications are reviewed and admission determined by the Rice Teacher Education Council and the Graduate Council.

Requirements for the Master of Arts in Teaching are found in the Department of Education section of the Courses of Instruction listing.

Engineering

Applications for admission to the professional master's degree program in a specified branch of engineering are considered by the Graduate Council upon recommendation of the various departments and the Engineering Committee on Professional Master's Degrees. Candidates are required to complete thirty hours of advanced courses (numbered 300 or higher) in addition to satisfying the requirements of an approved bachelor's degree program. The ten advanced courses include at least four of the 500 or 600 level, indicating professional study in depth of a particular area. The remaining six courses are used for additional professional concentration or for some breadth as determined by the department. Courses may not be taken on a pass-fail basis in satisfaction of these course requirements. The student's major department must approve the overall program. Programs that depart from these guidelines must have specific approval of the Engineering Committee on Professional Master's Degrees and the Graduate Council.

Students are recommended for degrees by their departments if they have a "2" ("B") grade average on all courses counted toward the degree.

Chemical Engineering. Flexibility in course planning permits specialization in such areas as economics, nuclear engineering, reservoir engineering, process control, optimization and systems analysis, applied mathematics, materials science, kinetics, and catalysis.

Civil Engineering. The detailed program of each student is formulated in consultation with a departmental adviser. The area of concentration is structures and mechanics. Some specialization in solid mechanics, geotechnical engineering, or applied mathematics is possible within the structures and mechanics concentration.

Electrical Engineering. Technical electives permit some specialization in the general areas of bioengineering, systems and information theory, solid-state and physical electronics, and computer science and engineering.

Environmental Science. Flexibility in choice of electives permits concentration in such areas as the biology, physics, chemistry, and geology of environmental planning and management, pollution detection and control, applied mathematics, and urban systems analysis; water quality, water pollution control, and water resources; environmental chemistry and toxicology; aquatic biology; surface or groundwater hydrology.

Environmental Engineering. Major emphasis of the degree program is in either water pollution control, water resources engineering, or water quality modeling. Flexibility in course planning will permit broad experience in the sciences basic to environmental engineering applications.

Materials Science. After successful completion of a bachelor's degree in materials science or a related field, a student may proceed to the professional Master of Materials Science by choosing eight courses in materials science or related fields plus two free electives.

Mechanical Engineering. For properly qualified students, flexibility in course requirements permits specialization in thermal sciences and energy conversion, gas dynamics, hydrodynamics and ocean engineering, stress analysis and mechanical behavior of materials, aerospace engineering, air pollution, and materials engineering.

Mathematical Sciences

An applicant for admission to graduate study for the professional master's degree in mathematical sciences should obtain specific information about the program and the application form from the chairman of the Department of Mathematical Sciences. The completed form with transcript(s) and recommendations, in the case of students who are not undergraduate students at Rice, should be returned to the department. Candidates are evaluated on their previous academic records and their potential for success in and benefit from the professional program.

Music

The Shepherd School accepts applications for admission to its Master of Music program from recipients of a bachelor's degree from other accredited institutions. An audition is usually required as part of the admissions process. Candidates for the Master of Music degree may be required to take additional work at the undergraduate level before continuing their graduate study, as determined by the faculty of the Shepherd School.

For a description of the requirements for the Master of Music degree, see Music in the Courses of Instruction section.

Admission to Graduate Study

Graduate study is open to well-qualified students who possess adequate background in the field of study they wish to pursue. Normally, but not always, the equivalent of an undergraduate major in the field is required, but the final judgment of preparation rests with the department concerned: the emphasis is on the quality of the applicant's preparation rather than on the academic program pursued or credits earned in achieving it. Applicants for graduate study should arrange to take the Graduate Record Examination since these tests offer an additional opportunity for applicants to demonstrate the quality and depth of their knowledge in the field of study. Completed applications are forwarded by the various departments to the chairman of the Graduate Council for review and action.

Each graduate student is advised by the departmental chairman or an officially designated faculty member in planning the initial semester of graduate study. As soon as possible, each student should affiliate with an adviser who will help plan both the course program and the thesis or special project.

Research Degrees

An applicant for admission to graduate study for a research degree should address all communications to the chairman of the appropriate department. The chairman will provide the relevant information about the graduate program and the appropriate application form. The completed form, with the transcript and recommendations, should be returned to the department chairman. After a departmental committee and the department chairman have made an evaluation, the application form and other documents are transmitted by the chairman to the Graduate Council for final action. Candidates are evaluated on their previous academic records, available test scores, and their qualifications to pursue advanced study. Their capacity for research is primarily determined through references from scholars under whom they have studied.

In addition to any specific requirements of the department, the applicant is expected to have at least a "2" ("B") average in undergraduate work. Preference is given to applicants who earn high scores on the Graduate Record Examination. Arrangements to take this examination may be made directly with the Educational Testing Service, Box 955, Princeton, New Jersey 08540 or Box 1502, Berkeley, California 94701. Applicants in the Houston area may also apply in person to the Office of Advanced Studies and Research at Rice for necessary forms.

Advanced study and research programs leading to the Doctor of Philosophy degree are available in twenty-six areas of study and normally are operated by the departments concerned. Most details of the various departmental requirements for the Ph.D. are found in this catalog under the listings of the individual departments; complete information may be obtained by contacting the appropriate departmental chairman.

Class III Students

Students with an undergraduate or graduate degree from an accredited college or university may apply for admission as Class III students to take courses for credit without being admitted to a specific degree program. Permission of the instructor and approval by the office of advanced studies and research are required. Courses taken under this arrangement cannot be used to fulfill the requirements for an

advanced degree at Rice until the student has applied to the appropriate department, been recommended for admission, and been officially admitted by the Graduate Council. Class III students cannot take courses on a pass/fail basis. Further information on enrollment of Class III students is found on page 73.

Tuition, Fees, and Expenses

Tuition and fees for graduate students given here are for academic year 1981-82 only and are subject to change in subsequent years as the operating expenses of the university change.

Tuition for full-time students enrolled in the graduate division is $3,200 per year ($1,600 per semester) for all students through six semesters. In addition, each full-time graduate student pays a health service fee of $104 per year ($52 per semester) and a Graduate Student Association fee of $5. After six semesters, students continuing any phase of their studies including work on their dissertation, on or off campus, must be registered and are subject to a tuition fee of $200 per year ($100 per semester). Continuous involvement and enrollment are expected. Failure to register for any period without a leave of absence granted by the Graduate Council requires reapplication by the student, approval of the Graduate Council for readmission, and the payment of the tuition for up to two missed semesters, plus a special registration fee of $100. A leave of absence is granted only before registration each semester and must have the approval of the department chairman and the Graduate Council. A reactivation fee of $25 is required upon return. No work toward the degree can be done at Rice or involve Rice facilities or faculty during a leave of absence.

The fee for the preceptorship programs in architecture, music, engineering, etc., which involve approved supervised work off campus to be recorded on the student transcript, is $100 per semester. Full-time interns at the Rice Center or an approved alternate pay $500 per semester.

The graduate programs at Rice are designed for full-time study, but in special circumstances a limited number of students may be admitted on a part-time basis. The part-time tuition is $140 per semester hour plus $50 registration fee each semester, the total not to exceed $1,600 per semester. The tuition for summer study and research, which is applicable to part-time students, is $200; there is no summer registration fee.

Graduate students who have fulfilled all requirements for the degree sought, including the thesis and/or final public oral examination, not already registered under one of the categories above, must be registered as "Requirements complete — registering for degree only" for the spring semester in which the degree is awarded. This requires the payment of a registration fee of $50 plus the diploma fee of $25. This registration fee is not refundable and may not be carried forward to a later year. The diploma fee is not refundable but may be carried forward for one year if a diploma is not prepared. The deadline for payment of the fees or cancellation of the diploma is eight weeks prior to the date scheduled for the graduation ceremonies.

Refer to pages 86-87 for discussion of fees for student health service and insurance.

For an annual fee of $4, a graduate student may purchase admittance to all regularly scheduled athletic events. If married, a student may purchase a season ticket for a spouse at a reduced rate of one-half the regular price provided the season ticket is purchased at the beginning of the fall term.

Fellowships, Scholarships, and Prizes

Memorial Fellowships, Honors, and Prizes. Provision is made for a variety of fellowships, scholarships, and prizes available to graduates of this and other universities. Memorial fellowships that have been founded and endowed by gift or bequest on the part of friends of Rice University provide stipends enabling the holders to devote their time to study and research in their chosen fields. There are also several industrial fellowships maintained by companies interested in the development of technical fields and the training of competent scientists and engineers.

Persons desiring consideration for appointment as fellows should consult with the department in which they desire to do research. However, not all fellowships are available every year.

A partial list of graduate scholarships, fellowships, and awards includes:

Leo M. Acker Memorial Scholarship in Accounting
Ora N. Arnold Fellowship for better understanding between people and governments of Mexico, the South American states, the West Indies, and the Philippine Islands
Nettie S. Autrey Memorial Fellowships in Science
Eleanor and Mills Bennett Fellowships in Hydrology
Ralph Budd Award for Research in Engineering
Samuel Fain Carter Fellowship in Economics
Robert L. Chuoke Award in Physics
Cities Service Research Fellowship in Geology
Continental Oil Company Fellowship in Geology
William Dunlap Darden Medal in Architecture
Environmental Protection Agency Fellowships in Environmental Science and Engineering
W. Maurice Ewing Fellowship in Marine Science
Exxon Fellowship in Geology
Financial Executives Institute Award
John W. Gardner Award in Humanities and Social Sciences
Gulf Oil Company Fellowship in Geology
Deloitte Haskins & Sells Foundation Scholarship in Accounting
Marjory Meyer Hasselmann Fellowship in Chemistry
Fannie and John Hertz Foundation in Applied Physical Sciences
Houston Gem and Mineral Society Fellowship in Geology
Houston Geological Society Outstanding Student Award
Houston Oil and Minerals Corporation Fellowship in Geology
Jameson Fellowship for American Decorative Arts
Captain Charles Septimus Longcope Awards in History
Edgar Odell Lovett Fellowships in Mathematics
Jermayne MacAgy Fellowships in Art History (begins fall 1982)
John T. McCants Scholarships in Accounting
Mrs. L. F. McCollum Fellowship
National Institutes of Health Fellowships
National Institutes of Health Traineeships in Biology
National Science Foundation Graduate Fellowships
Penzoil Company Fellowship in Geology
Petroleum Research Fund of the American Chemical Society
Phillips Petroleum Company Fellowship in Chemistry
Schlumberger Foundation Fellowship in Mathematics
Shell Fellowship in Physics

Sigma Xi Research Awards
John Stauffer Scholarship in Chemistry
Tenneco Oil Company Fellowship in Geology
Texaco Fellowship in Physics
Texas Society of Certified Public Accountants' Graduate Accounting Fellowship
Radoslav A. Tsanoff Fellowship in Philosophy
Richard B. Turner Memorial Awards in Chemistry
Union Oil of California Fellowship in Geology
Wiess Fellowship in Geology
Robert A. Welch Foundation Predoctoral Fellowships
H. A. Wilson Award in Physics

Rice Graduate Fellowships. Graduate students with high academic records and outstanding qualifications may receive assistance through awards of Rice University Fellowships. These appointments in most cases provide a stipend plus tuition for the nine-month academic period. Some research assistant positions or special fellowships may be available to provide support during the summer months. Appointees must be engaged in full-time graduate study.

In some departments, Rice Teaching Assistantships may be available to qualified advanced (third- or fourth-year) students. If exceptional teaching ability has been demonstrated, a student may be appointed to a Teaching Associateship.

Graduate Tuition Scholarships. Students whose previous records show marked promise but for whom no graduate fellowships are available may, especially in their first year of graduate study, be awarded full or partial graduate tuition scholarships without stipend. Graduate scholars must carry a full schedule of graduate work.

Scholarships which provide both tuition and stipends are also available for a limited number of graduate students who are participants in the Army or Navy ROTC programs. For information on these scholarships, contact the Departments of Military or Naval Science.

Financial Aid

A limited number of tuition grants based on financial need are available. Rice engineering students who have received financial aid from the university during their undergraduate years may apply for continuation of assistance as needed for the year of study for the professional master's degree. The Financial Aid Form, which is the usual application for financial assistance through the College Scholarship Service, is helpful in such cases. Information is available from the Financial Aid Office.

Financial aid is available to graduate students through the Texas Tuition Equalization Grant and the college work-study programs. This aid is based on financial need. Application may be made through the Rice University Financial Aid Office.

The Texas Tuition Equalization Grant Program provides grants to eligible students. No repayment of the grant is required.

Applicants for these programs must be American citizens or permanent residents, be enrolled at least half time, and prove financial need by filing the Financial Aid Form. This statement is submitted to the College Scholarship Service for processing and evaluation, and a small fee is required.

Guaranteed Student Loans (GSL) are available to graduate students. A GSL may be obtained from a bank, credit union, savings and loan association, or Rice

University. A graduate or professional student may borrow up to $5,000 per year to an aggregate of $25,000, which includes loans made at the undergraduate level. An insurance premium of one-quarter of one percent will be collected at the time of disbursement. Lenders may impose lower limits on loan maximums. No interest charges are made as long as the student remains enrolled at least half time at Rice University. Repayment of the loan, together with a 9 percent interest charge, begins six months after termination of at least half-time enrollment at Rice. Up to ten years may be allowed to repay the loan, unless the required minimum of $90 per quarter will repay the loan in a shorter period of time.

Payments may be deferred for up to three years for service in the Armed Forces, Peace Corps, or full-time volunteer programs conducted by ACTION (which includes VISTA, University Year for ACTION, ACTION Cooperative Volunteer Programs, Volunteers in Justice, and Programs for Local Service) or in a tax exempt organization comparable to the Peace Corps or to VISTA or as an officer on full-time duty in the Commissioned Corps of the U.S. Public Health Service. In addition, deferment is available for a return to full-time study at an eligible institution, or to pursue a course of study under a graduate fellowship program approved by the Commissioner of Education or while temporarily totally disabled or unable to secure employment because of providing care required for a spouse who is so disabled. Also, deferment can be obtained for up to two years while serving an internship required to begin professional practice or service. A single deferment for a period of not more than one year may be provided for students who are unable to secure full-time employment.

GSL applications are available in the Rice University Financial Aid Office.

A Gulf Oil Corporation Foundation loan fund is also available to students who are working toward a degree to assist them in meeting educational expenses. The Financial Aid Form is required. The funds of this loan program are limited. Interested persons may contact the Financial Aid Office.

Graduate students wishing to apply for a loan under any of these loan programs should commence application procedures the summer prior to the academic year for which they are seeking assistance. Detailed information and application forms are available in the Financial Aid Office.

An Emergency Loan Fund, originally provided through gifts from the Graduate Wives Club of 1972-73, the Graduate Student Association, and various faculty members, is available to help graduate students at Rice with short-term needs. Loans from this fund are limited to $150 and must be repaid within three months. In lieu of interest, a charge of $1 is made for loans up to $50 and $2 for loans over $50 to help build up the fund.

Graduate Student Life

Graduate Student Responsibility

Rice University encourages student self-discipline within the framework of its general objectives. Each member of the community is expected to govern his or her conduct by standards of good taste and ethical judgment and to exercise personal responsibility.

The university reserves the right to require the withdrawal of any students whose failure to accept responsibilities as evidenced by conduct or their scholastic achievements is considered detrimental to their own or the university's best interests.

The Honor System

Graduate students are expected to observe the provisions of the honor code. The provisions of the honor system are summarized on page 84.

Fondren Library

Fondren Library provides extensive resources for advanced study and research among its collections. Several notable research collections are Austrian history and literature, architecture, engineering, American history, French literature, natural sciences, and the Nadler German language and literature collection.

The Woodson Research Center is the repository of the library's rare books, manuscripts, and university archives. Special collections, including Civil War imprints, Texana, eighteenth-century English drama, the papers and library of Sir Julian Huxley, as well as numerous literary and historical manuscript holdings are available for research at the center. Large sets of research materials such as *Early American Imprints* (all monographic works published in the U.S. before 1800), papers of a number of United States presidents, and newspapers are available in microform.

Fondren's collections can be supplemented through interlibrary loan. A statewide teletype network, the Texas Information Exchange, expedites interlibrary loan among Texas libraries. Cooperative arrangements have also been made through HARLIC (Houston Area Research Library Consortium) in order to facilitate borrowing for graduate students and faculty. Through membership in the Center for Research Libraries, Fondren Library has access to more than three million items of research material. Fondren provides carrels for the use of graduate students and faculty.

Graduate Student Government and Organizations

All full-time graduate students are members of the Graduate Student Association. It is the sole organ representing the graduate students as a body. Part-time graduate students may become members of the association upon payment of the necessary fee. The governing body of this organization is the Graduate Student Association Council, consisting of a chairman, a secretary, a treasurer, and a representative from each department offering graduate study. Graduate students also participate in university affairs through their representatives on many of the standing committees appointed by the president, such as the Graduate Council, the Research Council, and on various departmental committees as well.

The Graduate Student Association invites participation by all members in a variety of social activities.

Housing

At present, the university has no campus housing for graduate students. Graduate students may apply for membership in the residential colleges, but normally the demand for on-campus space in the colleges by undergraduates exceeds the available rooms. Within walking distance of the campus there are rooms and apartments for rent. For the convenience of new students, the Office of Student Advising and Student Activities and the Student Association keep a record of rooms and apartments about which they have been notified, and the daily newspapers list still others. Incoming graduate students are advised to arrive in Houston several days early in order to find housing. They should be aware that inflation has been particularly rapid in this area and that housing in Houston is relatively expensive.

The Student Health Service and Insurance

Graduate students pay the same health service fee as undergraduates ($104 per year in 1981-82). A small health clinic is maintained on campus to provide limited care and referral service to doctors and to the emergency room of Park Plaza Hotel. Access to limited psychiatric consultation, including marriage counseling, is also available to graduate students through the Rice Counseling and Psychiatric Service. For more information, refer to pages 86-87.

The university offers to the students a rather comprehensive insurance plan which covers the student for twelve months beginning with the fall semester. The university strongly recommends that students have coverage either through this plan or through their parents' insurance plan. It is *mandatory* that *all foreign students* have adequate coverage. Proof of this coverage must be brought to the Cashier's Office prior to registration. If not deemed adequate, the university plan must be purchased. The cost of the plan is $160 per year.

Student Automobiles

All automobiles on campus must be registered with the Rice University Police Department. For more information, refer to page 88.

Courses of Instruction

Academic departments are listed in this section alphabetically (except for the engineering departments, which are grouped together), with complete lists and descriptions of courses. Most departments also give specific requirements for students both at the undergraduate and graduate levels. These statements are supplemental to the university degree requirements described on pages 50-51.

Beginning in 1978-79, major requirements for graduation were designated in semester hours instead of semester courses as previously given. Students enrolled at Rice in a degree program prior to or at the beginning of the fall semester 1978 have the option of completing university and major requirements for their degree according to either semester courses or semester hours. Students entering after fall 1978 must fulfill the semester hour requirements. On the following pages, departmental requirements are given in semester hours (to include all courses, laboratories, and tutorial sections). The corresponding requirement in courses (which refers only to courses of three or more semester hours and does not include associated laboratories or tutorial sections of fewer than three semester hours that may also be required) is shown in parentheses.

Courses numbered below 300 are lower level or introductory courses. Those numbered 300 to 499 are designated as advanced courses. Advanced courses are open to first-year and second-year students with proper prerequisites and to graduate students on approval of the individual student's adviser. Courses designed for graduate students are numbered 500 and above. The methods of presentation and quality of work expected make them generally unsuited to undergraduate participation. Undergraduates are permitted to enroll in graduate-level courses only after consultation with their advisers and with the instructor of the course.

Figures in parentheses following the title of each course signify the number of class hours per week, the number of laboratory hours per week, and the credit in semester hours for the completed course, in that order. The letters "a," "b," and "c" following the course number indicate the semester in which the course is normally taught. Thus, History 201a is normally taught in the fall semester and History 202b in the spring semester. Biochemistry 400c is normally taught in the summer session. The notation "a,b" indicates a course that is normally offered both semesters, while "a/b" indicates a course which may be offered either in the fall or spring semester depending upon the demand.

Certain courses are dependent upon available faculty, student demand, or funding. Uncertainty about *when* or *whether* a particular course will be offered during 1981-83 is indicated by the designation "Not offered every year." Moreover, the faculty lists preceding each departmental section are more accurate for the 1981-82 academic year as they cannot anticipate 1982-83 staff changes.

Course descriptions in this section illustrate topics within the subject matter of the courses. Topics actually covered in the courses may vary from the examples given. Courses are subject to cancellation or modification, but cancellation of a course after final enrollment occurs only in extreme circumstances.

Students may obtain more detailed information about courses from the Registrar's *Schedule of Courses Offered* published each year or from the instructor of the course.

Persons using this catalog to evaluate Rice University transcripts should refer to course titles and descriptions, rather than course numbers, to determine content because course numbers are occasionally changed.

Accounting and Administrative Science

The Jesse H. Jones Graduate School of Administration

Professor Tuggle, *Dean*
Professors P.W. Bell, J. Cooper, Edwards (on leave 1981-82),
Howell, Thrall (on leave fall 1981),
von der Mehden, E.E. Williams, and Zeff
Adjunct Professor Ballas
Associate Professors Dipboye, Driskill, and
L.T. Johnson (on leave 1981-82)
Adjunct Associate Professors D.K. Anderson, Danner, De Bellas,
Mauldin, and D. Ross
Assistant Professors Batsell, Greanias, Mandel,
Mascarenhas, and Windsor
Instructors Atherton and M.M. Wilson
Lecturers Bunch, K. Preston, and Viebig

Degrees Offered: B.A. with major in managerial studies (interdisciplinary program); Master of Business and Public Management; Master of Accounting; Ph.D.

The Jesse H. Jones Graduate School of Administration was established in 1974 through a gift from Houston Endowment, Inc. Interdisciplinary in nature, the school utilizes faculty of other university departments to augment its own still expanding faculty. The school is dedicated to providing unique educational opportunities for professional training in the fields of accounting and administrative science for highly select graduate students. The curricula leading to the degrees of Master of Business and Public Management and Master of Accounting are designed to be distinctive in terms of scope, realism, and utility. The school also offers a Doctor of Philosophy, in which students undertake highly individualized research studies under the direction of distinguished scholars.

Undergraduate Program No undergraduate major is offered in the Jones Graduate School; however, such undergraduate courses as accounting may be used to fulfill major requirements in the interdisciplinary program in managerial studies. This degree program is described on page 56.

Students admitted to the Honors Program in Managerial Studies may elect certain graduate courses in accounting and administrative science as part of their

major requirements. In addition, the undergraduate major in managerial studies may be partly satisfied by course work taken for the Master of Business and Public Management and Master of Accounting degrees.

Graduate Programs. The Jones Graduate School of Administration offers the Master of Business and Public Management and Master of Accounting degrees and the Doctor of Philosophy. Applicants to these programs must submit scores on the Graduate Management Admission Test (GMAT), all college transcripts, and three letters of recommendation. Application forms are available from and should be submitted to the Office of the Dean, Jesse H. Jones Graduate School of Administration. Graduates from any university and from a broad range of undergraduate majors are considered for either professional program. Students enrolled in the Jones Graduate School represent a wide variety of undergraduate majors, including economics, managerial studies, mathematics, mathematical sciences, political science, history, languages, fine arts, natural sciences, engineering, and business administration. An accelerated "3-2" degree plan is available to exceptional students from Rice and cooperating universities in which students may take graduate courses in their senior year, thereby completing the master's degree by the end of five years of college study. Students must maintain at least a "2" ("B") average and may be required to pass a special examination during their last semester in residence. Admission to the Jones Graduate School is highly selective and limited to those who have performed with distinction in their previous academic work and on the GMAT.

Undergraduates contemplating graduate work in accounting or administrative science are encouraged to take course work in principles of accounting, principles of microeconomics, and business data processing. College mathematics through calculus is helpful. However, no specific undergraduate course work is required for admission to either master's degree program.

Master of Business and Public Management (M.B.P.M.). The M.B.P.M. program seeks to prepare students for high-level management positions in business, government, and nonprofit organizations.

Completion of the M.B.P.M. program requires a minimum of two academic years in residence. Students must successfully complete sixty semester hours in administrative science and related subjects, plus the Dean's Seminar (Administration 501, 502) for up to four semester hours.

The following courses are required for the M.B.P.M. program: Administration 511, 531, 532, 541, 542, 561, 562, 591, 592, 593, 594; Accounting 521, 522, 524. The first year of the program is completely required and consists of foundation courses including economics, finance, managerial accounting, quantitative methods, organizational management, communications, and legal analysis. The second year features four case method courses, including management strategy and governmental processes, designed to integrate the foundation skills taught in the first year. Required courses may be waived in exceptional cases where the student already has the equivalent preparation. The residence requirement is not reduced, but additional elective courses are made available.

Each student is required to select at least one area of concentration for elective courses. With the assistance of an adviser, each student selects courses to meet the student's goals and objectives. Most courses will be in administrative science or accounting, but they may also include graduate or upper division offerings in other departments. Definition of a concentration is relatively flexible, subject to the adviser's consent. Concentrations are readily available in finance, management or financial accounting, information systems, business entrepreneurship, international management, and public management. Course work in operations research or organizational behavior is available through the Departments of Mathematical Sciences and Psychology for qualified students.

The **international management program** offers a set of elective courses in the political, economic, and legal aspects of multinational activities. Students ordinarily

take Administration 571 and 572. Students may take related courses in other departments. The international management program is particularly relevant for students with a strong background in foreign languages and cultures. Students lacking such a background are strongly advised to take additional time (including summers and possibly a third year) to acquire such skills. Basic language training does not qualify for graduate credit toward the M.B.P.M. degree.

The Jones Graduate School offers an area of concentration in **public management.** Students who wish to prepare for government service select, with the assistance of an adviser, a set of elective courses tailored to meet the student's career aims. Students may take related courses in other departments. The M.B.P.M. core curriculum is specifically designed to promote the transfer of management skills from the private to the public sector. Students interested in **business entrepreneurship** ordinarily take Administration 595 and 596 together with related courses, particularly in finance and accounting.

Master of Accounting (M.Acco.). The Master of Accounting program prepares students for professional positions in public accounting as well as for a variety of senior financial positions in business and government. The emphasis of the program is on management as well as accounting preparation. Concentrations are available in auditing and financial reporting, taxation, management accounting, information systems, and the management areas listed above.

Completion of the M.Acco. program requires a minimum of two academic years in residence. Students must successfully complete sixty semester hours in accounting and related subjects, plus the Dean's Seminar (Administration 501, 502) for up to four semester hours.

The following courses are required for the M.Acco. program: Accounting 511, 512, 513, 521, 522, 524, 527, 552; Administration 511, 531, 532, 541, 542, 561; and either Administration 562 or Accounting 560. The remainder of the course work may be graduate or appropriate upper division courses in the university. Required courses may be waived in exceptional cases where the student already has the equivalent preparation. The residence requirement is not reduced, but additional elective courses are made available.

Doctor of Philosophy. The Ph.D. program prepares candidates for teaching and research careers. The program, which emphasizes research, usually requires at least two years beyond the master's degree. Applicants must have a master's degree.

After completing one year of courses and demonstrating proficiency in a related area of concentration, the student is required to pass a general qualifying examination consisting of oral and written parts. Successful completion of this examination qualifies the student to prepare a dissertation that represents an original contribution to a particular field.

Accounting

Accounting Courses

305a,b. Introduction to Accounting (3-0-3).
Survey of basic accounting theory and practice with emphasis on the primary problems of asset valuation and income determination. *Staff*

406a. Management Accounting (3-0-3).
Uses of accounting data to plan and evaluate long-run investment and financing decisions and short-run price, costing, output, and financing decisions of the business firm or public entity. Prerequisite: Accounting 305, Economics 211, and a statistics course. *Mr. Mandel*

408b. Financial Statement Analysis (3-0-3).
Covers the informational content of financial statements, their use in decision making and capital asset pricing, and the predictive ability of financial statement information. Prerequisite: Accounting 305, Economics 211, and a statistics course. *Mr. Williams*

409a. Issues in Financial Accounting (3-0-3).
Oriented toward contemporary controversies in financial accounting, using a discussion format. Prerequisite: Accounting 305. *Ms. Wilson*

500a,b. Master's Thesis Research. *Staff*

511a. Asset Accounting (3-0-3).
Deals with the major questions of asset valuation and income determination in the context of accounting theory and the evolving financial, economic, and political factors which have shaped the extant standards. The standard-setting process is discussed. Prerequisite: Accounting 521 and graduate standing. *Staff*

512b. Equity Accounting (3-0-3).
Deals with the particular problems in the estimation of liabilities and stockholders' equity. The focus is both on accounting theory and on the financial, economic, and political factors that have shaped the extant standards. Prerequisite: Accounting 521 and graduate standing. *Staff*

513b. Special Topics in Accounting (3-0-3).
Deals with theoretical and technical problems of partnerships, consolidations, interim reporting, foreign operations, earnings per share, and nonprofit entities. Prerequisite: Accounting 511, 512. *Staff*

521a. Financial Accounting (3-0-3).
Introduction to accounting theory and practice with emphasis on the primary problems of asset valuation and income determination. Prerequisite: graduate standing. *Staff*

522b. Managerial Accounting (3-0-3).
Introduction to accounting systems designed to facilitate internal decision-making evaluation and control by private and public organizations. Particular emphasis given to behavioral impact of alternative internal reporting schemes. Prerequisite: Accounting 521 and graduate standing. *Staff*

524b. Managerial Accounting and Finance (3-0-3).
Relationship between economic and current value accounting concepts of income; investment and financing decisions and their social consequences; the framework of national economic accounts. Emphasis on capital budgeting and financial theory. Prerequisite: Accounting 521 and graduate standing. *Staff*

527a. Management Information Systems (3-0-3).
Case studies concerning managerial problems; topics include business models, equipment selection, data processing management, and systems development. A semester project is required. Prerequisite: graduate standing. *Mr. Mandel*

531a. Federal Taxation of Business Enterprises (4-0-4).
Theory of United States income taxation and its application to corporations and sole proprietorships; tax planning in business situations. Prerequisite: Accounting 521 and graduate standing. *Mr. Viebig*

532b. Federal Taxation of Individuals (2-0-2).
United States individual income taxation, including consideration of tax planning and partnerships. Prerequisite: Accounting 531 and graduate standing. *Ms. Preston*

534b. Special Topics in Taxation (2-0-2).
An examination of the basic elements of federal estate and gift taxation, with consideration of both compliance requirements and planning possibilities. Prerequisite: Accounting 531 and graduate standing. *Mr. Viebig*

536b. International Taxation (3-0-3).
Tax considerations involved in multinational operations. Prerequisite: graduate standing. *Mr. Danner*

541a. Auditing (4-0-4).
Auditing standards and procedures, statistical sampling applications, audit programs and reports, and professional ethics associated with the public accounting profession. Prerequisite: Accounting 513 and graduate standing. *Mr. Bunch*

542b. Auditing and Financial Reporting (2-0-2).
Examination of reporting issues associated with public accounting. Prerequisite: Accounting 541 and graduate standing. *Mr. Wise*

551a. Financial Accounting Practice (3-0-3).
Examines the extant standards for financial accounting in accordance with generally accepted accounting principles. Prerequisite: Accounting 511, 512 and graduate standing.
Staff

552b. Seminar in Accounting Theory (3-0-3).
Historical development of modern accounting thought and the standard-setting process. Factors underlying current accounting controversies. Competing approaches to the making and testing of accounting theories. Prerequisite: Accounting 511, 512, and graduate standing.
Mr. Zeff

560b. Law for Accountants (3-0-3).
Civil law, common law, equity, state and federal court systems, contracts, sales, bailments and carriers, commercial paper, agency, partnerships, corporations, unfair competition, bankruptcy, secured transactions, Uniform Commercial Code, Uniform Partnership Act. Prerequisite: graduate standing. *Mr. Friday*

597a, 598b. Independent Study (0-0-3 each semester).
Independent study or directed reading on an approved project under faculty supervision. Enrollment by special permission. Prerequisite: graduate standing.

600a,b. Doctoral Dissertation Research.

700c. Summer Graduate Research.

800b. Degree Candidate Only.

Administrative Science

Administration Courses

501a, 502b. Dean's Seminar (2-0-1 each semester).
Weekly seminar held each semester in which invited speakers discuss a variety of management topics. Prerequisite: graduate standing. *Mr. Tuggle*

503a, 504b. Faculty Research Seminar.
Faculty and invited guests meet periodically to present current research findings. Student attendance is welcome. No registration is required, and no credit is offered. *Mr. Thrall*

511a. Organizational Theory and Behavior (3-0-3).
Theoretical and empirical content of psychology applied in the organizational setting. Current issues in job satisfaction, work motivation, leadership, personnel selection, and related topics are explored in a format designed to produce both understanding of the concepts and proficiency in oral and written communication skills. Team taught. Prerequisite: graduate standing. *Ms. Driskill, Mr. Howell*

512b. Personnel Management (3-0-3).
Modern approaches to the study and management of people at work. Particular attention to the description of work, techniques for evaluating jobs and performance, problems in attracting, recruiting, selecting, training employees, and issues in supervision.

518b. Managerial Decision Making (3-0-3).
Review of current theories of decision making in and by organizations. Emphasis on behavioral decision theory, human problem solving, and organizational processes. Prerequisite: Accounting 522 and Administration 511 and 532. *Mr. Tuggle*

531a. Quantitative Methods I (3-0-3).
Use of statistical methods to analyze decision problems. Prerequisite: graduate standing.
Mr. Batsell

532b. Quantitative Methods II (3-0-3).
Application of operations research to decision problems. Prerequisite: Administration 531 and graduate standing. *Staff*

534b. Topics in Decision Analysis (3-0-3).
Matrix games, their relation to linear programing, nonzero sum games, games against nature, decision trees, models for group decisions, utility theory, and benefit-cost models. Not offered 1981-82. *Mr. Thrall*

541a. Managerial Decision Economics (3-0-3).
Long- and short-run investment, price, production, and financing decisions in private and public economic entities in the face of differing demand situations and market environments. Prerequisite: graduate standing. *Mr. Bell*

542b. Economic Environments and Managerial Decisions (3-0-3).
Problems of economic growth, stability, allocative efficiency, and distributional equity within and among nations; interactions of these environmental considerations with managerial decisions. Prerequisite: Administration 541 and graduate standing. *Mr. Bell*

543a. Financial Markets and Institutions (3-0-3).
Financial environment of the corporation; use of money and capital market instruments; roles of intermediaries and institutions. Prerequisite: Administration 542 and graduate standing. *Mr. Atherton*

544b. Financial Theory (3-0-3).
Underlying assumptions and maximization problems in finance; demand, supply, and cost for money capital; optimal capital structure and dividend policy; investment and financial equilibrium in a capital asset pricing world; disequilibrium and the real world. Offered alternate years. Prerequisite: Administration 542 and graduate standing. *Mr. Williams*

545a. Investments (3-0-3).
Investment policy for individuals and institutions; structure of rates in financial markets; investment timing and selection; principles of financial analysis and analysis of individual security issues; securities markets, valuation of securities, retention of portfolios. Prerequisite: Administration 542 and graduate standing. *Mr. Williams*

546b. Quantitative Methods in Finance (3-0-3).
Advanced topics in financial management are considered. Prerequisite: Administration 542 and graduate standing. *Mr. Ross*

548b. Banking (3-0-3).
Introduction to commercial and investment banking. Prerequisite: Administration 542 and graduate standing. *Mr. Anderson, Mr. De Bellas*

561a. Legal Analysis and Processes I (3-0-3).
Law as the medium in which American society functions: history, jurisprudential bases, theory and practice of principal sources of law — common law, statute law, constitutional law, law of government control. Prerequisite: graduate standing. *Mr. Greanias*

562b. Legal Analysis and Processes II (3-0-3).
Continuation of Administration 561a. Examination of specific legal problems arising from decisions made by public and private managers. Team taught by practicing legal specialists. Prerequisite: Administration 561 and graduate standing. *Mr. Greanias*

571a. Political Risk Analysis (3-0-3).
Analyses of political and social factors affecting business operations abroad, including domestic instability, foreign conflict, corruption, nationalization, indigenization, etc. A simulation exercise is required. *Mr. von der Mehden, Mr. Mascarenhas*

572b. Problems of International Management (3-0-3).
Decision problems of private and public sector entities involved in international economic activities. Prerequisite: graduate standing or permission of instructor. *Mr. Mascarenhas*

581. Marketing Decisions (3-0-3).
Introduction to decisions, concepts, and methodologies which comprise the field of marketing. Students are placed in a decision-making role. Prerequisite: graduate standing. *Mr. Batsell*

582. Marketing Research (3-0-3).
Students learn the skills necessary for the design, execution, and analysis of marketing research. Prerequisite: graduate standing. *Mr. Batsell*

591a, 592b. Management Seminars I, III: Management Policy and Strategy (3-0-3 each semester).
Examination of managerial and organizational problems in the private and public sectors which illustrate fundamental principles of domestic and international management practice. This course integrates key managerial skills taught in other core courses. Extensive use of case materials, student presentations, and computer simulation. Prerequisite: second-year graduate standing. *Mr. Mascarenhas, Mr. Windsor*

593a. Management Seminars II: Governmental Processes (3-0-3).
Political analysis and strategy; policy making in the public sector; procedures and processes of American government. Extensive use of case materials and student presentations. Prerequisite: second-year graduate standing. *Mr. Greanias, Mr. Windsor*

594b. Management Seminar IV: Governmental Processes (3-0-3).
Political environment of management; governmental intervention strategies in major industrial systems; trends and policy options. Extensive use of case materials and student presentations. Prerequisite: second-year graduate standing. *Mr. Windsor, Mr. Greanias*

595a. Entrepreneurship and the New Enterprise (3-0-3).
Characteristics of entrepreneurs. Process of starting and managing a new business. Venture capital. Legal and tax aspects of new venture activities. Preparation of a business plan. *Mr. Williams, Mr. Ballas*

596b. Entrepreneurial Survival and Growth (3-0-3).
The role of entrepreneurship in economic growth; management strategies for the developing enterprise; growth and managerial transition; buying and selling a going concern; corporate venturing; specialized ventures. Prerequisite: Administration 595. *Mr. Williams, Mr. Ballas*

597a, 598b. Independent Study (0-0-3 each semester).
Independent study or directed reading on an approved project under faculty supervision. Enrollment by special permission. Prerequisite: graduate standing.

Managerial Studies Courses

495a, 496b. Senior Honors Thesis (0-0-3 each semester).
Completion of senior honors thesis. Open only to seniors in managerial studies honors program.

497a, 498b. Independent Study (0-0-3 each semester).
Independent study on an approved project under faculty supervision. Enrollment by special permission.

Anthropology

Associate Professor Marcus, *Chairman*
Professors P.W. Davis and Tyler
Associate Professor Fischer
Visiting Associate Professor Hrdy
Adjunct Associate Professors Gibson, Schreiber, and Weiss
Assistant Professors Adair and R.J. McIntosh
Adjunct Assistant Professors Biesele and S.K. McIntosh

Degrees Offered: B.A., Ph.D., B.A. in behavioral science

Undergraduate Program. Anthropology is a discipline that encompasses many subjects of study, all related to understanding human beings and their cultures. A student may organize a major in one or more of anthropology's principal fields or may combine a major in anthropology with one in another discipline. Students majoring in anthropology are required to take a total of thirty semester hours in anthropology (ten semester courses). Majors must devise a plan of study in consultation with a faculty adviser. Although there are no required courses, students will be encouraged to gain exposure to all of the principal fields within anthropology (archaeology; biological, cultural, and linguistic anthropology). On declaring a major in anthropology, a student should meet with the departmental undergraduate adviser in order to tailor a major plan in line with the student's interests. This plan can be modified at any time with the approval of the adviser.

With departmental approval, a maximum of six semester hours (two courses) outside of anthropology but related to the student's plan of study may be substituted

for hours/courses in anthropology. Majors who plan to pursue graduate training toward a career in anthropology will need a reading knowledge of one or two European languages and are urged to enroll in undergraduate language courses. These majors are also urged to apply for admission to the honors program.

Honors Program. The primary purpose of the Honors Program is to provide selected undergraduate majors with an opportunity to receive advanced training, particularly in the planning and execution of independent research, within their chosen areas of specialization in anthropology. A secondary purpose of the program is to establish an administrative framework for the formal recognition of outstanding students. Majors considering a career in anthropology are strongly encouraged to apply, as are all others who desire the experience of an intensive, individual research project as part of their undergraduate education.

Application to the Honors Program should be made in person to the undergraduate adviser no later than the tenth week of the first semester of a student's junior year. In support of the application, the student must prepare a brief description of the proposed research project signed by the faculty member who is to supervise the work. Acceptance into the program is at the discretion of the anthropology faculty. A statement of eligibility requirements and program requirements is available in the departmental office.

Behavioral Science Major. The major in behavioral science centers on a nucleus of courses in anthropology, psychology, and sociology. The student ordinarily, but not necessarily, emphasizes one of these three fields.

Students majoring in behavioral science are required to take a minimum of thirty semester hours (ten semester courses) in anthropology, psychology, and sociology, of which twenty-four semester hours (eight courses) must be courses numbered 300 or higher. A minimum of six semester hours (two courses) in each of the three fields of anthropology, psychology, and sociology is required. With the approval of the major adviser, a maximum of six semester hours (two courses) in courses numbered 300 or higher in related fields outside the core fields may be included in the major. Six semester hours (two courses) at the 200 level may be substituted for advanced courses if they are in a field of the major in which no courses have been taken previously. Students are encouraged to plan in consultation with the program adviser an independent study course (to be taken in the fall of their senior year) that integrates the varying perspectives of anthropology, psychology, and sociology.

Graduate Program. The graduate program offers advanced training in social/cultural anthropology, biological anthropology, and archaeology, leading to a Ph.D. in anthropology. The M.A. is optionally offered upon approval of candidacy for the Ph.D.; however, no students who intend to complete only the M.A. are admitted to the program. The M.A. as a terminal degree is awarded only in unusual cases. In such cases, the M.A. requires satisfactory completion of thirty semester hours of course work approved by an adviser, satisfactory completion of one of the special papers (see uniform requirements for the Ph.D.), and a thesis. Although there are uniform requirements for the Ph.D. degree, each field of specialization offers different opportunities for training and different topical research orientations reflecting the interests of the faculty. Consequently, the department seeks applicants with a defined interest in one of the broad fields of specialization within anthropology. An undergraduate background in anthropology is desirable but not required for admission. In consultation with a major adviser and two other faculty members, each entering student is expected to design a flexible study plan that emphasizes broad training in a field of specialization and the eventual definition of a problem for dissertation research. All first-year students can be offered some form of support, ranging from full graduate fellowships, which provide tuition plus a stipend, to tuition scholarships only. When possible, these awards are renewed for the second year of study.

Specialization in Social/Cultural Anthropology. The faculty is eclectic in its interests, and the program offers exposure to styles of argument and reasoning across the range of contemporary theoretical issues in social/cultural anthropology. We emphasize the reading of primary sources of theory, which have inspired the discussion and definition of central problems within anthropology. In addition, as essential preparation for doctoral research, explicit attention in instruction is paid both to field work and to skills in the conception and writing of ethnography.

Specialization in Biological Anthropology. Training in biological anthropology emphasizes biomedical issues, including nutrition, growth and development, human adaptation, human genetics, and public health. Students may take advantage of the extensive resources of the Houston Medical Center through ties established with the University of Texas School of Public Health and Graduate School of Biomedical Sciences. In addition to work at Rice, degree credit may be given for both formal courses offered at the Schools of Public Health and Biomedical Sciences and independent study, tutorials, and research with adjunct faculty at these institutions.

Specialization in Archaeology. Training emphasizes research skills in the library, field, and laboratory, to be tested by means of the three required research papers, at least one of which must be an original data paper. In addition to research on the dissertation topic, all students are encouraged to develop at least one analytical skill — such as remote sensing, archaeological statistics, osteology, geomorphology, and pedology — making use of the excellent laboratory and computer facilities at Rice. By special arrangement with Cambridge University, it is possible for students to spend a year in England in a one-year course of concentrated studies leading to the M.Phil. degree in Paleolithic European Prehistory and African Prehistory.

Uniform Requirements for the Degree of Doctor of Philosophy. Each entering student will devise a detailed first year plan of study and provisional plans for succeeding years in consultation with his or her advisers. Seminars and tutorials can be arranged on any topic relevant to a student's training, and where appropriate, these can be conducted in supervisory consultation with scholars in other disciplines at Rice as well as with adjunct faculty. During the first two years of study, each student will prepare three substantial papers, each emphasizing an analytical, research, and writing skill appropriate to the field of specialization. The subjects of the papers and their scheduling are major considerations in the ongoing consultations between students and their advisers. During the course of study, each student must demonstrate reading competency in one foreign language. Before advancing to Ph.D. candidacy, a student must prepare a satisfactory proposal for dissertation research. Following approval of the research proposal, a dissertation committee is appointed. Dissertations are ordinarily based in substantial part upon field research.

Anthropology Courses

201a. Introduction to Social/Cultural Anthropology (3-0-3).
An introduction to the history, methods, and concepts of the discipline devoted to the systematic description and understanding of cultural diversity in human societies. (formerly Introduction to Anthropology) *Staff*

202b. Introduction to Biological Anthropology (3-0-3).
The evolution, genetics, and adaptive significance of human biological differences. Includes an examination of the fossil record of human evolution as well as patterns of and explanations for variability in modern human populations. (formerly Anthropology 332: Physical Anthropology) *Ms. Adair*

205a. Introduction to Archaeology (3-0-3).
Principles and methods of archaeology; an introduction to the elementary concepts of the discipline through a series of case studies. (formerly Anthropology 316: Fundamentals of Archaeology) *Mr. McIntosh*

207a. Introduction to General Linguistics (3-0-3).
Study of language including basic synchronic concepts and techniques: phonological, grammatical, and semantic systems. Also offered as Linguistics 201. *Staff*

208b. Introduction to General Linguistics (3-0-3).
Continuation of Anthropology 207 with an introduction to the diachronic study of language and the methods of linguistic prehistory. Also offered as Linguistics 202. *Staff*

211a. Early Civilizations (3-0-3).
A comparative study of the civilizations of Mesopotamia, Egypt, the Indus, China, and the Maya, emphasizing the causes and conditions of their origins. Not offered 1982-83. (formerly Anthropology 330) *Mr. McIntosh*

214b. African Prehistory (3-0-3).
Thematic coverage of developments throughout the continent from the Lower Paleolithic to medieval times, with emphasis on food production, metallurgy, and the rise of cities and complex societies. Not offered 1982-83. *Mr. McIntosh*

302. Syntax of Language (3-0-3).
Study of semantic categories common to all languages and their formal expression in the grammars of specific languages. Also offered as Linguistics 302. Not offered every year. (formerly Syntactic Analysis) *Mr. Davis*

303. Modern Linguistic Theory (3-0-3).
Survey of selected theories of language from de Saussure to the present. Also offered as Linguistics 303. Not offered every year. *Mr. Davis*

304. Phonology of Language (3-0-3).
Study of the categories that serve as the framework for the perception of sounds in specific languages. Also offered as Linguistics 304. Not offered every year. (formerly Phonological Analysis) *Mr. Davis*

305. Historical Linguistics (3-0-3).
The nature of language change in its social and geographical contexts from the perspective of language acquisition. Also offered as Linguistics 305. Not offered every year. *Mr. Davis*

308b. History As a Cultural Myth (3-0-3).
Ideas of history and attitudes toward the past as culturally conditioned phenomena. Emphasizes history as statement of cultural values as well as conceptualizations of cause, change, time, and reality. *Staff*

313a. Language and Culture (3-0-3).
Investigates the relation between language and thought, language and world view, language and logic. *Mr. Tyler*

315a. Traditional Societies (3-0-3).
A comparative exploration of symbolic and everyday life in a variety of contemporary nonindustrial societies, focusing on hunters and gatherers, tribal peoples, and peasants. The viability of traditional societies as nation-states or as entities within them is considered. Not offered every year. *Mr. Marcus*

317b. Anthropological Research in Complex Societies (3-0-3).
A consideration of the relevance of anthropological perspectives, developed in research on traditional societies, to theoretical and applied issues raised by other social sciences in the study of modern industrial societies. Not offered every year. *Mr. Marcus*

319a. Politics As Symbolic Process (3-0-3).
Attention to politics as an expressive phenomenon in Western and non-Western societies. Readings in anthropology as well as current cases from the media. *Staff*

323a. Intercultural Relationships (3-0-3).
The study of intercultural encounters at the levels of historically significant contact between societies and face-to-face relationships between persons. Emphasis on problems of mutual interpretation and understanding in various interactions between Western and non-Western peoples. (formerly Anthropology 331: Culture Contact) *Mr. Marcus*

326. The Anthropology of Law (3-0-3).
Social conflict and methods of dispute management in Western and non-Western societies. Comparison of legal institutions in band, tribal, early state, and complex industrial societies. Not offered every year. (formerly Anthropology 371) *Mr. Marcus*

327a. Witches, Wives, and Warriors: Gender and Symbolism (3-0-3).
Examination of beliefs concerning men, women, and gender in different cultures, including the West, relating to issues of symbolism, power, and the distribution of cultural models.
Staff

333. Contemporary Trends in Social and Cultural Theory (3-0-3).
British functionalism, analytic philosophy, French structuralism, neo-Marxism, phenomenology, hermeneutics, and ethnomethodology. An intensive review of the major sources of theory guiding research in contemporary anthropology. Strongly recommended for majors and for students in the humanities. Not offered every year. *Staff*

336b. Field Work and the Art of Ethnography (3-0-3).
A seminar that explores the experience of doing field work and the problems of transforming theory, field experience, and data into a written account. Emphasis is on reading field work accounts and gaining ethnographic writing skills. Strongly recommended for majors but also for other interested students in the social sciences and humanities. Not offered every year. *Mr. Marcus*

348b. America As a Culture (3-0-3).
Explorations in community studies, symbolic anthropology, literary criticism, religion, and politics. *Mr. Fischer*

351a. Thought and Culture in the Contemporary Middle East (3-0-3).
Social theory of both European and Middle Eastern writers as applied to the Middle East; survey of changing social structures. *Mr. Fischer*

353a. Cultures of India (3-0-3).
Summary of the prehistory, ethnography, and ethnology of the Indian subcontinent. Special emphasis on Hinduism, Buddhism, and Indian philosophy. Not offered every year.
Mr. Tyler

360b. Bandits and Borderlands: Latin American Culture (3-0-3).
The social bandit as focus of wider central Latin American cultural themes. Concentrates on Brazil, Argentina, and the American Southwest. *Staff*

362b. Archaeological Field Techniques (3-0-3).
Methods used in field work, laboratory analysis, and interpretation of archaeological data from a local site excavated by the class. Prerequisite: Anthropology 205. (formerly Anthropology 323: Archaeological Techniques) *Mr. McIntosh*

365a. Cultural Geography (3-0-3).
Elementary geomorphology, remote sensing, and survey techniques for ethnographers and archaeologists, as applied to past and present settlement on major floodplains. Not offered every year. *Mr. McIntosh*

371a. Primate Behavior (3-0-3).
An introduction to the ecology and social behavior of prosimians, monkeys, and apes with special attention to the reproductive strategies of males and females in these species. Not offered every year. *Ms. Hrdy*

374b. From Ethology to Sociobiology: Changing Conceptions of Human Nature (3-0-3).
In the last two decades, new information about other animals, particularly other primates, has generated a number of new theories about human nature. This course will trace the history of some of these ideas, analyze biases that shaped them, and critically examine some of the biological evidence on which they are based. Not offered every year. *Ms. Hrdy*

381a. Medical Anthropology (3-0-3).
Cultural, ecological, and biological perspectives on human health and disease throughout the world. (formerly Anthropology 430) *Ms. Adair*

383a. Human Adaptation (3-0-3).
Explanations for the range and patterns of human biological differences in the context of theories of adaptation. Integrates themes from human genetics, physiology, and cultural studies. Not offered 1982-83. (formerly Anthropology 307) *Ms. Adair*

386b. Biocultural Perspectives on Human Nutrition (3-0-3).
The anthropology of eating: nutrient requirements; assessment of nutritional status; food selection; symbolic, psychological, and cultural aspects of food and food consumption. (formerly Anthropology 308) *Ms. Adair*

388a. Human Growth and Development (3-0-3).
Growth and development from conception to old age. Includes consideration of biological, nutritional, and social factors that influence growth, along with population differences in patterns of growth and their consequences. Not offered 1981-82. *Ms. Adair*

394b. The Linguistic Structure of English (3-0-3).
Introduction to modern English grammar, phonology, and phonetics, including study of English pragmatics, discourse, sociolinguistics, dialectology, and Black English. Also offered as Linguistics 394 and English 394. *Mr. Davis*

404a,b. Independent Study (0-0-3).
Directed reading and preparation of written papers on anthropological subjects not offered in the curriculum and advanced study of subjects on which courses are offered. *Staff*

406b. Cognitive Anthropology (3-0-3).
Relations between thought, language, and culture. Special emphasis given to natural systems of classification and the logical principles underlying them. Also offered as Linguistics 410. *Mr. Tyler*

411a. Neurolinguistics: Language and the Brain (3-0-3).
Organization of the brain; localization of speech, language, and memory functions; hemispheric dominance; and pathologies of speech and language associated with brain damage. Also offered as Linguistics 411. Not offered 1982-83. *Mr. Tyler*

414b. Hermeneutics and Linguistic Anthropology (3-0-3).
Application of linguistic theory and method in the analysis of cultural materials. Discourse analysis; the structure and interpretation of texts and conversation. (formerly Anthropology 508: Linguistic Anthropology) *Mr. Tyler*

446b. Advanced Topics in Biomedical Anthropology (3-0-3).
Seminar on contemporary research on the biomedical aspects of human health and disease. Includes topics from medical ecology and epidemiology. Not offered 1981-82. *Ms. Adair*

460b. Archaeological Analysis (3-0-3).
Specialized techniques for the interpretation and presentation of archaeological data (including sampling theory, statistics, remote sensing, and miscellaneous typological techniques). Prerequisite: Anthropology 205. Not offered 1981-82. (formerly Anthropology 410) *Mr. McIntosh*

490b, 491a. Directed Honors Research (0-0-3).
A two-semester sequence of independent research culminating in the preparation and defense of an honors thesis. Open only to candidates formally accepted into the honors program. *Staff*

502. Syntax of Language (3-0-3).
Study of semantic categories common to all languages and their formal expression in the grammars of specific languages. Not offered every year. *Mr. Davis*

503. Modern Linguistic Theory (3-0-3).
Survey of selected theories of language from de Saussure to the present. Not offered every year. *Mr. Davis*

515a. Traditional Societies (3-0-3).
A comparative exploration of symbolic and everyday life in a variety of contemporary nonindustrial societies, focusing on hunters and gatherers, tribal peoples, and peasants. The viability of traditional societies as nation-states or as entities within them is considered. Not offered every year. *Mr. Marcus*

517b. Anthropological Research in Complex Societies (3-0-3).
A consideration of the relevance of anthropological perspectives, developed in research on traditional societies, to theoretical and applied issues raised by other social sciences in the study of modern industrial societies. Not offered every year. *Mr. Marcus*

533a. Contemporary Trends in Social and Cultural Theory (3-0-3).
British functionalism, analytic philosophy, French structuralism, neo-Marxism, phenomenology, hermeneutics, and ethnomethodology. An intensive review of the major sources of theory guiding research in contemporary anthropology. Not offered every year. *Mr. Marcus*

536b. Field Work and the Art of Ethnography (3-0-3).
A seminar that explores the experience of doing field work and the problems of transforming theory, field experience, and data into a written account. Emphasis is on reading field work accounts and gaining ethnographic writing skills. Not offered every year.
Mr. Marcus

581a. Medical Anthropology (3-0-3).
Cultural, ecological, and biological perspectives on human health and disease throughout the world. *Ms. Adair*

583a. Human Adaptation (3-0-3).
Explanations for the range and patterns of human biological differences in the context of theories of adaptation. Integrates themes from human genetics, physiology, and cultural studies. Not offered 1982-83. *Ms. Adair*

586b. Biocultural Perspectives on Human Nutrition (3-0-3).
The anthropology of eating: nutrient requirements; assessment of nutritional status; food selection; symbolic, psychological, and cultural aspects of food and food consumption.
Ms. Adair

588a. Human Growth and Development (3-0-3).
Growth and development from conception to old age. Includes consideration of biological, nutritional, and social factors that influence growth, along with population differences in patterns of growth and their consequences. Not offered 1981-82. *Ms. Adair*

600a,b. Independent Study (0-0-3).

606b. Cognitive Anthropology (3-0-3).
Relations between thought, language, and culture. Special emphasis given to natural systems of classification and the logical principles underlying them. *Mr. Tyler*

611a. Neurolinguistics: Language and the Brain (3-0-3).
Organization of the brain; localization of speech, language, and memory functions; hemispheric dominance; and pathologies of speech and language associated with brain damage. Not offered 1982-83. *Mr. Tyler*

614b. Hermeneutics and Linguistic Anthropology (3-0-3).
Application of linguistic theory and method in the analysis of cultural materials. Discourse analysis; the structure and interpretation of texts and conversation. *Mr. Tyler*

646b. Advanced Topics in Biomedical Anthropology (3-0-3).
Seminar on contemporary research on the biomedical aspects of human health and disease. Includes topics from medical ecology and epidemiology. Not offered 1981-82. *Ms. Adair*

660b. Archaeological Analysis (3-0-3).
Specialized techniques for the interpretation and presentation of archaeological data (including sampling theory, statistics, remote sensing, and miscellaneous typological techniques). Not offered 1981-82. *Mr. McIntosh*

697a, 698b. Research and Thesis (0-0-3 to -9 each semester).

700c. Summer Graduate Research.

800b. Degree Candidate Only.

School of Architecture

Professor O.J. Mitchell, *Dean*
Professors Cannady, Evans, Krahl, and Todd
Visiting Professors Crane, Taniguchi, and Wilford
Adjunct Professor Thomsen
Associate Professors Casbarian, Papademetriou, S.W. Parsons, Rowe, and D.L. Williams
Adjunct Associate Professor Perrine
Assistant Professors Underhill and Wittenberg
Adjunct Assistant Professor Turner
Instructor Bavinger
Lecturers Blackburn, C.J. Brown, Cavanaugh, Colaco, Cunningham, Kerner, Lord, Mixon, Moore, J. Preston, Scoular, and Tapley

Degrees Offered: B.A., B.Arch., M.Arch., M.Arch. in Urban Design, D.Arch.

Preceptors

Brown/Sullivan Associates
Philadelphia, Pennsylvania

Cambridge Seven Associates
Cambridge, Massachusetts

Caudill Rowlett Scott
Houston, Texas

Dagit/Saylor Architects
Philadelphia, Pennsylvania

Friday Architects
Philadelphia, Pennsylvania

Gensler & Associates
Houston, Texas

Gensler & Associates
San Francisco, California

Hellmuth, Obata & Kassabaum
San Francisco, California

Kliment and Halsband
New York, New York

Mitchell/Giurgola Associates
Philadelphia, Pennsylvania

Mitchell/Giurgola Associates
New York, New York

C.F. Murphy Associates
Chicago, Illinois

Office of Mid-Town Planning Development
New York, New York

I.M. Pei & Partners
New York, New York

Cesar Pelli & Associates
New Haven, Connecticut

Rogers, Nagel, Langhart
Denver, Colorado

Harry Seidler & Associates
Sydney, Australia

Skidmore Owings & Merrill
Chicago, Illinois

Robert A.M. Stern Associates
New York, New York

Charles Tapley Associates
Houston, Texas

V.D.L. Architektengroep
Amsterdam, Netherlands

Vasta-Shilpa
Ahmedabad, India

Wallace, McHarg, Roberts, Todd
Philadelphia, Pennsylvania

The School of Architecture seeks to contribute through teaching and research to a more humane environment. Its primary educational missions are teaching and research, development of a broad liberal education for undergraduates in the allied sciences and arts of architecture, and professional education at the graduate and postgraduate level in architecture and urban design.

These programs are offered in the setting of a small school to provide intimate student-faculty interaction, freedom for learning, and unrestricted institutional cooperation within and outside the university.

Degrees Offered. Five degrees are offered: Bachelor of Arts, Bachelor of Architecture, Master of Architecture, Master of Architecture in Urban Design, and Doctor of Architecture. The Bachelor of Arts, a liberal arts degree, may emphasize a major in either architecture or architectural studies; the two programs are described below. The B.A. is awarded after successful completion of the first four years of study. The Bachelor of Architecture is available to recipients of the B.A. degree from Rice and requires two additional years of work, one of which is an in-service preceptorship in a professional office.

The master's degrees are awarded after successful completion of a minimum of two years of study beyond the B.A., depending upon previous undergraduate and professional studies. Recipients of the B.A. degree from Rice normally undertake a minimum of three years of further work for one of the Master of Architecture degrees, of which one year is an in-service preceptorship in a professional office. Approval of Rice students for admission to either bachelor's or master's programs is contingent upon evaluation of the student's undergraduate academic record at the conclusion of the fourth year of study. Other applicants for the master's degree are evaluated in terms of their prior preparation, which may reduce their required period of study at Rice. The Master of Architecture is an accredited first professional degree, whereas the Master of Architecture in Urban Design requires prior or concurrent completion of accredited bachelor's or master's degrees.

Undergraduate Program. For both the B.A. and the B.Arch. degrees, the first two years center upon a carefully integrated study of the principles of architecture. In the third and fourth years, students are encouraged to develop their own interests through more specialized study of particular aspects of the field in studio, seminar, and lecture courses.

Below is a suggested course of study for either the B.A. or the B.Arch. degree. The order in which courses are taken is optional, subject to the following exceptions: (1) health and physical education must be taken in the first year, and (2) failure to take prerequisite courses in the earlier years may result in later scheduling problems.

First year:

History of Art, six semester hours
(two semester courses)
Physics 121, 122 (for architects)
Architecture 101, 102
Electives, twelve semester hours
(four semester courses)
Physical Education
ROTC, if elected

Second year:

Architecture 201, 202
Architecture 213, 214
History of Art, six semester hours
(two semester courses)
Electives, twelve semester hours
(four semester courses)
ROTC, if elected

Third and fourth years:
Architecture 301, 302
Architecture 401, 402
Architecture 315, 316
Electives, at least thirty semester hours (ten semester courses)

Fifth year (B.Arch. program):
Architecture 601, 602
Electives, at least twelve semester hours (four semester courses)
Electives (for M.Arch. applicants: at least six semester hours or two semester courses)

Preceptorship year:
Architecture 500

In addition to the departmental requirements for the major, students must also satisfy distribution requirements of 38 semester hours in the sciences and humanities outside the departmental requirements for a total program of at least 130 semester hours. See Degree Requirements and Majors, pages 50-51.

B.A. students have two options in their choice of a preprofessional major during the third and fourth years:

1. The **architecture major** requires two years of advanced studio courses and additional professional group requirements that permit reasonable elective freedom. This curriculum serves the needs of students who anticipate professional studies at an advanced level and who wish to have the alternatives of doing so through either the Bachelor of Architecture at Rice or various first professional master's degrees at Rice or other institutions.

2. The **architectural studies** major requires two years of advanced work combining architectural studies with other fields. It is focused on an approved, preprofessional theme for interdisciplinary studies chosen by the individual and approved by an adviser. Application to this program must be made during the second year of studies. Reduced architectural course requirements encourage the pursuit of a double major with another department. This curriculum can be regarded as the equivalent of a liberal arts education, but it also offers opportunity to prepare for a wide variety of graduate studies and career options in different design and planning related fields at Rice or other institutions. This program provides opportunity to pursue architectural or urban design master's degree programs at Rice by entering through the Qualifying Graduate Workshop program, but it does not include the option of a Rice Bachelor of Architecture.

Upon satisfactory completion of the B.A. degree with either above major, students may apply during the senior year for admission to the appropriate advanced professional degree programs.

Auxiliary services at Rice span the gap between school and practice: the preceptorship program, the visiting lecturer series, and the visiting critic series. The preceptorship program is designed to bridge classroom studio learning and professional practice. Qualified students who have been admitted to the professional degree programs work for an entire year with outstanding architects throughout the world who are designated by the school as preceptors. The timing of preceptorship service varies according to the level of design and technical proficiency reached during the B.A. program. For those admitted to the Bachelor of Architecture, the preceptorship occurs immediately on the receipt of the B.A.

Notes

1. History of Art 205, 206 are required in the first two years and will be scheduled where history of art electives are noted. History of Art 345, 346 are required for a major in architecture.
2. Electives must satisfy School of Architecture distribution requirements in addition to general university requirements.
3. A student who has studied physics in high school may substitute approved natural science courses in place of physics.

4. Studio courses (Architecture 201, 202; 301, 302; and 401, 402) which carry six semester hours each semester in the sophomore, junior, and senior years count toward graduation as the equivalent of one course per semester in the sophomore year and as two courses per semester in the junior and senior years.
5. Students contemplating later specialization in the fields of structural or environmental engineering are advised to take Mathematics 101, 102 and Physics 101, 102 and 132.

Graduate Programs. The School of Architecture offers the degrees of Master of Architecture and Master of Architecture in Urban Design. Within the two degree programs, varied areas of interest are open to students.

An advanced building design curriculum is the basis for the Master of Architecture degree program. This program is designed to provide the student an individual course of study with a wide choice of special project, research, and internship opportunities both within and outside the School of Architecture.

The first year of the urban design curriculum is composed of studio and lecture courses. The second year allows a student choice and specialization in the areas of interest listed above.

Joint degree programs with other disciplines are available for students with special interests. The Texas School of Public Health offers a cooperative program with the Rice School of Architecture. Joint programs within the university include behavioral science, computer science and technology, and environmental science.

Clinical practice is an important dimension of graduate education in architecture at Rice. Normally, one semester plus a summer (or one summer in special cases) is spent in full-time clinical education for academic credit during a two-year master's program. The Rice Center for Community Design and Research is an off-campus, nonprofit corporation concerned with practical problems of planning, clinical education, public service, contract research, and professional services. Students and faculty of the School of Architecture are employed in the center, where they serve in professional teams on actual projects with participants from many other fields.

Graduate studies are open to candidates who hold the degree of Bachelor of Architecture, Bachelor of Arts with a major in architecture, or Bachelor of Arts in other disciplines. Candidates with a Bachelor of Architecture degree are normally expected to complete three academic semesters plus one semester of clinical education. Candidates with a Bachelor of Arts degree with a major in architecture are normally expected to complete four academic semesters plus one semester of clinical education, which may occur in the intervening summer. Students without sufficient architectural background are expected to complete a program of special studies before admission to one of the graduate options. This program takes a minimum of two semesters, depending on the individual's preparation, and stresses history, theory, technology, and design techniques.

Students not possessing a prior first professional degree and completing the urban design program requirements receive a Master of Architecture degree with a certificate in urban design.

For students having a bachelor's degree with no architectural background, the Qualifying Graduate Workshop program is offered. This is normally a seven-semester program leading to the Master of Architecture degree. The first four semesters consist of special studio offerings plus selected seminar and lecture courses. The last three semesters are spent in the regular graduate programs.

An option for a master's thesis in lieu of part of the clinical education requirements is available for students who are oriented toward research and teaching in architecture or urban design.

Doctor of Architecture. Admission to the Doctor of Architecture program requires a bachelor's or master's degree in architecture. A student entering with a

master's degree normally takes one and one-half years of course work before the qualifying examination; a student with a bachelor's degree normally requires two and one-half years of course work before the qualifying examination. Candidates should be prepared for advanced analytic and creative work in their specialized field. Such preparation may include foreign languages, statistics, or a computer language. This requirement is established individually when the student is admitted.

After successful completion of all required course work plus the language examination or equivalent, students may apply for the qualifying examination. At this time, students must submit an outline of their research program for the doctoral dissertation. This dissertation must represent an original contribution to knowledge in the field of architecture. The completion of the dissertation and the passing of the final oral examination required for the doctorate in architecture take a minimum of one year.

Architecture Courses

101a. Principles of Architecture I (2-6-4).
Visual studies of restricted dimensions, explorations using simple tools and materials to develop an awareness of the environment. Requisite for architecture majors. Limited enrollment. *Ms. Evans*

102b. Principles of Architecture I (2-6-4).
A development of communication of formal information from further investigation of visual structures and their order. Requisite for architecture majors, but Architecture 123 may be substituted. By permission of instructor only. *Ms. Evans*

132b. Changing Perspectives of Architecture (0-3-1).
Introductory tutorial. Reading, field trips, and observation of current events and public affairs; values, institutions, and nature of environmental changes relating to future role and practice of architecture. *Mr. Underhill, Staff*

201a, 202b. Principles of Architecture II (3-9-6 each semester).
Introduction to concepts of beginning architectural design. Manipulation of visual structure to render formal and operational information. Design process as problem solving with emphasis on conscious method. Requisite for architecture majors. *Mr. Casbarian, Mr. Underhill, Visiting Critics*

213a, 214b. Structural and Construction Systems (3-0-3 each semester).
Introduction to characteristics of materials, basic structural analysis, design of wood and masonry structures, field trips. Requisite for architecture majors. *Mr. Cunningham*

301a, 302b. Architectural Problems: Studio (2-12-6 each semester).
Variety of intermediate level problems for developing comprehensive experience in design methods and processes. Requisite for preprofessional major in architecture. Prerequisite: Architecture 201, 202. *Mr. Parsons, Mr. Todd, Mr. Wittenberg, Visiting Critics*

308b. Architecture for Nonarchitects (3-0-3).
Designed to increase awareness of architectural issues through site visits and comparative building studies, guest architects, design problems, lectures, readings, and discussion. Impact of architecture on its users and its relation to institutions that produce it. Enrollment by permission of instructor. *Mr. Casbarian*

315a. Intermediate Architectural Technology (3-0-3).
Analysis and design of structural systems; continuation of Architecture 213, 214. Prerequisite: Architecture 213, 214. *Mr. Cunningham*

316b. Intermediate Architectural Technology (3-0-3).
Introduction to building climatology and environmental control systems with an emphasis on energy conservation. Lectures are augmented with lab exercises and field trips. *Mr. Wittenberg*

336b. Architecture and Urban Issues (3-0-3).
Major issues and problems confronting metropolitan centers; emphasis on physical and built environment. Visiting lecturers on transportation, housing, education, minority problems, new communities, physical development and redevelopment. Course is open to all students. *Mr. Savino*

341a. Theory and Practice in Urban Design (3-0-3).
Comparative analysis of recent theory and practice in projecting and controlling urban growth and change. Open to students outside of architecture. *Mr. Mitchell*

342b. History and Theory of Modern Movements in Architecture and Urban Design (3-0-3).
A critical review of theory and specific examples of leading schools of thought in architecture and urban design from the early twentieth century to the present. Open to all students outside of architecture by permission of instructor. *Staff*

343a. Construction and Design (3-0-3).
A seminar in which the relationship between the construction of an object and its usefulness is explored. The premise in the course is that the way things are made can be one credible point of departure for the architectural design process. *Mr. Underhill*

346a. Natural Environmental Factors in Community Design (3-0-3).
An overview of issues on natural resource consumption and environmental impact pertinent to urban design activities. *Mr. Blackburn*

351a. Design Methods (3-0-3).
Rational processes of design, problem-solving methods, simple statistics, data surveys and handling, graph theory, graphic information systems, computer applications in design.
Mr. Cavanaugh

352b. Computer Applications in Architectural Programing and Evaluation (3-0-3).
Seminar on present and potential uses of electronic computers in architectural programing, graphic display, and problem analysis. Limited enrollment. *Staff*

353a. Photography for Architects (3-0-3).
Exploration of a variety of photographic techniques for architectural research, design, and presentation. *Mr. Hester*

356a. Seminar on Natural Environmental Factors in Community Development (3-0-3).
Readings and discussion of natural environmental factors affecting and affected by the development of the built environment. Review of data sources, analytical procedures, and implementation tactics. *Mr. Blackburn*

401a, 402b. Architectural Problems: Studio (2-12-6 each semester).
Vertically integrated studio with Architecture 301, 302. Same description.
Mr. Parsons, Mr. Papademetriou, Mr. Todd, Mr. Wittenberg, Visiting Critics

410b. Investigations in Building Climatology (3-0-3).
Lectures and individual student research dealing with issues governing human comfort in buildings. Emphasis is placed on modifying climate through architectural measures that exploit the use of natural phenomena. Course requirements include wind tunnel experiments and term papers. *Mr. Parsons*

413a. Design of Structural Systems I (3-0-3).
Structural systems for wood buildings, high-rise buildings, concrete thin-shell roofs, space trusses; also intermediate-span bridges, long-span suspension bridges. Graduate credit offered with approval of school. Prerequisite: Architecture 313, 314. Meets with Civil Engineering 413.
Staff

414b. Design of Structural Systems II (3-0-3).
Structural systems for low-rise buildings, industrialized building systems, cable-supported roofs, inflatables; also short-span bridges, long-span truss bridges. Graduate credit offered with approval of school. Prerequisite: Architecture 313, 314. Meets with Civil Engineering 414.
Staff

415a, 416b. Advanced Building Technology (3-0-3 each semester).
Consideration of the technical aspects of building systems for interior finishes and environmental control, as well as of passive and active response to energy demand in buildings.
Mr. Kerner

417a, 418b. Teaching of Technology (0-0-3 each semester).
Classroom teaching under the supervision of the instructors. *Staff*

419a. Advanced Topics in Environmental Control (3-0-3).
Advanced study in one or more topics in the field of environmental control, including building climatology and energy conservation, lighting, and acoustics. *Mr. Wittenberg*

437a. Advanced Computer Projects (3-0-3).
Individual projects in the application of computer technology to architectural programing, planning, and urban design, graphic display, and problem analysis. *Mr. Bavinger*

438b. Computer Applications in Architecture (3-0-3).
Individual projects in the application of computer technology to architectural programing, planning, and urban design, graphic display, and problem analysis. *Mr. Bavinger*

442b. Recent Trends in Architecture (3-0-3).
An historic-critical presentation of modern architecture since World War II; examination of its maturity and transformation on a global scale. By permission of instructor.
Mr. Papademetriou

451a,b. Architectural Measured Drawings (3-0-3).
Analysis of historic and contemporary examples of architecture or civil engineering through measured drawings constructed to standards. Drawings become part of a permanent architectural archive. Limited enrollment. Prerequisite: permission of instructor.
Mr. Papademetriou

458b. Explorations in Energy Supply and Demand (3-0-3).
An overview of potential future sources of energy and alternatives for demand reduction. In addition to numerous lectures concerning specific alternatives special attention will be directed to the environmental issues attendant to various alternative courses of action.
Mr. Blackburn

461a,b. Special Projects in Architecture (Credit variable).
Independent research or design arranged in consultation with a faculty member. Subject to approval of faculty adviser and director. Very limited enrollment. *Staff*

500a,b. Preceptorship Program (0-0-15).
Requisite for admission to graduate studies in architecture for all recipients of Rice B.A. degrees in preprofessional or area majors. Student completes nine to twelve months of full-time internship under guidance of an appointed preceptor. *Staff*

501a, 502b. Qualifying Graduate Workshop I, II (10-15-15 each semester).
Requisite for admission to graduate professional program options in architecture or urban design for students with nonarchitectural bachelor's degree. Lectures, seminars, laboratories, and design studio projects adjusted to individual needs. Prerequisites determined by the Committee on Advanced Standing within the School of Architecture. *Mr. Todd, Mr. Papademetriou, Staff*

503a, 504b. Qualifying Graduate Workshop III, IV (5-15-10 each semester).
Design studio to follow Architecture 501, 502. Preparation for entering studios in the regular graduate programs in architecture and urban design in the following semester. *Staff*

509a, 510b. Basic Beginning Explorations (3-0-3).
Two- and three-dimensional firsthand explorations of forming and ordering processes; involvement in highly disciplined problems dealing with conditions relating and interrelating timeless and basic design elements to the human spatial and visual place and condition of inhabiting and being. Enrollment limited to Qualifying Graduate Workshop. *Staff*

511a. Classical Language of Architecture (3-0-3).
Introduction to architectural theory using historical classical examples to explore universal issues of architectural culture, replacing History of Architecture survey courses.
Staff

514b. Building Technology — Structures (3-0-3).
A course in structures for students in the Qualifying Graduate Workshop. Topics include: structure in architecture; forces and equilibrium; structural materials; the behavior, analysis, and design of structural elements and their connections. Prerequisite: Architecture 513a.
Mr. Cunningham

515a. Building Technology — Advanced Structures (3-0-3).
A second course in structures for students in the Qualifying Graduate Workshop. Topics include: additional topics in the behavior, analysis, and design of structural elements; synthesis of structural elements into structural systems; integration of structural systems with other building systems. Prerequisite: Architecture 514b. *Mr. Cunningham*

516b. Architectural Technology (3-0-3).
Same as Architecture 316.

542a. Seminar: Trends in Architecture (3-0-3).
For lecture course description, see Architecture 442; includes additional graduate seminar for students enrolled in Architecture 503 and other graduate students in architecture. Prerequisite: History of Art 346 or equivalent, permission of instructor. *Mr. Papademetriou*

543a. Construction and Design (3-0-3).
Same as Architecture 343.

600a,b. Qualifying Graduate Workshop Practical Internship (0-0-0).
Practical work experience for students who have completed at least four semesters in the Qualifying Graduate Workshop program prior to their entrance into the regular Master of Architecture studio sequence. Student completes four to six months of full-time internship in an approved professional office under the guidance of an appointed sponsor. *Staff*

601a,b. Architectural Problems: Studio (5-15-10).
Emphasis on abstract thought and design capabilities relevant to systematic processes of designing specific buildings and facilities. Prerequisite: Architecture 500; or Architecture 501, 502, 503; or B.Arch. degree. *Mr. Cannady, Staff*

603a, 604a,b. Urban Design Problems: Studio (5-15-10 each semester).
Developing abstract thought and applied design and planning capabilities to total urban systems of facilities, large-scale developments, or other broad environmental action. Prerequisite: Architecture 500; or Architecture 501, 502, 503; or B.Arch. degree. Requisite for M.Arch. Urban Design degree. *Mr. Rowe, Staff*

606b. Thesis (0-14-10).
Independent investigations in architecture or urban design culminating in preparation and presentation of a master's thesis. *Staff*

608b. Architecture for Nonarchitects (0-0-3).
Classroom teaching under the supervision of the instructor. For elective credit only. *Mr. Casbarian*

610b. Investigations in Building Climatology (3-0-3).
Same as Architecture 410.

611a. Design of Structural Systems I (3-0-3).
Structural systems for wood buildings, high-rise buildings, concrete thin-shell roofs, space trusses; also intermediate-span bridges, long-span suspension bridges. Prerequisite: Architecture 313, 314. Meets with Civil Engineering 517. *Staff*

612b. Design of Structural Systems II (3-0-3).
Structural systems for low-rise buildings, industrialized building systems, cable-supported roofs, inflatables; also short-span bridges, long-span bridges. Prerequisite: Architecture 313, 314. Meets with Civil Engineering 518. *Staff*

613a, 614b. Teaching of Technology (0-0-3 each semester).
Same as Architecture 417, 418. *Staff*

615a, 616b. Advanced Building Technology (3-0-3 each semester).
Same as Architecture 415, 416. *Mr. Kerner*

619a. Advanced Topics in Environmental Control (3-0-3).
Same as Architecture 419.

621a. Theory and Practice in Urban Design (3-0-3).
Comparative analysis of recent theory and practice in projecting and controlling urban growth and change. *Mr. Mitchell*

624b. Professionalism and Management in Architectural Practice (3-0-3).
Examination of characteristics in delivery of architectural services by professional design organizations; problems and potentials facing design professionals in social, technical, legal, ethical, financial, and marketing milieu of modern practice. Prerequisite: fourth year or graduate standing. *Mr. Ochsner (Visiting Critic)*

626b. Transportation Facilities, Systems Design, and Environment (3-0-3).
Theories and practice related to the professional urban designer's role in multidisciplinary transportation planning teams. *Staff*

627a. Housing Design Problems Theory and Principles (3-0-3).
Same as Architecture 331. *Staff*

628b. Graduate Seminar in History and Theory of Modern Movements in Architecture and Urban Design (3-0-3).
A critical review of history and specific examples of leading schools of thought in architecture and urban design from the early twentieth century to the present. *Staff*

630b. Recent Trends in Architecture (3-0-3).
Same as Architecture 442. *Mr. Papademetriou*

632b. Problem-Solving Methods in Architecture and Urban Design (3-0-3).
Advanced problem-solving seminar and case studies. Application of rational methods and tools, modeling and simulation techniques. Prerequisite: equivalent of Architecture 351. *Mr. Rowe*

637a. Advanced Computer Projects (3-0-3).
Individual projects in the application of computer technology to architectural programing, planning, and urban design; graphic display; and problem analysis. *Mr. Bavinger*

638b. Computer Applications in Architecture (3-0-3).
Individual projects in the application of computer technology to architectural programing, planning, and urban design; graphic display; and problem analysis. *Mr. Bavinger*

640b. Seminar in Recent Trends in Architecture (3-0-3).
Same as Architecture 442. *Mr. Papademetriou*

646a. Natural Environmental Factors in Community Design (3-0-3).
Same as Architecture 346. *Mr. Blackburn*

648b. Graduate Seminar on Housing Design Principles and Problems (3-0-3).
Review of international problems in housing and community development. Design criteria and processes responding to user needs and aspirations. *Staff*

651a, 652b. Planning Law and Land Development I, II (3-0-3 each semester).
Legal and economic considerations in practical land and building development; public controls, private/public sector relationships, entrepreneurial objectives, financing methods. Case studies in total development "packaging." *Mr. Mixon, Staff*

655a. Housing Programs in the United States (3-0-3).
Critical review of housing programs under government assistance as they have evolved historically; factors shaping new policies and relationships in housing delivery at national, state, and local levels. Open to students outside of architecture. *Mr. Lord*

658b. Explorations in Energy Supply and Demand (3-0-3).
Same as Architecture 458.

700a,b. Practicum (Credit variable).
Full-time internship service in approved local offices under interdisciplinary supervision. Emphasis on "real world" design, planning, or research experiences. Special tuition. May be taken in any semester or in summer. *Clinical Staff*

710c. Summer Graduate Research (Credit variable).
Independent graduate research supervised by faculty member subject to approval of student's faculty adviser and director. *Staff*

711a,b. Special Projects (Credit variable).
Independent research or design arranged in consultation with a faculty member subject to approval of the student's faculty adviser and director. *Staff*

751a,b. Graduate Research.

800b. Degree Candidate Only.

Art and Art History

Associate Professor Boterf (on leave 1982-83), *Chairman*
Professors K.T. Brown, Camfield (on leave fall 1981), **Havens, and Oliver-Smith**
Professor Emeritus O'Neil (1981-82 only)
Winningham Mellon Chair Professor R. Lewis (1981-82 only)
Associate Professor Widrig
Assistant Professors Hallam, Poulos, and de Vecsey
Visiting Assistant Professor Broker
Lecturers P.T. Brown and Huberman
Visiting Lecturers Davezac and McEvilley

Degrees Offered: B.A., B.F.A., M.A.

The Department of Art and Art History offers courses in three distinct disciplines: the history of art, studio art (painting, drawing, sculpture, etc.), and film and photography. Majors may elect to concentrate their study in any of these areas of specialization.

Undergraduate Program. A minimum of thirty-eight semester hours (twelve semester courses) is required for the full major, including at least eleven semester hours (three courses) in the history of art and nine semester hours (three courses) selected from studio, film, and photography. Double majors must take a minimum of thirty-two semester hours (ten courses), including at least three courses in both the creative arts and the history of art.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 82 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 50-51.

A reading knowledge of French, German, or Italian is strongly recommended for all majors, especially those who intend to take 300- or 400-level courses in the history of art.

Students interested in further guidance in planning the Bachelor of Arts degree with a major in art and art history should consult departmental faculty advisers.

Bachelor of Fine Arts Program. The Bachelor of Fine Arts program consists of a fifth year of intensive study in the creative arts to be taken after a student has obtained a B.A. degree in art at Rice or its equivalent at another university. Candidates possessing a B.A. degree with a major in a field other than art may in exceptional cases be admitted to the program. Special fifth-year courses are available to the B.F.A. candidate only, in addition to advanced courses normally offered by the department. Satisfactory completion of a total of thirty semester hours or the equivalent in approved major electives at the 300, 400, or 500 level is required for the B.F.A. degree.

Admission to the program is determined by the Committee on Examinations and Standing on recommendation of the Bachelor of Fine Arts Committee. For further information about application forms, deadlines, admission standards, and the like, write to the chairman of the Department of Art and Art History.

Graduate Program (beginning fall 1982). Qualified students are eligible for the graduate program leading to a degree of Master of Arts in art history with an option

in classical archaeology. Areas of concentration in art history are those in the western tradition of European and American Art.

Graduate fellowships and scholarships are awarded on the basis of scholarly achievement and available funds. Fellowships consist of a stipend and a waiver of tuition; scholarships provide only a waiver of tuition. Graduate students as part of their training may be expected to render some service as research assistants, tutorial instructors, or curatorial assistants in the Sewall Art Gallery.

Entering students must pass a reading examination in either French or German. In classical archaeology, students must pass a reading examination in one of the following languages: French, German, Italian, Greek, or Latin. Upon entrance, all students will be required to take an examination to be used as a guide in determining their programs.

Requirements for the Degree of Master of Arts:

1. Complete with high standing a minimum of thirty hours of graduate course work to include a three-hour course in art historical concepts, history, and methods of research; a nine-hour thesis in the second year; and eighteen hours of lecture, seminar, and reading courses. For students in classical archaeology, six hours must be in archaeological field experience applied to specific research in addition to the above requirements.
2. Pass satisfactorily a comprehensive examination during the first half of the second year.
3. Pass satisfactorily a reading examination in a second language early in the first semester of the second year. In classical archaeology, either the first or second language tested must be Greek or Latin.

Sewall Art Gallery

Esther de Vécsey, *Director*

Sewall Art Gallery, located on the main floor of Sewall Hall, functions principally as an extension of the teaching activities in the Department of Art and Art History. The gallery actively collects art works which are used for research, loan, and exhibitions. Four to six exhibitions are mounted during the academic year which correlate with the department's course offerings, focusing on historical and contemporary presentations of painting, sculpture, and graphic, video, and performance arts. The gallery is staffed by a professional coordinator and students, who gain experience in museum registration methods, exhibition techniques, and other aspects of museum work.

Institute for the Arts

Dominique de Menil, *Director*

The Institute for the Arts organizes exhibitions and publishes catalogs of national and international interest. It operates the Rice University Museum located at the University Boulevard and Stockton Street entrance to the campus. Exhibitions of the institute have traveled to major museums in the United States and abroad. Visits to the campus by distinguished lecturers, art historians, and creative artists are sponsored by the institute.

Educational and other services provided by the Institute for the Arts include: the art-to-schools program, a lecture series on art that is presented to school children by volunteer docents; the campus loan collection, art available for exhibition in various campus facilities; the teaching collection, art available to faculty for teaching purposes.

A large portion of the institute's function is open to the general public as well as the university community and is thus designed to enrich the cultural ambience not only of the campus but also of the city of which it is a part.

History of Art and Architecture

History of Art Courses

205a, 206b. Introduction to the History of Art (4-0-4 each semester).
A survey of painting, sculpture, and architecture from the Paleolithic period to the twentieth century. Open to all students. *Mr. Oliver-Smith, Mr. Hallam, Staff*

215a. History of the Film (3-0-3).
The silent period. Emphasis on Griffith, Chaplin, Eisenstein, and the German Expressionists. Classic films approached theoretically and technically. *Mr. McEvilley*

216b. History of the Film (3-0-3).
The sound period through the 1960s. The problem of assimilating sound and its effects. Primarily European, but some attention to Indian and Japanese films. *Mr. McEvilley*

291-296. Special Topics (3-0-3).
Courses at the introductory level or special research and reading. May be used in awarding transfer credit. Prerequisite: permission of instructor.

301, 302. Symbols in the Visual Arts (3-0-3 each semester).
Paleolithic caves, neolithic temples, Egypt, Mesopotamia, Crete, Greece, India, the Far East, Christianity, cabalism, alchemy, tarot. Numerical, geometrical, and natural symbols. Diffusion patterns. Psychological and philosophical interpretations. Not offered every year.
Mr. McEvilley

303, 304. World Mythology (3-0-3 each semester).
Primitive, Near-Eastern, Egyptian, and Greek myths. Spring semester: India, China, Japan, New World, Medieval, and Modern. Origin, diffusion, and development of myths; relation to religion, philosophy, literature, and psychoanalysis. Not offered every year.
Mr. McEvilley

305, 306. Greek Art and Archaeology (3-0-3 each semester).
Fall semester: the Bronze Age; tangible remains of Greek culture from its beginnings to the end of the Archaic period. Spring semester: development from Early Classical through Hellenistic periods. Offered 1981-82. *Mr. Oliver-Smith*

308. Roman Art and Archaeology (3-0-3).
The painting, sculpture, and architecture of ancient Rome from roots in Etruscan art through the Republican and Imperial eras to the age of Constantine. Offered spring 1982.
Mr. Oliver-Smith

309. Late Antique and Early Christian Art (3-0-3).
The adaptation of Late Antique art and architecture to Christian content in the centuries following Constantine. Offered fall 1981. *Mr. Widrig*

310. Byzantine Art (3-0-3).
Attempts to define the distinct character of the art of the Eastern Empire from the Age of Justinian to the fall of Constantinople in 1453. Not offered every year. *Mr. Widrig*

312. Early Medieval and Romanesque Art (3-0-3).
Survey of Carolingian, Ottonian, and Romanesque art and architecture, including Barbarian, Hiberno-Saxon, and Classical sources. Not offered every year. *Mr. Davezac*

316. Bronze Age Art of the Eastern Mediterranean (3-0-3).
Comparative analysis of the architecture, sculpture, and painting of the early civilizations of Egypt, Mesopotamia, the Levant, and Asia Minor. *Mr. Oliver-Smith*

319. Gothic Art (3-0-3).
A survey of European architecture, sculpture, and painting, both religious and secular, from the mid-twelfth century to the early sixteenth century. Not offered every year. *Staff*

345. Renaissance and Baroque Architecture (3-0-3).
Renaissance architecture considered as a conscious break with medieval practice; its stylistic and theoretical development, primarily in Italy, during the fifteenth, sixteenth, and seventeenth centuries. *Mr. Widrig*

346. Modern Architecture (3-0-3).
The origins of modern architecture in rival modes of the eighteenth and nineteenth centuries; the new architecture of Richardson, Sullivan, and Wright; the International Style to mid-twentieth century. *Mr. Widrig*

355. American Art: Colonial to 1900 (3-0-3).
Emphasis on painting and architecture, with some consideration of photography, sculpture, and decorative arts. Offered fall 1981. *Mr. Hallam*

356. American Art of the Twentieth Century (3-0-3).
Survey of painting, sculpture, photography, and architecture in the United States from 1900 to mid-century. Offered spring 1982. *Mr. Hallam*

400. The Classical Tradition (3-0-3).
A seminar in the origins of classicism in the architecture, sculpture, and painting of fifth-century Greece. Analysis of subsequent revivals of the late periods to the twentieth century. Prerequisite: permission of instructor. *Mr. Oliver-Smith*

415, 416. Renaissance Art (3-0-3 each semester).
A survey of European architecture, sculpture, and painting from the beginning of the fifteenth century to the late sixteenth century. Offered 1982-83. *Mrs. Brown*

417, 418. Baroque and Rococo Art (3-0-3 each semester).
Exploration of new spaces and expressive possibilities in seventeenth- and eighteenth-century art with particular attention to the achievement of major artists and architects. Offered 1981-82. *Mrs. Brown*

419. The Eighteenth Century (3-0-3).
The art and architecture of the Age of Enlightenment, including Rococo, Neoclassicism, and early Romanticism. *Mr. Hallam*

442. Recent Trends in Architecture (3-0-3).
Historic-critical presentation of modern architecture since World War II; examination of its maturity and transformation on a global scale. Prerequisite: permission of instructor. Also offered as Architecture 442. Not offered every year. *Staff*

461. Nineteenth-Century Art in Europe (3-0-3).
Major developments in painting and sculpture from late eighteenth-century Neo-Classicism and Romanticism through Realism, Impressionism, and Post-Impressionism. Brief consideration of architecture, photography, and decorative arts. Offered spring 1982. *Staff*

463. Trends in Art since the 1940s. (3-0-3).
Consideration of trends in the painting and sculpture of America and Europe from Abstract Expressionism to the present. Emphasis on American Art and criticism. Prerequisite: History of Art 475 or permission of instructor. Offered spring 1982. *Mr. Camfield*

475. Twentieth-Century Art in Europe (3-0-3).
Consideration of major developments in painting and sculpture from the 1880s to the 1940s: Impressionism and Post-Impressionism through Expressionism, Cubism, Abstraction, Dada, and Surrealism. Brief consideration of architecture and photography. Offered spring 1981. *Mr. Camfield*

480. Approaches to Art History (3-0-3).
Survey of important approaches to the study of art from antiquity to the present; theories of art; biographies of artists; connoisseurship; art history as a discipline beginning with Winckelmann. Offered fall 1982. *Mr. Davezac*

483, 484. Archaeological Field Work and Research (3-0-3).
Field work and research applied to specific archaeological problems.
Mr. Oliver-Smith, Mr. Widrig

491-496. Special Topics (3-0-3).
Advanced courses or special research and reading. May be used in awarding transfer credit. Prerequisite: permission of instructor.

497a, 498b. Senior Thesis (1-0-1 first semester; 3-0-3 second semester).
Thesis written under the direction of a member of the faculty. Limited to senior art majors. Prerequisite: permission of faculty.

500. Approaches to Art History (3-0-3).
Graduate level. See 480.

501-540. Graduate Level Courses: Seminars and Individual Research (hours to be assigned).

542. The Classical Tradition (3-0-3).
Graduate level seminar. See 400.

545a. Graduate Seminar in Renaissance and Baroque Architecture (3-0-3).
Consideration of theoretical issues involved in the development of the Renaissance-Baroque styles. Individual project assignments. Prerequisite: History of Art 345 or equivalent; may be taken concurrently. *Mr. Widrig*

546b. Graduate Seminar in Modern Architecture (3-0-3).
Consideration of special issues related to the several movements of modern architecture. Individual project assignments. Prerequisite: History of Art 346 or equivalent; may be taken concurrently. *Mr. Widrig*

583-584. Archaeological Field Work and Research (3-0-3).
Graduate level. See 483-484.

Studio Art

Arts Courses

101a. Design I (0-6-3).
Principles of two-dimensional design with a variety of problems exploring individual creative solutions using black-and-white media. Architecture 101 accepted as equivalent. *Mr. O'Neil, Staff*

102. Design I (0-6-3).
Continued study of the elements and principles of design. Three-dimensional problems are introduced. Architecture 102 accepted as equivalent. Not offered every year. *Staff*

202b. Design II (0-6-3).
A study of color: various theories with applications to specific pictorial problems. *Mr. O'Neil, Staff*

225a,b; 226b. Drawing I (0-6-3 each semester).
Introduction to the problems of drawing using various media (pencil, charcoal, pen-and-ink). Open to all students. *Staff*

291-296. Special Problems (0-6-3 each semester).
Problems at the introductory level in creative art with individual instruction and criticism. May be used in awarding transfer credit. Prerequisite: permission of instructor.

301, 302. Painting I (0-6-3 each semester).
Problems in painting, both traditional and experimental, in various opaque media. Prerequisite: Arts 225 or permission of instructor. Arts 302 not offered every year. *Staff*

311a. Printmaking I (0-6-3).
Etching in both black-and-white and in color. *Ms. Broker*

312b. Printmaking II (0-6-3).
Etching, including advanced color methods; engraving; and history of etching. *Ms. Broker*

325a, 326b. Life Drawing (0-6-3).
Drawing from the model in various media. Prerequisite: permission of instructor. *Mr. Boterf, Ms. Broker, Mr. Poulos*

365a,b; 366a,b. Sculpture I (0-6-3 each semester).
Sculpture in clay, wood, plaster, metal welding, and other sculptural media. *Staff*

413b. Lithography (0-6-3).
Stone lithography in both black-and-white and in color. *Ms. Broker*

423. Painting on Paper (0-6-3).
Watercolor, both transparent and opaque. In addition, pastel, collage, and various contemporary mixed media may be employed. Prerequisite: Drawing I or Arts 101.
Mr. O'Neil, Staff

449a, 450b, 451a, 452b, 453a, 454b. Special Problems (0-6-3 each semester).
Advanced problems in creative art with individual instruction and criticism. May be repeated for credit. May be used in awarding transfer credit. Prerequisite: permission of instructor.

465a,b; 466a,b. Sculpture II (0-6-3 each semester).
Advanced problems in various sculptural media. Prerequisite: Arts 365, 366. *Staff*

475a, 476b. Painting II (0-6-3).
Advanced problems in painting. Emphasis on independent development and participation in class critiques. Prerequisite: Painting I and permission of instructor. *Mr. Poulos*

501a,b-507a,b. Independent Study (0-6-3 each semester).
Individual work in the studio arts, film, or photography under the direction of one or more staff members. Restricted to B.F.A. degree candidates.

508a,b-514a,b. Independent Study (0-12-6 each semester).
The same as Arts 501-507 with increased credit hours.

515a,b-521a,b. Independent Study (0-18-9 each semester).
The same as Arts 501-507 with increased credit hours.

522a,b-528a,b. Independent Study (0-24-12 each semester).
The same as Arts 501-507 with increased credit hours.

Film and Photography

Arts Courses

205a, 206b. Photography I (3-3-3 each semester).
Exploration of the basic materials and processes of the photographic medium; viewing, analysis, and discussion of the medium's history and current trends. *Mr. Brown, Mr. Winningham*

291-296. Special Problems (3-3-3 each semester).
See Studio Art section for description.

305a, 306b. Photography II (3-3-3 each semester).
Advanced problems in photography. Emphasis on independent pursuit of projects submitted by the students. *Mr. Brown, Mr. Winningham*

327a,b; 328a,b. Film and Videotape Making I (1-5-3 each semester).
A study of the expressive possibilities of the media. Synchronous sound, using super-eight millimeter film. Also offered as Sociology 327, 328 and Anthropology 327, 328.
Mr. Huberman

329a. Film Form I (3-0-3 each semester).
Viewing, analysis, and discussion of modern and classic films. Also offered as English 329.
Mr. Huberman

345a, 346b. Color Photography (3-3-3 each semester).
Fundamental techniques of color photography, including special problems in color camera work, color negative and transparency processing, and color printing. Prerequisite: Arts 205, 206. *Mr. Winningham*

427a, 428b. Film and Videotape Making II (1-5-3 each semester).
One major film project by each student. Production planning and use of professional techniques, employing sixteen millimeter film and synchronous sound. Prerequisite: Arts 327, 328. *Mr. Huberman*

432b. Film Genre: The Western (3-0-3).
The essential American film experience spanning all the years of U.S. cinema. Focusing on the Western, the course concerns itself with questions regarding what creates a genre.
Mr. Huberman

449a, 450b, 451a, 452b, 453a, 454b. Special Problems (3-3-3 each semester).
See Studio Art section for description.

501a,b-528a,b. Independent Study.
See Studio Art section for description.

Theater

The Rice Players is an extracurricular group that presents a wide range of theatrical performances under the direction of Neil Havens. In recent years, these have included Shakespeare's *A Midsummer Night's Dream,* outstanding contemporary plays such as Edward Albee's *Seascape* and Landford Wilson's *The Mound Builders* and *5th of July,* and Brecht's *The Caucasian Chalk Circle.* Participation is open to any Rice student or member of the faculty and staff.

Theater Courses

227-229. Special Problems (3-0-3 each semester).
Topics in theater production, history, or literature tailored to the individual student. Prerequisite: permission of instructor. *Mr. Havens*

301a. Acting I (4-0-3).
Development of the actor's technique through exercises in body work, concentration, creative imagination, sensory perception, and improvisation. *Mr. Lewis, Mr. Havens*

302b. Acting II (4-0-3).
Script analysis, characterization, work on acting roles. *Mr. Lewis, Mr. Havens*

430-432. Special Problems (3-0-3 each semester).
Advanced topics in theater production, history, or literature. Prerequisite: permission of instructor. *Mr. Havens*

Biochemistry

Professor Schroepfer, *Chairman*
Professors Awapara, Palmer, Quiocho, and J.B. Walker
Associate Professors Matthews, J.S. Olson, and Rudolph
Assistant Professors Beckingham, Bennett, and Berget
Lecturers R.H. White and Brabson

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. Undergraduate biochemistry majors must complete the following courses:

First-year level: Mathematics 101, 102 or 121, 122; Chemistry 101, 102, 107; Physics 101, 102 or 111, 112; Physics 132.
Second-year level: Mathematics 211, 212; Chemistry 211, 212, 213, 214; and any advanced physics or mathematics course or Mathematical Sciences 220 or 223 or Engineering 240.
Advanced level: Biochemistry 361, 365, and 367; Chemistry 311, 312; at least nine semester hours (three courses) at the advanced level in biochemistry, biology, or chemistry in addition to those specified.

An undergraduate major in biochemistry must have forty-eight semester hours (fourteen courses) in courses numbered 300 or higher to obtain a Bachelor of Arts degree.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 129 semester hours. See Degree Requirements and Majors, pages 50-51.

Undergraduate majors in biochemistry are encouraged but not required to pursue independent supervised research in Biochemistry 401. Concurrent registration in Biochemistry 411 is required. In addition, undergraduate majors in biochemistry are strongly encouraged, but not required, to enroll in Chemistry 401, 402 and Biochemistry 460. Undergraduates wishing to enroll in graduate courses in biochemistry normally require permission of the instructor.

Graduate Program. Graduate study in biochemistry leading to the M.A. or Ph.D. degrees is open to qualified students holding a bachelor's degree or the equivalent. Admission to the graduate program is based on previous academic performance, recommendations, and performance on the Graduate Record Examination. Entering students are expected to have very strong backgrounds in one or more of the following: chemistry, biochemistry, or biology. Candidates for advanced degrees must meet the general university requirements (see pages 90-92) and specific departmental requirements determined in consultation with an adviser. For further information, interested applicants should contact the departmental chairman.

Biochemistry Courses

101b. Nutritional Biochemistry for Nonscience Majors (3-0-3).
Biochemical concepts underlying the science of nutrition and related subjects: food composition, calories and energy needs, needs for special nutrients, nutritional deficiencies, current nutritional topics. No previous chemistry courses required. *Mr. Awapara*

200c, 201a, 202b. Special Topics in Biochemistry for Undergraduates (0-TBA-2 each semester).
Independent program of study and research under direction of faculty member. Requires permission of supervising faculty member and the departmental chairman. *Staff*

361a. General Biochemistry (6-0-6).
The chemistry, biological functions, and metabolism of molecules in living cells. Topics include enzymic catalysis, metabolic control, and energy production and utilization. Prerequisite: Chemistry 211, 212. *Ms. Matthews, Mr. Olson*

365a,b. Experimental Biochemistry (Lecture) (3-0-3).
A lecture course on modern techniques of biochemical investigation. Prerequisite: Biochemistry 361. *Staff*

367a,b. Experimental Biochemistry (Laboratory) (0-9-3).
Modern techniques of biochemical investigation: chemistry of lipids, carbohydrates, nucleic acids; separation techniques; spectroscopy; measurement and safe handling of radioisotopes; enzyme purification and methods of kinetic analysis. Prerequisite or corequisite: Biochemistry 365. *Staff*

400c, 401a, 402b. Undergraduate Research in Biochemistry (0-15-5 each semester).
Open only to undergraduate majors with the permission of the research supervisor and the chairman. Prerequisite: Biochemistry 361, 365, 367, and enrollment in Biochemistry 411. *Staff*

410c. Undergraduate Research Seminar in Biochemistry (3-0-3). *Staff*

411a, 412b. Undergraduate Research Seminar in Biochemistry (3-0-3 each semester).
Discussion of current research in area under investigation. Prerequisite: enrollment in Biochemistry 401. *Staff*

460b. Advanced Biochemistry (3-0-3).
The structure and metabolism of macromolecules, advanced intermediary metabolism, reaction mechanisms, regulation (including hormonal control of metabolism), and enzyme kinetics. Prerequisite: Biochemistry 361. *Mr. Walker*

501a. General Biochemistry for Graduate Students (6-0-6).
Chemical nature of molecules in living cells and their biological functions; biosynthesis and degradation; mechanisms and stereochemistry of enzymic catalysis; metabolic control, energy production, and utilization. Prerequisite: graduate status, one year of organic chemistry.
Ms. Matthews, Mr. Olson

515a,b. Experimental Biochemistry (Lecture) (3-0-3 each semester).
An intensive lecture course dealing with modern techniques of biochemical investigation. Prerequisite: graduate status and completion of enrollment in Biochemistry 501 or equivalent.
Staff

517a,b. Experimental Biochemistry (Laboratory) (0-9-3 each semester).
Modern techniques of biochemical investigation: chemistry of lipids, carbohydrates, nucleic acids; separation techniques; spectroscopy; measurement and safe handling of radioisotopes; enzyme purification and methods of kinetic analysis. Prerequisite: graduate status and enrollment in Biochemistry 515 or equivalent. *Staff*

560b. Advanced Biochemistry (3-0-3).
Same as Biochemistry 460. Prerequisite: 361 or equivalent and graduate status.
Mr. Walker

566b. Advanced Experimental Biochemistry (3-0-3).
The biochemical application of spectroscopic (including ORD-CD, ESR, NMR, and mass spectroscopy) and other physical approaches (including ultracentrifugation and x-ray crystallography). *Staff*

568b. Advanced Experimental Biochemistry (Laboratory) (0-9-3). *Staff*

571a, 572b. Special Topics in Biochemistry (3-0-3 each semester).
Subject to be announced. *Staff*

575a. Introduction to Research (0-3-1).
A rotation of first-year graduate students through the research laboratories of individual faculty members. *Staff*

581a, 582b. Graduate Seminar in Biochemistry (2-0-2).
A discussion of selected biochemical topics. *Mr. Schroepfer*

601a, 602b. Graduate Research in Biochemistry (Credit variable).

610c, 611a, 612b. Biochemistry Research Seminar (3-0-3).
Discussion of current research in area under investigation. Prerequisite: enrollment in Biochemistry 601. *Staff*

621a, 622b. Biochemistry Department Thesis Seminar (1-0-1 each semester).

Biology

Professor Sass, *Chairman*
Professors Campbell, F.M. Fisher, Glantz, Philpott, C.R. Stewart, Storck, Subtelny, and C.H. Ward
Associate Professor Harcombe
Assistant Professors J.P. Martin, Procunier, and Strassmann
Adjunct Associate Professor Schroder
Instructor Hsu

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. Biology majors are required to take eight semester hours in introductory mathematics (Mathematics 101, 102 or equivalent), seven semester hours of introductory physics (Physics 101, 102 and 132; or 111, 112 and 132; or 121, 122 and 123 or 124), eight semester hours of introductory chemistry (Chemistry 101, 102 and 107), eight semester hours of organic chemistry (Chemistry 211, 212 and 213, 214), six semester hours of general biochemistry (Biochemistry 361), and the following courses in biology: Biology 201, 202, 322, 360, 381, plus two advanced electives to total a minimum of twenty-one hours. In addition, Biology Laboratories 203 and 384 are required. Biology 401, 402 may be used to satisfy one of the advanced biology electives. Students interested in ecology or evolutionary biology should contact the chairman for alternative curriculum requirements.

Undergraduate Double Major. Double majors including biology must comply with the above requirements except that one biology course may be deleted.

Major Following Early Admission to Medical School. A major in biology is normally approved for students entering medical school at the end of their junior year provided they have satisfied the requirements for the double major described above. These requirements may be completed following matriculation in medical school only by enrollment in courses offered by the department. They may not be satisfied by transfer credit for preclinical courses taken in medical school.

Graduate Program. The graduate program is open to qualified applicants who hold a bachelor's degree or equivalent. Prospective graduate students must take the Graduate Record Examination, including the advanced examination in biology. The entering graduate student generally is expected to have a strong background in one of the several areas of biology; in addition, completion of courses in physics (one year), mathematics (including calculus), chemistry (including organic), and biochemistry is required. The above requirements do not preclude admission of qualified applicants who have majored in areas other than biology. Any deficiencies should be made up no later than the first year of residence in graduate study, including the first summer. It is strongly recommended that deficiencies be made up during the summer preceding the first semester of residence. A preliminary examination is administered during the first year. Students entering with the master's degree are normally exempt from this examination.

Requirements for the Degree of Doctor of Philosophy. In addition to the general university requirements for advanced degrees (pages 90-92), the following departmental requirements must also be met:

1. Three or more years of graduate study with at least two years in residence at Rice
2. An original investigation worthy of publication in a scientific journal and a doctoral thesis as described in the *General Announcements*
3. A grade average of "2" or better in courses taken in the department and satisfactory grades in courses taken outside the department
4. Satisfactory performance in Biology 503 for at least four semesters
5. Satisfactory performance on a candidacy examination administered by the advisory committee; this examination may be oral and/or written
6. Public defense of the thesis
7. Presentation of a departmental seminar on the candidate's research

Requirements for the Degree of Master of Arts. The degree of Master of Arts may be obtained after the completion of thirty semester hours of graduate study, six hours of which must be earned by the completion and public defense of a thesis embodying the results of an original investigation.

Assistantships. A limited number of graduate fellowships are available on a competitive basis. All graduate students in biology are expected to engage in laboratory instruction for at least two years, regardless of appointment.

Biology Courses

201a. Organismal Biology (3-0-3).
Study of the basic principles of biology through analysis of form and function in animals. *Staff*

202b. Developmental Biology (3-0-3).
Analysis of processes and principles in development of organisms with emphasis on experimental embryology. *Staff*

203a. Laboratory in Experimental Biology (1-3-2).
Experimental approaches to the functional morphology of biological systems. *Staff*

311a. Animal Behavior and Evolution (3-0-3).
Evolutionary theory is used to evaluate behavior adaptations of organisms to their environment. *Ms. Strassmann*

322a. General Physiology (3-0-3).
Basic principles and mechanisms of animal physiology. Special emphasis on cellular and subcellular processes. Prerequisite: biochemistry, physics, and calculus. *Staff*

341a. Ecosystem Biology (3-0-3).
Analysis of species interactions, plant and animal community organization, and ecosystem function. Not offered every year. *Mr. Harcombe*

343a. Laboratory in Ecosystem (1-3-2).
Field studies of natural ecosystems. Saturday field trips required. Corequisite: Biology 341. Not offered every year. *Mr. Harcombe*

350b. Plant Biology (3-0-3).
Analysis of the physiology, morphology, and evolution of plants in terms of adaptation to environment. Not offered every year. *Mr. Harcombe, Mr. Ward*

352b. Laboratory in Plant Biology (1-3-2).
Field and laboratory studies of plant adaptation to environment. Corequisite: Biology 350 or permission of instructor. Limited to twenty students. Not offered every year.
Mr. Harcombe, Mr. Ward

360b. Genetics (3-0-4).
Analysis of the structure, function, and transmission of genetic material. Biochemistry 361 recommended. *Staff*

362b. Laboratory in Genetics (1-3-2).
Corequisite: Biology 360 or permission of instructor. *Mr. Stewart*

381b. Cell Biology (3-0-3).
The morphology and function of cell components; cells and tissues as revealed by light and electron microscope and associated histo- and cytochemical methods. Corequisite: Biochemistry 361 or permission of instructor. *Staff*

384b. Laboratory in Advanced Experimental Biology (1-6-3).
Identification and characterization of cells and subcellular components including macromolecules. Corequisite: cell biology and general physiology. *Staff*

401a,b,c. Undergraduate Honors Research Laboratory (Credit variable).
Normally limited to senior biology majors with superior academic records. Permission of supervision professor and departmental chairman required. Enrollment in Biology 405 also required. *Staff*

403a,b. Special Topics in Biology (Credit variable).
Used for transfer credit and other special circumstances. Permission of departmental undergraduate affairs committee required. *Staff*

405a,b. Undergraduate Research Seminar in Biology (1-0-1).
Discussion of contemporary research areas in the biological sciences. Required for those students enrolled in Biology 401. *Staff*

418b. Biological Oceanography (3-3-4).
Study of the biological aspects of oceanography, emphasizing planktonic, nektonic, and benthonic organisms. Prerequisite: permission of instructor. Not offered every year.
Mr. Casey, Mr. Fisher

420b. Neurobiology (3-0-3).
Mechanisms involved in the development, maintenance, and function of nervous systems of simple and complex organisms. Prerequisite: Biology 322 or permission of instructor. Enrollment limited to twenty students. Not offered every year. *Staff*

423a. Comparative Biochemistry (3-0-3).
Diversity of biochemistry with emphasis on animal metabolism; molecular basis of biological evolution. Prerequisite: Biochemistry 361. *Mr. Campbell*

471a. Microbiology (3-0-3).
Anatomy, physiology, and molecular biology of microbial procaryotes, microbial eucaryotes, and viruses. *Mr. Storck*

473a. Laboratory in Microbiology (1-3-2).
Methods of isolation, identification, and numeration of bacteria. Corequisite: Biology 471. Enrollment limited to twenty-four students. *Mr. Storck*

501a,b. Seminar in Biology (1-0-1).
General departmental seminar. Required of all graduate students. *Staff*

503a,b. Teaching in Biology (3-0-3).
Supervised instruction in teaching the various areas of biology. Prerequisite: graduate standing in biology. *Staff*

511a. Physiology of Parasitism (3-0-3).
Conferences and student reports on the physiology of parasites and the functional relationships of hosts and parasites; growth, metabolism, nutrition, and physiological evolution of parasites. Not offered every year. *Mr. Fisher*

522b. Biophysical Chemistry (3-0-3).
Physical chemistry applied to problems in the biological sciences: solutions of macromolecules, ionic processes, interfacial phenomena, transport systems, and molecular models of biochemical and physiological processes. Not offered every year. *Mr. Sass*

524b. Advanced Comparative Biochemistry (3-0-3).
Seminar on current literature in comparative animal biochemistry. Prerequisite: graduate standing and Biochemistry 361 or equivalent. *Mr. Campbell*

525a. Concepts of Nervous Systems Functions (3-0-3).
Vertebrate and comparative neurophysiology. Prerequisite: Biology 322 or equivalent and permission of instructor. Understanding of cell physiology is assumed. Limited to fifteen students. *Mr. Glantz*

533a,b. Special Projects in Developmental Biology (0-6-2).
Laboratory training in experimental manipulations on developing embryos; individual research projects. *Mr. Subtelny*

534b. Advanced Developmental Biology (3-0-3).
Student seminars on current research literature. *Mr. Subtelny*

543b. Marshland and Estuarine Biology (3-3-4).
Student reports, conferences, and field work on the physical composition and biota of nearby coastal environments. Field trips on weekends. Prerequisite: permission of instructor. Not offered every year. *Mr. Fisher*

547a,b. Topics in Ecosystem Biology (3-0-3).
Discussions, seminars, and projects concerning organization, structure, and function of ecosystems. Prerequisite: permission of instructor. *Mr. Harcombe*

533a,b. Topics in Plant Biology (3-0-3).
Seminar on current literature and research in plant biology. Prerequisite: permission of instructor. Not offered every year. *Mr. Ward*

569a. Topics in Molecular Genetics (3-0-3).
Student seminars analyzing recent research on a subject of current interest in microbial genetics and molecular biology. Prerequisite: permission of instructor. *Mr. Stewart*

571a,b. Topics in Microbiology (3-0-3).
Discussion of research literature. Prerequisite: permission of instructor. *Mr. Storck*

580b. Cell Biology (2-6-4).
Study of cells and cell phenomena and interpretation of observations. Advanced laboratory and seminar. Prerequisite: Biology 381 and Biochemistry 361 or equivalent and permission of instructor. *Mr. Philpott*

582b. Topics in Cell Biology (3-0-3).
Prerequisite: Biology 381 and Biochemistry 361 or permission of instructor.
Mr. Philpott

601a,b. Graduate Research (Credit variable).
Independent research open to first-year graduate students.

701a,b. Thesis Research (Credit variable).

800b. Degree Candidate Only.

Chemistry

Professor E.S. Lewis, *Chairman*
Professors Berry, Billups, Brooks, Curl, Engel, Hackerman, Kilpatrick, Margrave, Sass, Schroepfer, and Smalley
Adjunct Professor Cargill
Associate Professors Glass, Mukamel, Parry, and L.J. Wilson
Assistant Professors Fukuyama, Sosinsky, Stanbury, and Weisman

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. Undergraduates electing chemistry as a major are expected to take the following courses in their first year: Mathematics 101, 102 (or equivalent honors courses); Physics 101, 102, 132; Chemistry 101, 102, 107. In general, they take Chemistry 211, 212 and 213, 214; Physics 201, 202; and Mathematics 211, 212 in the sophomore year. The department further requires satisfactory completion of the following courses:

Junior and Senior Years
Chemistry 311, 312 and 313, 314
Chemistry 401 and 403
Chemistry 430
Chemistry 460 or 495
Two additional courses in advanced chemistry, physics, mathematics, mathematical sciences, or biochemistry. Superior students may substitute undergraduate research (Chemistry 491, 492) for one or two semesters of classroom instruction.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 133 semester hours. See Degree Requirements and Majors, pages 50-51.

American Chemical Society Certification. The Rice chemistry department is on the approved list of the Committee on Professional Training of the American Chemical Society and as such can certify that graduates have met the appropriate standards. For certification, two additional advanced courses are required and a foreign language, preferably German, is recommended.

Accelerated Ph.D. Plan. Because of the high level of training provided in the Rice B.A. program, it is possible for certain especially qualified undergraduate

students to be admitted to an accelerated program that normally leads to the Ph.D. degree about two years after completion of the B.A. program. In order to complete the work in this time, the student initiates research during the summer following the junior year and continues research by taking Chemistry 491, 492 during the senior year. The student may start taking cumulative examinations during the senior year and should be able to complete all courses and examinations before the end of the second year after the B.A. The student should in most cases, if not all, be able to complete the thesis in this time as well.

Interdepartmental Majors. An interdepartmental major in chemical physics is offered jointly with the physics department. Advice about this program should be obtained from both departments. Double majors with several other departments, such as biochemistry, materials science, physics, and mathematics have also been used since the programs have many required courses in common.

Graduate Program. Students who have completed work equivalent to that required for the bachelor's degree in chemistry offered at Rice University may be admitted to graduate standing. Preference is normally given to applicants who earn high scores on the Graduate Record Examination, including the advanced test in chemistry (see page 95). A minimum of one year of graduate study is required for the degree of Master of Arts and at least two years for the degree of Doctor of Philosophy. A nominal amount of undergraduate teaching is normally considered an integral part of the graduate program.

Candidates for the degree of Master of Arts are required to complete six one-semester courses; present in a thesis the results of a program of research approved by the department; and pass a final oral examination.

Candidates for the degree of Doctor of Philosophy must complete for publication a thesis which represents a distinctly original and significant contribution to the field of chemistry. Candidates must further have acquired through course work and independent study a broad fundamental knowledge of chemistry in addition to those areas of the subject encompassed by their own research interests. Cumulative examinations for the Ph.D. degree are given periodically, and a final oral examination on the thesis is required for all candidates.

Chemistry Courses

101a, 102b. Introductory and Analytical Chemistry (3-0-3 each semester).
The basic phenomena and principles of chemistry. Normally taken with Chemistry 107; the three courses (or equivalent) are prerequisite to advanced courses in chemistry. Prerequisite: high school chemistry. *Mr. Glass, Mr. Smalley*

106b. Honors Laboratory (0-4-1).
Independent projects in synthesis and characterization of compounds; experiments related to environmental chemistry. Prerequisite: Chemistry 101, 107, and permission of instructor. *Mr. Sosinsky*

107a,b. Introductory and Analytical Chemistry Laboratory (1-4-2).
Volumetric, gravimetric, and instrumental methods of inorganic quantitative analysis. Normally taken with Chemistry 101, 102; the three courses (or equivalent) are prerequisite for advanced courses in chemistry. *Mr. Stanbury, Mr. Weisman*

211a, 212b. Organic Chemistry (3-0-3 each semester).
Aliphatic and aromatic organic chemistry with emphasis on structure, bonding, and reaction mechanisms. Second semester: greater emphasis on the chemistry of various functional groups. Normally accompanied by Chemistry 213, 214. Prerequisite: Chemistry 101, 102. Chemistry 212 must be preceded by Chemistry 211. *Mr. Lewis, Mr. Parry*

213a, 214b. Organic Chemistry Laboratory (0-4-1 each semester).
Synthesis, purification, and characterization of organic compounds. Experiments related to topics covered in Chemistry 211, 212. Second semester includes identification of unknown organic compounds. Corequisite or prerequisite: Chemistry 107 and 211, 212. *Staff*

311a, 312b. Physical Chemistry (3-0-3 each semester).
First semester: principles of thermodynamics, including topics of equilibria, theory of solutions, and electrochemistry. Second semester: kinetic theory of gases, kinetics, transport properties, photochemistry, the solid and liquid states, surfaces, and polymers. Prerequisite: Mathematics 211, 212; Physics 101, 102 (Physics 201, 202 or 211, 212 recommended); Chemistry 101, 102. *Mr. Curl, Mr. Weisman*

313a. Experimental Physical Chemistry (1-4-2).
Experiments illustrating techniques employed in high vacuum, optical spectroscopy, calorimetry, electrochemistry, and surface area measurements. *Mr. Brooks*

314b. Advanced Instrumental Laboratory (0-8-2).
Principles and application of modern instrumental methods to inorganic and physical chemistry. Prerequisite: Chemistry 311 and 313. *Mr. Wilson*

401a. Advanced Organic Chemistry (3-0-3).
The course develops, in detail, the concepts of modern organic chemistry. A major portion is devoted to reactions of synthetic importance. Prerequisite: Chemistry 211, 212.
Mr. Billups

403a. Advanced Organic Laboratory (1-8-2).
Covers the techniques of modern organic chemistry. Designed to accompany Chemistry 401. Prerequisite: Chemistry 211, 212. *Mr. Fukuyama*

411a,b. Spectral Methods in Organic Chemistry (3-0-3).
Elucidation of organic structures by physical techniques. Interpretation of infrared, ultraviolet, nuclear magnetic resonance, and mass spectra. Prerequisite: Chemistry 401. Not offered both semesters. *Mr. Parry*

415a. Chemical Kinetics (3-0-3).
Measurement of reaction rates, phenomenological and theoretical treatment of kinetics of simple and chain reactions. Prerequisite: Chemistry 311, 312. *Mr. Brooks*

420b. Statistical Thermodynamics (3-0-3).
A development of the equilibrium theory of statistical mechanics. Applications to imperfect gas theory and the calculation of thermodynamic properties of molecules. Prerequisite: Chemistry 311, 312, 430; Mathematics 211, 212; Physics 201, 202 or 211, 212.
Mr. Mukamel

430a. Quantum Chemistry (3-0-3).
Quantum mechanics, atomic structure, the nature of the chemical bond, and statistical mechanics. Prerequisite: Mathematics 211, 212; Physics 101, 102 and 201, 202 or 211, 212; Chemistry 311. *Mr. Mukamel*

445a,b. Physical-Organic Chemistry (3-0-3).
Organic reaction mechanisms; substituent and medium effects, linear free energy relations and acidity functions. Prerequisite: Chemistry 311, 312 and 401. Chemistry 401 may be corequisite. Not offered both semesters. *Mr. Engel*

460b. Inorganic Chemistry (3-0-3).
Atomic and molecular structures; bonding in covalent, ionic, and electron deficient systems; thermochemical principles and experimental techniques for analysis, structure determination, and synthesis. *Mr. Sosinsky*

471b. Molecular Spectroscopy (3-0-3).
The spectra of simple molecules, including microwave, infrared, visible, ultraviolet, and Raman spectra; introductory aspects of molecular symmetry and group theory; resonance spectroscopy. Prerequisite: Chemistry 430 or equivalent. *Mr. Curl*

491a, 492b, 493c. Special Study and Research for Undergraduates
(Credit variable).
Open only to chemistry majors with superior records and with the permission of the chairman. Written report required. *Staff*

495a. Transition Metal Chemistry (3-0-3).
Mechanisms of inorganic reactions, group theory applications to chemistry, ligand field theory, and coordination chemistry. Prerequisite: Chemistry 311, 312. *Mr. Wilson*

501a, 502b; 503a, 504b; 505a, 506b; 507a, 508b. Graduate Research (Credit variable). *Staff*

521a. Chemical Thermodynamics (3-0-3).
An intensive review of thermodynamics designed primarily for first-year graduate students. Prerequisite: Chemistry 311, 312. *Mr. Kilpatrick*

541, 542, 543, 544, 545, 546, 547, 548. Special Topics in Organic Chemistry (3-0-3).
A variety of courses in advanced organic chemistry. Recent subjects have included natural products, photochemistry and photophysics of organic molecules, organic chemistry of nonmetals, biosynthesis. Offered irregularly and on demand. *Staff*

561a, 562b. Advanced Organic Chemistry (3-0-3 each semester).
Organic reaction mechanisms, modern structure theory, and synthetically important reactions; designed primarily for first-year graduate students. *Mr. Billups, Mr. Fukuyama*

590, 591, 592. Special Topics in Physical and Theoretical Chemistry (3-0-3).
Offered irregularly and on demand. *Staff*

595. Special Topics in Organometallic Chemistry (3-0-3).
Topics in homogenous catalysis with particular emphasis on the role of ion specificity in synthesis. Not offered every year. *Staff*

596a. Special Topics in Inorganic Chemistry (3-0-3).
Physical techniques used in modern transition metal chemistry, including magneto-chemistry, electrochemistry, and esr, pmr, photoelectron, and Mossbauer spectroscopy. Not offered every year. *Mr. Stanbury*

597, 598, 599. Special Topics in Inorganic Chemistry (3-0-3).
A variety of courses in advanced inorganic chemistry. Recent subjects have included fluorine chemistry, boron chemistry, radiochemistry, and advanced descriptive inorganic chemistry. Offered irregularly and on demand. *Staff*

611a. High Temperature and High Pressure Chemistry (3-0-3).
The techniques for generation and measurement of high temperatures and high pressures and of the nature of phenomena under extreme conditions. *Mr. Margrave*

651a. Quantum Mechanics (3-0-3).
A development of the elements and techniques of quantum mechanics. Prerequisite: Mathematics 211, 212. *Mr. Kilpatrick*

652b. Quantum Mechanics (3-0-3).
Application of quantum mechanics to atomic and molecular systems. *Mr. Kilpatrick*

700c. Summer Graduate Research.

800b. Degree Candidate Only.

Classics (see Spanish, Portuguese, and Classics)

Computer Science

Professor Jump, *Chairman*
Professor Kennedy
Associate Professor Cartwright
Assistant Professors Hirschberg and Sinclair
Instructor Pearlman

Degree Offered: B.A.

The program in computer science is administered by a committee of faculty members in computer science who have appointments in various departments — primarily electrical engineering and mathematical sciences. For 1981-83, Professor Jump is the committee chairman.

Undergraduate Program. Each student plans, with the aid of an adviser, an individual program that meets university distribution requirements and the computer science major requirements listed below. Under certain circumstances, modifications of the major requirements may be approved in individual cases. In addition, a student majoring in electrical engineering or in mathematical sciences may elect computer science as an area of emphasis and may develop a program within these majors that has as many of the features of the computer science major as desired. Joint majors in computer science and the sponsoring departments are common.

The following courses are required for the Bachelor of Arts degree with a major in computer science:

1. Mathematics and Physics (nine courses; thirty-two hours)
Elementary Analysis: Mathematics 101, 102 or honors equivalents
Introductory Physics: Physics 101, 102, 132
Differential Equations: Mathematics 211
Multivariable Calculus: Mathematics 212
Linear Algebra: Mathematical Sciences 310 or Mathematics 355
Discrete Structures: Computer Science 316
Probability: Mathematical Sciences 381

2. Basic Computer Science (four courses; sixteen hours)
Introduction: Computer Science 220
Computer Organization and Software: Computer Science 320
Advanced Programing: Computer Science 321
Digital Logic Design: Computer Science 326

3. Advanced Computer Science (three courses; eleven to twelve hours)
Three courses chosen from the following list:
Automata and Formal Languages: Computer Science 416
Algorithms and Data Structures: Computer Science 420
Systems Programing: Computer Science 421
Computer Systems: Computer Science 425
Digital Systems Design: Computer Science 426

4. Electives (two courses; six to eight hours)
Two approved courses taken for major credit usually provide a concentration in some area of computer use.

Graduate Program. Both the Department of Electrical Engineering and the Department of Mathematical Sciences offer graduate programs with research in computer science. These programs are often interdisciplinary in character. The computer science faculty works cooperatively in administering the computer science graduate programs in the two departments. Each graduate student is assigned, for administrative purposes, to one of these two departments. The assignment is based on student background, interest, and preference.

To obtain information or to make application for admission, prospective graduate students may write the chairman of either department or the chairman of the Committee for Computer Science, Rice University, Post Office Box 1892, Houston, Texas 77001.

Computer Science Courses

220a,b. Introduction to Computer Science and Engineering (3-3-4).
Introduction to programing for students in computer science and engineering. Also offered as Electrical Engineering 220 and Mathematical Sciences 220.

222a,b. Introduction to Business Data Processing (3-3-4).
A semi-self-paced introduction to programing in PL/I with emphasis on business applications and problems. Also offered as Mathematical Sciences 222.

223a,b. Introduction to Computing (3-3-4).
A semi-self-paced introduction to the computer solution of equations using APL and FORTRAN. Also offered as Electrical Engineering 223 and Mathematical Sciences 223.

226a,b. Digital Computing in APL (1-1-1).
A semi-self-paced introduction to the solution of simple science and engineering problems using APL. Also offered as Engineering 226.

316a. Introduction to Discrete Structures (3-0-3).
Set theory, relations, mappings; algebraic systems such as semigroups, groups, rings, and fields; graph theory, Boolean algebra, and propositional logic. Also offered as Electrical Engineering 316 and Mathematical Sciences 316.

320a,b. Computer Organization and Software (3-3-4).
Basic computer architecture and assembly language programing. System software, including loaders and assemblers. Input-output devices and programing. Prerequisite: Computer Science 220. Also offered as Electrical Engineering 320 and Mathematical Sciences 320.

321a,b. Advanced Programing (3-3-4).
Advanced programing methods, including structured programing, team programing, data structures, searching and sorting, data management, and information retrieval. Prerequisite: Computer Science 220. Also offered as Electrical Engineering 321 and Mathematical Sciences 321.

322a. Introduction to Management Information Systems (3-0-3).
Basic concepts for development and implementation of computer based management systems. Field assignments in local industry. Prerequisite: Computer Science 222. Also offered as Mathematical Sciences 322.

326a,b. Digital Logic Design (3-3-4).
Gates, flip-flops, combinational and sequential switching circuits, registers, data transfer circuits, and logical and arithmetic operators. Prerequisite: Computer Science 220. Also offered as Electrical Engineering 326.

416b. Automata and Formal Languages (3-0-3).
Finite automata, regular expressions, regular languages, pushdown automata, context-free languages. Turing machines, recursive languages, computability, and solvability. Prerequisite: Computer Science 316. Also offered as Electrical Engineering 416, Mathematical Sciences 416, and Linguistics 416.

420b. Algorithms and Data Structures (3-3-4).
Design and analysis of computer algorithms. Models of computation, data structures, and efficiency considerations. Prerequisite: Computer Science 316, 321. Also offered as Electrical Engineering 420 and Mathematical Sciences 420.

421a. Systems Programing (3-3-4).
Introduction to the design and construction of important software systems programs, including assemblers, compilers, and operating systems. Introduction to concurrent programming. Prerequisite: Computer Science 316, 320, 321. Also offered as Electrical Engineering 421 and Mathematical Sciences 421.

425b. Computer Systems (3-3-4).
Memory utilization, storage management, addressing, control, and input-output. Microprograming. Computer networks. Comparison of solutions to computer system design problems. Prerequisite: Computer Science 320, Mathematical Sciences 381. Also offered as Electrical Engineering 425.

426b. Digital System Design (3-3-4).
Digital system organization, microprogramed control units, bus architectures, microprocessors, memory organizations, and high speed arithmetic. Prerequisite: Computer Science 320, 326. Also offered as Electrical Engineering 426.

490a,b. Computer Science Projects (Credit variable).
Theoretical and experimental investigations under staff direction.

518a. Analysis Techniques for Combinatorial Algorithms (3-0-3).
Analysis of problem complexity; matrix multiplication, primality testing, string matching, NP-complete problems, approximation algorithms, lower bound techniques. Outside readings and term project. Prerequisite: Computer Science 416, 420. Also offered as Electrical Engineering 518 and Mathematical Sciences 518.

520a. Operating Systems (3-3-4).
Operating systems as a resource manager; memory management, including allocation, virtual memory, and sharing; scheduling; concurrent processes, including process synchronization and communication and deadlocks; protection and file systems. Prerequisite: Computer Science 420, 421, 425, Mathematical Sciences 381. Also offered as Electrical Engineering 520 and Mathematical Sciences 520.

521b. Artificial Intelligence (3-3-4).
Techniques for simulating intelligent behavior by machine; problem solving, game playing, pattern perceiving, theorem proving, semantic information processing, and automatic programing. Prerequisite: Computer Science 420, Mathematical Sciences 381. Also offered as Electrical Engineering 521, Mathematical Sciences 521, and Linguistics 521.

523b. Compiler Construction (3-3-4).
Advanced topics in the design of programing language compilers, including parsing, run-time storage management, code generation and optimization, and error recovery. Prerequisite: Computer Science 416, 421. Also offered as Electrical Engineering 523 and Mathematical Sciences 523.

525b. Advanced Computer Organization (3-0-3).
Advanced concepts in computer systems organization and computer architecture. Prerequisite: Computer Science 425. Also offered as Electrical Engineering 525.

528a. Digital System Projects (1-6-3).
Design projects involving the specification design, construction, and testing of microprocessor based digital systems. Prerequisite: Computer Science 426. Also offered as Electrical Engineering 528.

590a,b. Computer Science Projects (Credit variable).
Theoretical and experimental investigations under staff direction.

621b. Principles of Programing Languages (3-0-3).
The logical design and efficient implementation of programing languages. Prerequisite: Computer Science 321, 416, 420. Also offered as Electrical Engineering 621 and Mathematical Sciences 621.

623. Advanced Compiler Construction (3-0-3).
Advanced topics in construction of programing language translators. Prerequisite: Computer Science 523. Also offered as Electrical Engineering 623 and Mathematical Sciences 623.

Economics

Professor G.W. Smith, *Chairman*
Professors Huddle, Mieszkowski, Rimlinger, Soligo, and Young
Associate Professor K.J. White
Adjunct Associate Professors Lairson and Swint
Visiting Associate Professor J.F. Stewart
Assistant Professors Blanco, Cooke, and Zodrow

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. Undergraduate majors are required to take a minimum of nine courses totaling twenty-seven semester hours in economics, including:

1. Economics 211 and 212
2. Economics 370 or 372
3. Economics 375
4. At least three of the following: Economics 301, 355*, 415, 416, 417, 420, 430, 435, 436, 438, 445, 448, 450, 455, 461, 480, 483, 485, 486

*Students may take Economics 355 to satisfy this last requirement only if they have taken Economics 375 to satisfy the requirements in macro theory.

Mathematics 101,102 or 103,106 and Mathematical Sciences 382 are recommended for students intending to do graduate work in economics. Furthermore, in lieu of one or two semesters of course work, the department offers an independent work program, admission to which is granted on a selective basis.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 50-51.

Graduate Program. Admission to graduate study in economics is granted each year to a limited number of students who hold an undergraduate degree (or the equivalent), whether in economics or another field. The graduate program is designed primarily for students qualified to pursue a course of study leading to the Ph.D. degree.

Training in mathematics through calculus and linear algebra at the undergraduate level is advisable but is not a prerequisite for admission. The Department of Economics also offers graduate work leading to the M.A. degree.

Candidates for the Ph.D. degree who have good undergraduate preparation in economics should expect to devote two to two and one-half years to full-time study (or the equivalent) before taking the general examinations which must be passed before the submission of the doctoral dissertation. A minimum of one additional year is usually necessary for completion of the dissertation. Applicants are required to take the Graduate Record Examination.

Requirements for the Degree of Doctor of Philosophy:

1. Demonstrated proficiency in statistics, elementary mathematical economics, and economic history or history of economic thought
2. Completion of an approved program of graduate courses
3. Satisfactory performance on written general examinations on:
   a. Economic theory
   b. A major field chosen from: (1) econometrics, (2) economic development, (3) industrial organization and regulation, (4) international trade and finance, (5) mathematical economics, (6) monetary economics, (7) public finance, (8) economic theory, or (9) economic history
4. Satisfactory performance on an oral examination emphasizing the field of specialization and the methodology to be used in dissertation research
5. Completion and oral defense of a doctoral dissertation setting forth in publishable form the results of original research

Requirements for the Degree of Master of Arts:

1. Thirty semester hours, including the thesis, with not more than nine semester hours at the undergraduate level
2. Attainment of a grade point average exceeding "2.5" in all courses, except the thesis
3. Successful completion of a master's thesis

A master's degree may also be awarded to students who attain candidacy for the Doctor of Philosophy degree.

Economics Courses

211a,b. Principles of Economics (3-0-3).
Nature of economics; the price system; household decisions; production; cost and supply; marginal productivity and capital theory; industrial organization and control; economic efficiency, externalities, and public goods. *Staff*

212a,b. Principles of Economics (3-0-3).
Measurement and determination of national income; money, banking, and fiscal policy; business cycles, unemployment, and inflation; international trade and balance of payments; other contemporary economic problems. Prerequisite: Economics 211. *Staff*

301b. History of Economic Analysis (3-0-3).
The fundamental ideas of great economic thinkers from Plato to the present. Prerequisite: Economics 211. *Mr. Rimlinger*

350a. Elements of Statistical Method (3-2-3).
Basic concepts and techniques in probability theory and statistical inference. A student taking Economics 350 may not also receive credit for Mathematical Sciences 280. *Staff*

355a. Money and Banking (3-0-3).
Demand and supply of money; determinants of prices, interest, and income; American financial institutions; monetary policy; inflation. Prerequisite: Economics 211, 212. *Staff*

370a,b. Microeconomic Theory (3-0-3).
Intermediate level analysis of markets, firms, households, income distribution, and general equilibrium. Prerequisite: Economics 211. *Staff*

372b. Mathematical Microeconomics (3-0-3).
Mathematical approach to microeconomic theory. Recommended for engineering and science students. Students may not receive credit for both Economics 370 and Economics 372. Prerequisite: Economics 211 and the equivalent of Mathematics 101 and 102 or permission of instructor. *Mr. Cooke*

375a,b. Macroeconomic Theory (3-0-3).
Intermediate level analysis of relationships between the levels of income, employment, interest, investment, consumption, and government spending. Prerequisite: Economics 211, 212. *Staff*

400b. Econometrics (3-0-3).
Estimation and forecasting models; topics include multiple regression time series, contingency table analysis, and Bayesian inference. Prerequisite: Economics 350 or Mathematical Sciences 380, 381. *Mr. White*

403a, 404b. Senior Independent Research (0-0-3 each semester).
Independent research project for seniors on an approved topic of their own choosing. Enrollment is by special permission. *Staff*

415. Human Resources, Wages, and Welfare (3-0-3).
Study of labor markets and wage determination. Special emphasis on "investment in human capital" through education, training, and health services. Prerequisite: Economics 211. *Staff*

416. Economic History of the U.S.: 1700-1945 (3-0-3).
Economic history of the United States from the Colonial Period to the end of World War II. Attention focuses upon the trends in per capita income and the forces behind these trends. Prerequisite: Economics 211. Not offered every year. *Staff*

417. Comparative History of Industrialization (3-0-3).
Comparative historical analysis of industrialization of Western Europe, the United States, and Russia from the eighteenth century to World War I. Prerequisite: Economics 211. Not offered every year. *Mr. Rimlinger*

420b. International Economics (3-0-3).
A study of the economic relationships between countries. Trade theory, tariffs and other trade restrictions, international finance, trade and development, and current policy issues. Prerequisite: Economics 211, 212. *Mr. Smith*

430. Comparative Economic Systems (3-0-3).
Theoretical models of various economic systems as a basis for analyzing the operation and the institutional characteristics of economies including the U.S., the U.S.S.R., Yugoslavia, and China. Prerequisite: Economics 211. Not offered every year. *Mr. Rimlinger*

435a. Industrial Organization (3-0-3).
Market structure, concentration, barriers to entry, and ologopoly pricing. Application of micro theory to industry problems. Prerequisite: Economics 211 or permission of instructor. *Staff*

436b. Government Regulation of Business (3-0-3).
Analysis of governmental regulatory activities under antitrust laws and in such regulated industries as communications, energy, and transportation. Prerequisite: Economics 211. Economics 370 and 435 suggested. *Staff*

438b. Economics of the Law (3-0-3).
The role of economic reasoning in understanding the enactment, interpretation, and enforcement of the law. Applications to contracts, property, torts, discrimination, and criminal justice. Prerequisite: Economics 211. *Staff*

445a. Managerial Economics (3-0-3).
Application of economics to decision making within the firm; organization theory, cost, pricing, and problems of control. Prerequisite: Economics 211. *Staff*

448b. Corporation Finance (3-0-3).
Financial analysis, planning, and control in modern corporations; includes valuation, cost and allocation of capital, capital markets. *Staff*

450b. World Economic and Social Development (3-0-3).
Examines past and future development in advanced and poor countries emphasizing resources, population, entrepreneurship, education, and planning. Prerequisite: Economics 211, 212. *Mr. Huddle*

455a,b. Money and Financial Markets (3-0-3).
Determinants of the demand and supply of money, bonds, stocks, and other financial assets. Financial intermediaries. Monetary policy. Inflation. International linkages of financial markets. Prerequisite: Economics 375 or permission of instructor. *Staff*

461a. Urban Economics (3-0-3).
Economic analysis of the development and problems of urban areas with particular attention to current policy issues. Prerequisite: Economics 211 or permission of instructor. *Mr. Cooke*

471a. Linear Programing (3-0-3).
Formulation of managerial and technical problems; simplex method; revised simplex method; duality theory and applications; transportation problems; decomposition techniques. Also offered as Mathematical Sciences 471. *Mr. Young*

475a. Operations Research, Deterministic Models (3-0-3).
Optimization problems in a managerial and economic context. Familiarity with linear programing and microeconomic theory is strongly recommended. Also offered as Mathematical Sciences 475. *Staff*

476b. Operations Research, Stochastic Models (3-0-3).
Decision theory, waiting line theory, Markov chains, inventory models, replacement models, simulation. Prerequisite: Mathematical Sciences 380 or 381. Also offered as Mathematical Sciences 476. *Staff*

477b. Mathematical Structure of Economic Theory I (3-0-3).
Competitive economics from a mathematical perspective, unifying calculus, matrix algebra, and set-theoretic approaches. Theories of household, firm; production models. Prerequisite: Economics 211, Mathematics 212, Mathematical Sciences 310. Also offered as Mathematical Sciences 477. Not offered every year. *Staff*

478b. Mathematical Structure of Economic Theory II (3-0-3).
Continuation of Economics 477, which is prerequisite. Also offered as Mathematical Sciences 478. Not offered every year. *Staff*

480b. Energy Economics and Policy (3-0-3).
Statics and dynamics of efficient energy resource usage; evaluation of domestic and international energy policies; assessment of potential of conventional and alternative energy sources. *Staff*

483a. Public Finance (3-0-3).
Tax and expenditure policies at the federal, state, and local levels; emphasizes resource allocation and equity. Prerequisite: Economics 211. *Mr. Zodrow*

485, 486. Contemporary Economic Issues (3-0-3 semester).
Analysis of urgent and significant economic problems. Emphasis on the evaluation of policy remedies. Principal topics vary from year to year. Not offered every year. *Staff*

495a, 496b. Senior Seminar (3-0-3 each semester).
Reading and discussion of topics in advanced economics. Open to seniors with special approval. *Staff*

500a,b. Master's Thesis Research.
Research on an approved topic in partial fulfillment of the requirements for the master's degree.

501a. Advanced Microeconomic Theory (3-6-5).
Theory of the firm, the theory of consumer behavior, duopoly, bilateral monopoly, imperfect competition, capital theory, and the theory of income distribution. *Staff*

502a. Advanced Macroeconomic Theory (3-6-5).
Macroeconomic theory of employment, interest, and income. Considers the work of Keynes and subsequent developments. *Staff*

504b. Advanced Economic Statistics (3-6-5).
Statistical inference and the testing of hypotheses; multiple and partial correlation analysis; analysis of variance and regression. *Staff*

505b. Monetary Theory (3-6-5).
The nature of monetary economy; asset choice; the role of financial institutions; inflation. *Staff*

506b. Monetary and Fiscal Policy (3-6-5).
Determination of money supply; tools of monetary policy; effectiveness of monetary and fiscal policy; policy making under uncertainty. *Staff*

507a. Mathematical Economics I (4-0-5).
Theory of household, firm; activity analysis; set theory, matrix algebra, vector calculus, metric spaces, separation theory, constrained optimization. *Staff*

508b. Mathematical Economics II (4-0-5).
Continuation of Economics 507. Set theoretic approach to general equilibrium; aggregate linear and nonlinear production models; existence, stability, optimality. *Staff*

509a. Theory of Public Finance (3-6-5).
Governmental revenue and expenditures at the federal, state, and local levels; includes welfare economics, project analysis, taxation, incidence, tax reform, and fiscal federalism. *Staff*

510a. Econometrics (3-6-5).
Estimation and testing in econometric models; theoretical and applied econometrics. Prerequisite: mathematical statistics and linear algebra. *Mr. White*

511b. Applied Econometrics (3-6-5).
Estimation and testing of systems of equations, consumer demand systems, production functions, econometric models. Prerequisite: Economics 510. *Mr. White*

512a. International Trade Theory (3-6-5).
Classical, neoclassical, and modern trade theory; some welfare aspects of trade, including the theory of commercial policy. Applications are emphasized. *Mr. Smith*

513. Topics in Managerial Economics (3-6-5).
Theory of investment of the firm; organization theory; problems in applying theory in decision making. Not offered every year. *Staff*

514b. Industrial Organizations and Control (3-6-5).
Industrial markets and public policy. *Staff*

515. Labor Economics (3-6-5).
The economics of the labor market and the economic implication of trade unions. Attention is given to major public policy issues. Not offered every year. *Staff*

516. Economic History and Development (3-6-5).
Historical analysis of economic growth and industrialization of the U.S., Western Europe, and Russia in the last 150 years. Stresses conditions which favored or retarded growth. Not offered every year. *Staff*

517b. History of Economic Analysis (3-6-5).
The development of economic analysis from the scholastics to the neoclassical school. *Mr. Rimlinger*

518a. International Finance (3-6-5).
International monetary problems, foreign exchange theory, international investments. *Mr. Huddle*

519b. Economic Growth and Development (3-6-5).
Analysis of theory and policy questions relating to the level and rate of economic development. *Mr. Soligo*

530a. Comparative Economic Systems (3-6-5).
Analysis of theoretical models of market and centrally planned economies; national economic systems of the Soviet Union, China, Yugoslavia, Western European countries, and the United States. Not offered every year. *Mr. Rimlinger*

536b. Government Regulation of Industry (3-6-5).
Advanced analysis of the economics of antitrust and other forms of regulation. Not offered every year. *Staff*

561a. Urban Economics (3-6-5).
Analysis of urban development and such urban problems as housing, land use, transportation, discrimination, and pollution. Not offered every year. *Mr. Cooke*

565a. Health Economics (3-6-5).
Economic aspects of health; production, cost, demand and supply factors; methods of payment and effects of regulation. *Mr. Lairson, Mr. Swint*

573. Nonlinear Programing (3-0-3).
Theory and computational methods for nonlinear programing, including: Kuhn-Tucker conditions, duality theory, methods for constrained optimization of convex and nonconvex problems. Also offered as Mathematical Sciences 573. Not offered every year. *Mr. Young*

577b. Topics in Mathematical Economics I (3-0-3).
Selected topics in advanced mathematical economics. Prerequisite: Economics 508 or Economics/Mathematical Sciences 478. Not offered every year. *Staff*

578b. Topics in Mathematical Economics II (3-0-3).
Selected topics in advanced mathematical economics. Prerequisite: Economics 508 or Economics/Mathematical Sciences 478. Not offered every year. *Staff*

579b. Topics in Mathematical Economics III (3-0-3).
Selected topics in advanced mathematical economics. Prerequisite: Economics 508 or Economics/Mathematical Sciences 478. Not offered every year. *Staff*

591a, 592b. Topics in Policy and Applied Economics (3-6-5 each semester).
Staff

595a, 596b. Readings in Advanced Topics (3-0-3 each semester). *Staff*

600a,b. Doctoral Dissertation Research.

700c. Summer Graduate Research.

800b. Degree Candidate Only.

Education

Professor Wood, *Chairman*
Associate Professor J.D. Austin
Lecturers Baum and Duke, *Director of Student Teaching*

Degrees Offered: Secondary Teaching Certificate in conjunction with B.A. in major field; Master of Arts in Teaching

Teacher Education and Certification. Rice University seeks to contribute graduates to society able to think and to question, educated to comprehend and to cope with a rapidly changing world. Although professional instruction is not the primary ingredient of undergraduate education, the university's role in preparing students for their future life work cannot be ignored. While maintaining complete institutional integrity, Rice University supports the intention as well as the letter of regulations promulgated by the state governing the development and presentation of teacher preparation and certification programs.

To this end, the Rice University Department of Education closely cooperates with departments offering work in subject matter fields. It is the function of this department to provide rigorous professional courses and to administer the established teacher education programs.

The Rice University teacher education program strives to fit the prospective teacher to perform all the roles which may be expected of a teacher. To accomplish this objective, it gives sustained close attention to the following vitally interrelated components:

1. A sound liberal or general education
2. An extended knowledge of the subject(s) or area(s) to be taught
3. Professional knowledge, as distinguished from professional skills (i.e., relevant historical, philosophical, social, and psychological material)
4. Skills in managing a classroom, in working with children and adults, and in supervising the learning process

Admission to the Undergraduate Teacher Education Program. Students who have satisfied the following requirements may apply to the Rice Education Council for admission to the teacher education program:

1. Junior standing at Rice University
2. Satisfactory completion of History 105, 106 or 211, 212
3. A grade average of "3" or better in at least 75 percent of all semester hours attempted in the teaching field offered for approval
4. Passing grades in first- and second-year English courses
5. Evidence of satisfactory speech patterns
6. Evidence of adequate physical vigor and strength and absence of obvious physical conditions which might interfere materially with performance in a classroom as a teacher
7. Approval of a completed Teacher Certification Program form by the appropriate departmental representatives and the Education Council prior to registration for the junior year
8. Approval of the completed form "Application for Admission to the Teacher Education Program" by the Education Council prior to registration for the junior year

Texas State Requirements for Secondary Provisional Certificate (Grades 7-12). A Provisional Teacher's Certificate is based upon a bachelor's degree, satisfactory completion of an approved teacher preparatory program, and the recommendation of the university. Rice University is approved to offer the following teacher

preparatory programs: biology, chemistry, earth science, anthropology, art, economics, English, French, German, health, history, Latin, mathematics, physical education, physics, political science, psychology, Russian, general science, social studies, sociology, and Spanish.

1. Foundations in Arts and Sciences: Approximately two years including:

A. English, twelve semester hours
American history, six semester hours
Government, six semester hours
From two of the following, twelve semester hours
Science
Mathematics
Foreign language

B. Other institutional degree requirements

2. Academic Specialization:

Plan I. Preparation to teach two fields:
Twenty-four semester hours in each area including twelve semester hours of advanced work in each, with approval of the Rice Education Council

Plan II. Preparation to teach related fields:
Forty-eight semester hours in a composite field (such as general science or social studies) with at least eighteen semester hours of advanced work and approval of the Rice Education Council

3. Professional Education: eighteen semester hours, of which six semester hours shall be in student teaching

4. Elective Courses

Requirements for completion of the Teacher Education Program. To be recommended to the Texas Education Agency for certification, a student must satisfy all institutional requirements for a bachelor's degree, including:

A. Completion of History 105, 106 or 211, 212 and Political Science 209, 210 before the junior year
B. Twenty-four semester hours of credit in each of two teaching fields or forty-eight semester hours of credit in a composite field
C. Completion of the required professional education courses
D. Satisfaction of the supervised student teaching requirement (Education 419) as outlined below

Supervised Teaching Experience. Either of two distinct plans may be followed by teacher education candidates. The main difference is the type of supervised teaching experience provided.

1. The Apprenticeship Plan (Plan A):

Prerequisite: Education 304, 311, 312

Apprenticeship is designed for students who wish to complete preparation for their teaching careers in four years and two six-week summer sessions. Candidates will enroll for the summer session following their junior year. The apprentice will observe teaching, act as a helping teacher, and perhaps teach as may be appropriate in the Rice Summer School for High School Students.

Education 409 and a 400-level course, Seminar in Teaching, is to be completed during the senior year.

Following graduation from Rice, the apprentice will attend the summer session for full-time teaching in the Rice Summer School for High School Students under the supervision of a master teacher and the university staff. While the apprentice spends somewhat less time in student teaching than under the internship plan, he or

she is not remunerated for the teaching service. The apprentice is to be recommended for the Texas Provisional Teacher's Certificate following successful completion of the second summer session.

2. The Internship Plan (Plan B):

Prerequisite: twelve semester hours in education courses

Under this plan, students are expected to attend a six-week summer session immediately following their graduation from Rice. Each intern will observe and teach classes under the supervision of a master teacher and a university staff member in the Rice Summer School for High School Students. During the following fall semester, interns will be assigned to classrooms in a neighboring school system and may select one of two plans dependent upon the availability of a suitable position.

A. Employed on a full-time basis, the intern will teach three classes, occasionally act as a substitute teacher, and perform other school-related tasks as stipulated. The intern will be supervised by a teacher at the assigned school and a staff member from the university. During the half year of their service, interns will be paid a salary commensurate with the salary being paid to substitute teachers by cooperating school systems for their employment as classroom teachers. Upon the successful conclusion of the internship semester and upon the recommendation of the appropriate secondary school principal, the intern will be given preference for a regular teaching position in the spring semester should there be a suitable vacancy and will be recommended for a Texas Provisional Teacher's Certificate. However, there is no guarantee that the intern will be offered a regular teaching position the semester following internship.

B. The intern will be employed for full-time duty and will teach five periods per day under the supervision of a staff member of the cooperating school system and a staff member from the university. During the half year of service, the intern will be paid for employment as a classroom teacher a salary commensurate with the salary being paid a full-time teacher with a degree and an emergency teaching permit by cooperating school systems. Upon successful completion of the internship semester and upon the recommendation of the appropriate secondary school principal, the intern will be offered a regular teaching contract for the spring semester if a suitable vacancy exists and will be recommended for a Texas Provisional Teacher's Certificate.

Program for the Master of Arts in Teaching. The professional education degree is based on one academic year and two summers of satisfactory graduate work consisting of the program prescribed below:

1. Introductory courses in education (during the first summer session) developed in conjunction with observation and actual teaching in the Rice Summer School for High School Students under the guidance of master teachers and university faculty
2. Courses in secondary school educational theory, teaching strategies, educational objectives, and evaluation
3. Graduate and upper division courses in the candidate's two subject matter teaching fields and/or related fields, equivalent to a full semester of graduate study
4. Supervised teaching internship for one semester in a cooperating public school system
5. Practicum (second summer session). Supervised full-time teaching in the Rice Summer School for High School Students. Candidates will be responsible for the design and implementation of courses, for teaching, and for evaluation.

Normally, the degree program will consist of ten semester courses. However, some candidates may need to remove deficiencies in their teaching or related fields or in state-mandated fields and may therefore require additional time. Candidates will begin their program in the summer preceding their academic year of residence.

Students in the program will not normally be eligible for Rice Graduate Fellowships or scholarship support since the cooperating school districts pay a salary for internship teaching.

Please refer to page 93 for additional information regarding admission to the graduate program in education.

Education Courses

304b. Seminar in Teaching (junior level apprentice teachers only) (1-0-1).
A study of procedures and materials used in teaching various subject areas. Preparation of resource units, orientation to secondary school teaching. *Staff*

311a. The Historical and Philosophical Foundation of Education (3-0-3).
Analysis of contemporary and recent theories useful in planning educative activities of the secondary school. Prerequisite for those intending to complete Rice teacher preparatory program: History 211, 212; 105, 106; or permission of instructor; and filing of Teacher Certification Plan. *Mr. Austin, Mr. Duke, Mr. Wood*

312b. Human Development: The Psychology of Human Learning (3-0-3).
Introduction to theoretical systems of human learning with emphasis on implications for secondary education; introductory tests and measurements. *Mr. Austin, Mr. Wood, Mr. Duke*

400b. Seminar in Teaching (apprentice English teachers only) (2-0-2).
Same as Education 304. *Mr. Wood*

402b. Seminar in Teaching (apprentice social studies teachers only) (2-0-2).
Same as Education 304. *Mr. Baum*

404b. Seminar in Teaching (apprentice math and science teachers only) (2-0-2).
Same as Education 304. *Mr. Austin, Mr. Duke*

406b. Seminar in Teaching (apprentice health and physical education teachers only) (2-0-2).
Same as Education 304. *Mr. Duke*

407b. Seminar in Teaching (art teachers only) (2-0-2).
Same as Education 304. *Mr. Baum*

408b. Seminar in Teaching (apprentice foreign language teachers only) (2-0-2).
Same as Education 304. *Mr. Wood*

409a. Fundamentals of Secondary Education (3-0-3).
Background, purposes, and organization of modern secondary education curriculum and current trends in administration of secondary schools. Introductory educational research. *Mr. Austin, Mr. Baum*

410b. Seminar in Teaching (English teachers only) (3-0-3).
Same as Education 304. *Mr. Wood*

412b. Seminar in Teaching (social studies teachers only) (3-0-3).
Same as Education 304. *Mr. Baum*

414b. Seminar in Teaching (math and science teachers only) (3-0-3).
Same as Education 304. *Mr. Austin, Mr. Duke*

415a. Seminar in Teaching: Media Techniques (3-0-3).
Students explore the existing film literature, explore the creative and orderly processes of film making, produce two films, and complete an advanced individual project. *Staff*

416b. Seminar in Teaching (health and physical education teachers only) (3-0-3).
Same as Education 304. *Mr. Duke*

417b. Seminar in Teaching (art teachers only) (3-0-3).
Same as Education 304. *Mr. Baum*

418b. Seminar in Teaching (foreign language teachers only) (3-0-3).
Same as Education 304. *Mr. Wood*

419a,b; 420c. Principles of Teaching (3-0-3 each semester).
Introduction to teaching in the secondary school and supervised teaching. *Staff*

422b. Seminar in Innovative Teaching (3-0-3).
Educational trends such as modified scheduling, personalized instruction, open concept, and interdisciplinary learning. Newspaper-centered materials utilizing the best innovative practices now influencing secondary education. *Mr. Baum*

800b. Degree Candidate Only.

Engineering and Applied Science

The George R. Brown School of Engineering

Rice's engineering programs have been prominent since the early days of the university. Five departments, each of which is strong in teaching and research, now comprise the George R. Brown School of Engineering. The school was dedicated in 1975 at ceremonies honoring the distinguished Rice alumnus, trustee, and benefactor who was a founding partner in Brown & Root, Inc. The dean of the school is J.D. Hellums, professor of chemical engineering and a member of the faculty since 1960.

The B.S. programs in engineering are accredited by the Accreditation Board for Engineering and Technology (ABET) in chemical, civil, electrical, and mechanical engineering and in materials science.

General Undergraduate Information. Curricula in engineering at Rice University lead to either Bachelor of Arts or Bachelor of Science degrees in the fields of chemical engineering, civil engineering, electrical engineering, mechanical engineering, and materials science. These curricula are also part of integrated five-year programs that lead to professional master's degrees in each of the above fields and in environmental science or environmental engineering.

A student taking the B.A. program in engineering is required to pass a total of at least 120 semester hours (forty courses). The major department may require no more than 80 specific semester hours for the major and may require fewer. Students must complete at least 60 semester hours in addition to the departmental major requirements. Some departments require more than 120 hours for graduation.

A student following a B.S. program in engineering (other than chemical engineering) must pass a total of at least 134 semester hours (137 semester hours for chemical engineering). Except for chemical engineering, which may require up to 104 semester hours in specific course requirements, no department may require more than 92 semester hours in specific courses for the B.S. degree. Each student should get a list of required courses from the appropriate department. First- and second-year students should have their programs approved each semester by an engineering adviser as well as by their college adviser. Before registering for the junior year, students must associate themselves with an adviser in the department of their major. Registration for every semester thereafter must be approved by an adviser in the major department.

The undergraduate courses listed below are offered for the preparation of students majoring in all branches of engineering.

Engineering Courses

200b. Classical Thermodynamics (3-0-3).
Fundamental exposition of the laws of classical thermodynamics and deductions therefrom. Applications illustrated with particular attention to pure substances. Prerequisite: Physics 101, 102.

201b. Engineering Drawing (2-3-3).
Graphical communication with an emphasis on freehand sketching, lettering, multiview and auxiliary projection, pictorials, sections and dimensioning practices, and an introduction to descriptive geometry. *Mr. Leach*

211a. Engineering Mechanics (3-0-3).
Equilibrium of static systems, dynamics of a particle, dynamics of particle systems, and rigid-body dynamics. Elements of vibrational analysis. Prerequisite: Physics 101, 102, Mathematics 101, 102.

226a,b. Digital Computing in APL (1-1-1).
Semi-self-paced introduction to the solution of simple science and engineering problems using APL. Also listed as Computer Science 226.

240a,b. Digital Computing for Engineering and Science (3-3-4).
Programing; algorithms and flow charts; languages, FORTRAN programing. Data structures and representation. Numeric and nonnumeric computing techniques. Introduction to numerical analysis. Prerequisite: Mathematics 101, 102.

241a,b. Electrical Circuits (3-4-4).
Basic circuit elements, mesh and node anlaysis, Thevenin and Norton equivalent circuits, controlled sources and op-amps solution of circuits, differential equations, use of phasors and impedance for sinusoidal AC analysis, frequency response. Laboratory on basic electrical measurements. Prerequisite: Mathematics 101, 102 or equivalent. *Mr. Burrus, Mr. de Figueiredo*

Chemical Engineering

The George R. Brown School of Engineering

Professor S.H. Davis, *Chairman*
Professors Akers, Armeniades, Dyson, Hellums, Hightower, Kobayashi, Leland, and McIntire
Adjunct Professors Boyd, Deans, G.D. Fisher, and Koenig
Adjunct Associate Professors Schaezler, V.C. Smith, and Venable
Assistant Professors Papoutsakis, Rowley, and Zygourakis
Lecturer Hirasaki

Degrees Offered: B.A., B.S., M.Ch.E., M.S., Ph.D.

Undergraduate Program. The undergraduate curriculum in chemical engineering is designed to provide a sound scientific and technical basis for further professional development. Concurrently, the student has the opportunity of concentration in a particular technical specialty such as applied mathematics, biomedial engineering, nuclear technology, environmental quality, kinetics and catalysis, engineering economics, or polymer science and engineering.

In the four-year curriculum, a student may qualify for either the Bachelor of Arts degree or the Bachelor of Science degree. The Bachelor of Arts program is highly flexible and allows a student to pursue other areas of interest with or without a double major. The Bachelor of Science program has a higher content of scientific and professional courses. On completion of either bachelor's program, a student is

eligible to apply for a fifth year of specialized study leading to the degree of Master of Chemical Engineering. The curriculum is designed so that outstanding students interested in careers in research and teaching may enter graduate school after either of the bachelor's degrees.

The Department of Chemical Engineering requires 77 semester hours in the major for the B.A. degree, prerequisites and laboratory courses included. In addition to these requirements, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmentl requirements for a total of at least 137 semester hours.

The B.S. degree is accredited by the Accreditation Board for Engineering and Technology. Students enrolled in the B.S. program must take:

Chemistry 101, 102, 107, 211, 212, 213, 214, 311, 312, 313
Chemical Engineering 301, 302, 344, 390, 401, 402, 403, 404, 411, 412, 443, 444
Mathematics 101, 102, 211, 212 or equivalent honors courses
Two approved junior level mathematics courses
Physics 101 or 111, 102 or 112, and 132
Computer Science 223 or 226 and Computer Science 220 or Engineering 240
Engineering 211
An approved basic science
Two courses selected from Engineering 241, Materials Science 395, and Civil Engineering 300

In addition to these courses, students must also satisfy the distribution requirements and complete sufficient courses outside the departmental requirements for a total of at least 137 semester hours.

Graduate Program. Graduate study in chemical engineering can lead to the Master of Chemical Engineering, the Master of Science, or the Doctor of Philosophy. University requirements for the professional degree M.Ch.E. are given on pages 92-94. The department requires that at least six of the courses taken must be at the advanced level in chemical engineering. In addition, four semesters of chemical engineering design, a computer science course, and an approved mathematics course must have been taken some time in the student's curriculum.

University requirements for the research degrees M.S. and Ph.D. are outlined on pages 90-92.

Candidates for the Master of Science degree are required to complete a minimum of eighteen approved semester hours with high standing. They must also submit and defend the thesis in an oral examination demonstrating research ability.

Candidates for the Doctor of Philosophy degree must demonstrate competence in the areas of applied mathematics, thermodynamics, transport processes, and chemical kinetics and reactor design by passing qualifying examinations, normally during the first year of study. They must also complete a minimum of thirty-six approved semester hours with high standing and submit a thesis that provides evidence of their ability to carry out original research in a specialized area of chemical engineering. The thesis must be defended in a public oral examination.

Chemical Engineering Courses

301b. Chemical Engineering Fundamentals (3-0-3).
Use of basic mathematical concepts, physical laws, stoichiometry, and the thermodynamic properties of matter to obtain material and energy balance for steady and unsteady state systems. Required for sophomores intending to major in chemical engineering. Prerequisite: Computer Science 223 (may be taken concurrently) *Mr. Davis, Mr. Rowley*

302b. Separation Processes (3-0-3).
Systematic treatment of single and multistage contacting operations involving binary and multicomponent systems. Prerequisite: Chemical Engineering 301. *Mr. Davis, Mr. Dyson, Mr. Armeniades*

344b. Chemical Engineering Laboratory (1-3-2).
Experiments demonstrating the principles presented in Chemical Engineering 301, 302, 390. *Staff*

390b. Kinetics and Reactor Design (3-0-3).
Principles and significance of chemical kinetics; procedures for evaluating kinetic parameters from reaction rate data; application of these methods to design and predict the performance of various types of ideal and nonideal chemical reactors in both homogeneous and heterogeneous systems. *Mr. Hightower*

401a. Introduction to Transport Phenomena (3-0-3).
Fundamental principles of heat, mass, and momentum transport applied to the continuum; analysis of macroscopic physical systems based on the continuum equations. Prerequisite: Chemical Engineering 302 or permission of instructor. *Mr. Papoutsakis*

402b. Introduction to Transport Phenomena (3-0-3).
Continuation of 401a. *Mr. Rowley*

403a. Equipment Design I (3-3-4).
Applications of the basic principles of fluid mechanics and thermodynamics to the design and performance of process equipment. Introduction to process control. *Mr. McIntire, Mr. Zygourakis*

404b. Equipment Design II (3-3-4).
Optimal design of chemical reactors and heat exchange equipment; industrial economic principles. Special process design projects in small groups. *Mr. Dyson, Mr. Armeniades*

411a. Fundamentals of Thermodynamics (3-0-3).
Development and application of the first and second laws of thermodynamics. *Mr. Rowley*

412b. Thermodynamics II (3-0-3).
Advanced treatment of chemical and physical equilibrium in multicomponent systems. Detailed study of nonideal solutions. *Mr. Leland*

443a, 444b. Chemical Engineering Laboratory (1-3-2 each semester).
Experiments demonstrating transport coefficient measurement, forced and free convection transfer operations, and thermodynamic principles as covered in Chemical Engineering 401, 402, 411. *Staff*

483a, 484b. Undergraduate Research (Credit variable).
Independent investigation of a specific topic or problem in modern chemical engineering research under the direction of a selected faculty member. Prerequisite: permission of the Department. *Staff*

501a. Fluid Mechanics and Transport Processes (3-0-3).
Advanced study in fluid mechanics and transport processes including analytical and numerical approximation methods, boundary layer theory, and hydrodynamic stability. *Mr. Hellums*

503a. Simulation and Design of Chemical Engineering Process I (2-3-3).
Synthesis course applying the principles of staged processes, transport phenomena, kinetics, and economics to the simulation, design, and operation of equipment and processes. *Mr. Akers*

504b. Simulation and Design of Chemical Engineering Processes II (2-3-3).
Continuation of 503, with emphasis on the use of available process design computer programs. *Mr. Kobayashi*

522b. Design with Flowtran (3-3-4).
Description of the Monsanto Flowtran Simulation Program. Use of the simulator to design processes. Prerequisite: Chemical Engineering 403, working knowledge of FORTRAN programing. Enrollment limited. *Mr. Dyson*

528b. Air Pollution and Its Abatement (3-0-3).
Atmospheric physics and chemistry of gaseous and particulate pollutants; relationship between emissions and air quality; engineering, economics, and politics of abatement. Also offered as Environmental Science and Engineering 528. Not offered every year. *Staff*

551a/b. Advanced Separation Processes (3-0-3).
Multistage calculations for multicomponent systems; digital computer solutions of separation problems. *Mr. Dyson*

571a. Fundamentals of Reservoir Engineering (3-0-3).
Basic reservoir engineering principles — single and two phase flow in porous media. *Staff*

591a. Heterogeneous Catalysis (3-0-3).
Principles of heterogeneous catalysis, catalyst preparation, measurement and significance of surface physical and chemical properties, adsorption, heterogeneous kinetics, diffusion in porous media, catalyst poisoning and regeneration, aspects of reactor engineering, and a review of selected commercial catalytic reactions. *Mr. Hightower*

593a. Polymer Science and Engineering (3-0-3).
Basic concepts in macromolecular chemistry and their application in the synthesis and chemical modification of polymers. Prerequisite: Chemistry 211, 212. *Mr. Armeniades*

594b. Structure and Properties of Polymers (3-0-3).
Molecular organization and physical properties of polymeric materials; elastomeric, semicrystalline, and glassy polymers; processing and technology of polymeric systems. Also offered as Materials Science 594. *Mr. Armeniades*

601a/b. Advanced Topics in Fluid Mechanics and Transport (3-0-3).
Advanced study in one of several areas of fluid mechanics or transport, including tensor analysis, continuum mechanics, rheology, and mathematical methods of special interest in fluid mechanics. *Mr. McIntire*

602b. Physico-Chemical Hydrodynamics (3-0-3).
Topics in hydrodynamics including areas such as waves on liquid surfaces, diffusion in liquids, motion of drops and bubbles, and electrophoresis. *Mr. McIntire*

611a. Advanced Topics in Thermodynamics (3-0-3).
An advanced treatment of the classical thermodynamics of pure and multicomponent systems. Topics include first and second law analysis of engineering problems, property estimation and prediction, mixture theories, phase and chemical equilibria, and availability analysis. *Mr. Rowley*

612b. Advanced Topics in Thermodynamics (3-0-3).
An advanced study of thermodynamics. Topics include thermodynamics of systems under external forces, nonequilibrium thermodynamics, and applied statistical mechanics. *Mr. Rowley*

631a, 632b. Nuclear Engineering I, II (3-0-3 each semester).
Introductory course in nuclear properties, nuclear reactions, radioactive decay, neutron diffusion, and fission. Theory design of nuclear reactors using the Fermi Age treatment and introductory reactor kinetics. 632 not offered 1982. *Mr. Leland*

661a, 662b. Graduate Seminar (1-0-1 each semester). *Staff*

671b. Reservoir Engineering II (3-0-3).
Computational methods in reservoir engineering; application to reserves estimation, recovery prediction, history matching, tertiary recovery operations. *Mr. Hirasaki*

672a. Applied Mathematics for Chemical Engineers I (3-0-3).
Linear algebra and its applications; direct and iterative methods for the solution of linear systems of equations, eigenvalues and eigenvectors, systems of ordinary differential equations, quadratic forms, series solution of ordinary differential equations and special functions and applications to chemical engineering problems. *Mr. Zygourakis*

673b. Applied Mathematics for Chemical Engineers II (3-0-3).
Linear operator theory, Green's functions, integral equations, perturbation and numerical methods, and functional analysis used in the solution of chemical engineering problems. Prerequisite: Chemical Engineering 672 or permission of instructor. *Mr. Papoutsakis*

675a/b. Process Dynamics (3-0-3).
Dynamic equations for discrete and continuous models of chemical systems; lumped parameter systems and state space representation and multivariable control techniques; nonlinear systems, linearization, and phase plane analysis; sampled data systems; digital simulation techniques. Not offered 1981-82. *Mr. Zygourakis*

683a, 684b. Master's Research and Thesis.

685a. Molecular Theory of Fluids (3-0-3).
Prediction of equilibrium thermodynamic properties of pure and multicomponent gases and liquids from molecular properties and interactions. Emphasis given to fluid properties and vapor-liquid equilibria important in gas processing and petroleum hydrocarbon separation. Not offered every year. *Mr. Leland*

692b. Advanced Chemical Reaction Engineering (3-0-3).
Diffusion and reaction in catalytic and noncatalytic porous media, gas-liquid reactions, nonideal flow patterns and models. Design aspects of fixed bed catalytic reactors, fluidized-bed, trickle-bed, and other multiphase-flow reactions. Multiplicity and stability of tubular reactors. Material from current literature on coal pyrolysis, coal gasification, fluidized pyrolysis beds. Analytical and numerical techniques of problem solution. *Mr. Papoutsakis, Mr. Zygourakis*

700c. Summer Research.

720a/b. Advanced Topics in Chemical Engineering (3-0-3).
Not offered every year. *Staff*

730a/b. Advanced Topics in Biomedical Engineering (3-0-3).
Biomechanics and biomaterials; structure and function of extracellular supportive tissue in skeletal and cardiovascular systems; design, development, and evaluation of synthetic polymers for structural tissue replacement. *Mr. Armeniades*

783a, 784b. Doctoral Research and Thesis.

800b. Degree Candidate Only.

Civil Engineering

The George R. Brown School of Engineering

Professor W.J. Austin, *Chairman*
Professors Lutes, Merwin, Sims (on leave 1981-82), **and Veletsos**
Associate Professor Holt
Lecturers Ghazzaly, Gosain, and Moore

Degrees Offered: B.A., B.S., M.C.E., M.S., Ph.D.

Preceptors

George E. Brandow
Brandow and Johnston Associates
Los Angeles, California

Fazlur R. Khan
Skidmore, Owings, and Merrill
Chicago, Illinois

William J. LeMessurier
LeMessurier Associates/SCI
Cambridge, Massachusetts

E.O. Pfrang
National Bureau of Standards
Washington, D.C.

W.B. Pieper
Brown and Root, Inc.
Houston, Texas

The profession of civil engineering is concerned with the development, planning, design, construction, and operation of large facilities and systems. These include buildings, bridges, and other structures of various forms; transportation systems,

water supply systems, drainage and flood control and systems for waste disposal and pollution control. The planning of new communities and the redevelopment of existing cities are also within the spectrum of civil engineering activities.

Undergraduate Program. Two professional programs are offered: a basic program of a general nature that has considerable strength in structural engineering and an environmental engineering option given in collaboration with the Department of Environmental Science and Engineering. Both of these programs lead to a Bachelor of Science in Civil Engineering degree. Both programs are accredited by the Accreditation Board for Engineering and Technology. The departmental requirements are as follows:

Basic Program

Mathematics 101, 102, 211, 212, and Mathematical Sciences 381 or 382
Physics 101, 102, 132, Chemistry 101,102
One of the following: Physics 201, Chemistry 211, Geology 101, 102, Environmental Engineering 201, Space Physics 443
Engineering 211, 240, Environmental Engineering 403
Two of the following: Engineering 200, 241, Materials Science 395 and 397, Geology 352
Civil Engineering 251, 300, 302, 304, 305, 306, 363, 403, 451, 464, 470
One of the following: Civil Engineering 495, 530, 532, 570
One of the following: Civil Engineering 495, 511, 512, 530, 532, 570

Environmental Engineering Option

Mathematics 101, 102, 211, 212, Mathematical Sciences 381 or 382
Physics 101, 102, 132, Chemistry 101, 102, 107, 211, 213
Engineering 200, 211, 240
Civil Engineering 300, 302, 304, 306, 403, 470
Environmental Engineering 311, 401, 403, 412, 536
One of the following: Environmental Engineering 550, Chemical Engineering 411, 490
One of the following: Environmental Engineering 517, 518, 528
One of the following: Geology 321, 341, 352, Chemistry 212 and 214, Environmental Engineering 201, 443

In addition to the departmental requirements above, students must satisfy the university distribution requirements (p. 50), and must complete no fewer than 42 semester hours in addition to the departmental requirements for a total program of at least 134 semester hours. More information on the civil engineering program including a recommended course of study by semesters and suggestions for selecting electives may be obtained from the departmental office. The program of each student is formulated in consultation with a departmental adviser. As soon as students decide on an engineering major, they should consult the departmental advisers.

A Bachelor of Arts degree with a civil engineering major is also available for students not interested in a professional career in civil engineering. The B.A. program has less technical content than the B.S.C.E. program and hence more flexibility with electives. It is not accredited. The detailed curriculum may be obtained from the departmental office. This curriculum requires 129 semester hours of which no fewer than 60 semester hours must be outside of the specific departmental requirements.

The Bachelor of Science in Civil Engineering is a suitable terminal degree for students interested in a professional career, but a master's degree is highly desirable. The Doctor of Philosophy degree is generally required for a career in teaching or in research and development.

Preceptorship Program. A limited number of preceptorships are available on a competitive basis for civil engineering majors. After completing the requirements for

a Bachelor of Science in Civil Engineering, a student works for one year in the office of and under the personal guidance of a structural engineer who has achieved national or international prominence in the profession. The student then returns to Rice for a year of graduate study. The program is designed to provide the student with an opportunity to experience the professional practice of engineering at its highest contemporary level.

Graduate Program. Programs of study in structural engineering and structural mechanics can lead to the degrees of Master of Civil Engineering, Master of Science, and Doctor of Philosophy. Special attention is given to developing the student's interest in and ability for independent study and research in the M.S. and Ph.D. degree programs.

The requirements for a professional Master of Civil Engineering degree are described on page 94. University requirements for other advanced degrees are described on pages 90-91. Departmental requirements for the M.S. and Ph.D. degrees are as follows. A candidate for the Master of Science degree is required to (1) complete at least twenty-one semester hours of approved courses; (2) complete an acceptable thesis; and (3)pass a final oral examination on the thesis. A candidate for the degree of Doctor of Philosophy must satisfy the following requirements: (1) complete at least forty-eight semester hours of approved courses with high standing; (2) pass a comprehensive preliminary examination designed to test the candidate's knowledge of the field and ability to think in a creative manner; (3) pass an oral qualifying examination on the proposed thesis research and related topics; (4) complete a thesis which shall constitute an original contribution to knowledge; and (5) pass a final public oral examination on the thesis and related topics. If the departmental faculty concludes at any stage of a student's doctoral program that he or she is unqualified to continue, the student is denied further registration.

The research interests of the members of the civil engineering faculty lie in the areas of structural and foundation dynamics, including earthquake engineering and offshore structures, applications of probability theory to civil engineering problems, particularly random vibrations; behavior of concrete components and structural systems; structural instability; plasticity; and experimental studies of fatigue in steel structural assemblies.

Civil Engineering Courses

251a. Plane Surveying (2-3-3).
Fundamental surveying principles and techniques. *Mr. Sims*

300b. Introduction to Mechanics of Solids. (3-0-3).
Stresses and deformation due to various loads. Study of engineering properties of materials and failure theories. Prerequisite: Engineering 211 or equivalent. *Mr. Merwin*

302b. Strength of Materials Laboratory (0-3-1).
Standard tension, compression, and torsion tests of ferrous and nonferrous metals; experimental techniques; behavior of structural elements. *Mr. Merwin*

304b. Structural Analysis I (3-0-3).
Analysis of statically determinate structures; stability and determinacy; influence lines and moving loads. Calculation of deflections. Introduction to analysis of indeterminate structures. Prerequisite: Engineering 211 and concurrent registration in Civil Engineering 300. *Mr. Austin*

305a. Structural Analysis II (3-0-3).
Force and displacement methods of analysis of indeterminate structures; influence lines; energy methods. Limit analysis of beams and frames. Prerequisite: Civil Engineering 304. *Mr. Austin*

306b. Steel Design (3-0-3).
Design of steel members, connections, and assemblies. Behavior of steel members as related to design. Prerequisite: Civil Engineering 304. *Mr. Holt*

363a. Applied Fluid Mechanics (3-3-4).
Fluid properties, hydrostatics, and fluid flow equations. Fluid forces, continuity, energy, and momentum principles and applications. Fluid resistance, boundary layer theory, pipe network analysis, and drag forces. Also offered as Environmental Science and Engineering 311. *Mr. Bedient*

403a. Reinforced Concrete Design (3-3-4).
Behavior and design of reinforced concrete members and structural assemblies. Introduction to prestressed concrete. Laboratory tests of materials and reinforced concrete members. Prerequisite: Civil Engineering 304. *Mr. Austin*

451b. Introduction to Transportation (3-0-3).
Operational characteristics of transport modes, elements of transportation planning, and design of stationary elements. *Mr. Lutes*

464b. Hydrology and Watershed Analysis (3-3-4).
Atmospheric processes, precipitation, evaporation, infiltration, ground-water flow, and surface runoff. Stream-flow hydrograph techniques; flood routing in open channels and river systems. Hydrologic anaylsis of a local watershed. Also listed as Environmental Science and Engineering 412. *Mr. Bedient*

470a. Basic Soil Mechanics (3-3-4).
Soil exploration, soil properties and behavior, soil classifications, hydraulics of soil moisture, consolidation and settlement, strength characteristics, soil stabilization, lateral earth pressure, slope stability. *Mr. Ghazzaly*

491. Civil Engineering Professional Practice (3-0-3).
Professional aspects of engineering work; project financing, elements of contracts and specifications, manuals of professional practice. Offered 1982-83. *Mr. Sims*

495b. Design of Civil Engineering Systems (3-0-3).
The material covered in previous civil engineering courses is integrated along with economic and financial considerations into the synthesis of civil engineering systems. Offered 1982-83. *Mr. Sims*

499a/b. Special Problems (Credit variable).
Study of selected topics including individual investigations, special lectures, and seminars. Offered upon mutual agreement of faculty and student. *Staff*

500a. Advanced Mechanics of Solids (3-0-3).
Advanced topics in stress analysis, curved beams, beams on elastic supports, plates, torsion of noncircular sections, columns, buckling, plate analysis. *Mr. Merwin*

501a, 502b. Preceptorship Program
Student completes nine to fifteen months of full-time internship in a selected professional office under the guidance of an appointed preceptor. *Staff*

503a. Structural Analysis by Matrix Methods (3-0-3).
Flexibility and stiffness of structural elements. Compatibility and equilibrium. Force and displacement methods of analysis. Finite element methods. Nonlinear structures. Prerequisite: Civil Engineering 305 or equivalent. *Mr. Holt*

506. Experimental Methods (2-3-3).
Strain measurement methods; mechanical and electrical resistance strain gauges; analogies; instrumentation; analysis of experimental data. *Staff*

507. Numerical Methods of Structural Analysis (3-0-3).
Numerical analysis of beams, beam-columns, and beams on elastic foundations; influence lines; buckling loads; natural frequencies. Integration of initial value problems; dynamic analysis. Not offered every year.

508a. Engineering Analysis (3-0-3).
Methods of formulating equations for discrete (lumped parameter) and continuous systems. Energy methods, variational calculus; finite difference, discrete element, and series methods for continuous boundary value problems. Eigenvalue problems. Applications in structural mechanics. *Mr. Austin*

511a. Optimality in Design (3-0-3).
Application of optimization techniques to design and operation of civil engineering systems. Topics include problem formulation, linear and nonlinear optimization, and scheduling problems. Not offered every year.

512a. Applications of Probability Theory (3-0-3).
Probability, statistics, and decision theory applied to problems of design and operation of civil engineering systems. Prerequisite: Mathematical Sciences 381 or 382. *Mr. Lutes*

514a. Theoretical Plasticity (3-0-3).
Formulation of basic laws of isotropic and anisotropic plastic flow; yield and loading surfaces, normality and convexity requirement, and hardening rules; plane plastic flow problems and slip-line field theory; introduction to limit analysis theorems. Also offered as Mechanical Engineering 514. *Mr. Cheatham*

515b. Applied Plasticity (3-0-3).
Problems in limit analysis and design, plastic behavior of structures, flexure and torsion of prismatic members, axially symmetric problems. Also offered as Mechanical Engineering 515. *Mr. Merwin*

516. Plates (3-0-3).
Introduction to theories of plates with applications to practical problems. Not offered every year.

519. Shells(3-0-3).
Introduction to theories of shells with applications to practical problems. Not offered every year. *Mr. Veletsos*

521a. Structural Dynamics I (3-0-3).
Dynamics of force-excited discrete linear systems with application to design. *Mr. Veletsos*

522b. Structural Dynamics II (3-0-3).
Dynamics of force-excited continuous linear systems and ground-excited linear and yielding structures. Fundamentals of earthquake engineering. Prerequisite: Civil Engineering 521. *Mr. Veletsos*

523b. Probabilistic Structural Dynamics (3-0-3).
Dynamic response of structural systems to excitations characterized as stochastic processes. Prerequisite: Civil Engineering 521 and basic knowledge of probability theory. *Mr. Lutes*

525a. Structural Dynamics III (3-0-3).
Special topics in structural dynamics, including problems of wave propagation, response of structures to waves, dynamics of foundations, and soil-structure and fluid-structure interaction. Prerequisite: Civil Engineering 521. *Mr. Veletsos*

526b. Structural Stability (3-0-3).
Stability criteria. Flexural and torsional buckling of columns and frames, lateral buckling of beams, plate buckling. Effect of imperfections on strength. Beam-columns. Evaluation of design code provisions. *Mr. Austin*

530. Concrete Building Design (3-0-3).
Design of reinforced concrete building structures and floor slab systems. Case histories will be discussed. Prerequisite: Civil Engineering 403. *Mr. Moore, Mr. Gosain*

531. Behavior of Reinforced Concrete Members (3-0-3).
Strength and behavior of reinforced concrete members under various loadings from first application of load to ultimate load. Not offered every year. *Staff*

532b. Prestressed Concrete (3-0-3).
Methods of prestressing. Behavior and design of prestressed concrete members subjected to axial force, flexure, shear, and torsion. Not offered every year. *Staff*

570b. Foundation Engineering (3-0-3).
Geotechnical engineering applications to the analysis, design, and construction of shallow and deep foundations and earth retaining structures. *Mr. Ghazzaly*

699a,b. Special Problems (Credit variable).
Study of selected topics including individual investigations under the direction of a member of the civil engineering faculty. Offered upon mutual agreement of faculty and student.
Staff

700c. Summer Graduate Research.

701a, 702b. Research and Thesis.

800b. Degree Candidate Only.

Electrical Engineering

The George R. Brown School of Engineering

Professor Rabson, *Chairman*
Professors Burrus, J.W. Clark, de Figueiredo, W.E. Gordon, Jump, Kim, Leeds, T.W. Parks, Pearson, Pfeiffer, and Tittel
Adjunct Professor Saltzberg
Associate Professor W.L. Wilson
Adjunct Associate Professor P.M. Stevens
Assistant Professors Hirschberg, D.H. Johnson, and Sinclair
Adjunct Assistant Professors Murphy and Garcia
Instructor Pearlman
Lecturers Bourland, Cyprus, and Harman
Adjunct Lecturers Calfee and Lande

Degrees Offered: B.A., B.S., M.E.E., M.S., Ph.D.

Undergraduate Program. The four-year program in electrical engineering leads to either the B.A. or the B.S. in Electrical Engineering. The B.S. program has more technical requirements, and the degree is accredited by the Accreditation Board for Engineering and Technology, while the B.A. program allows more flexibility with electives. It is possible in either program to satisfy major requirements of two departments, but only a single degree may be received. Students may take a double major combining electrical engineering with physics, mathematics, economics, languages, or other disciplines.

Students contemplating a major in electrical engineering should take:
Mathematics 101, 102, 211, 212 (or the corresponding honors courses)
Physics 101, 102, 132
Electrical Engineering 220
Engineering 241
Three courses plus one laboratory selected from: Chemistry 101, 102, 107, Physics 211, 212, 231
One of the following to satisfy the B.S. requirement for an engineering science course from another engineering department: Engineering 200, 211, Materials Science 245, 395
Electrical Engineering 301, 305, 320, 326, 342 (all of these courses are required for the B.S. degree, while any four of them are required for the B.A. degree)

Although a general program of study can be arranged, the program in electrical engineering may be described in terms of four major areas of concentration. This program consists of six courses taken in the area of concentration (see below) and two related electrical engineering courses outside the major area. For the B.S. degree, one

minor course must be an engineering science course, and the other must be an engineering design course, except for those concentrating in Computer Science and Engineering, who must take two engineering science courses. The classification of electrical engineering courses as to engineering science or design is given below in the course descriptions.

Bioengineering

Modern medicine and research in health-related sciences make increasing use of engineering methods and instrumentation. With proper selection of electives, the undergraduate program represents an excellent preparation for medical school. The major area courses are Mathematical Sciences 335, Electrical Engineering 380, 381, 401, 442, 482.

Circuits, Controls, and Communication Systems

This specialization is composed of three subareas: (1) circuits and electronics, (2) dynamics and control, and (3) information processing and communications. These are closely related and generally involve the study of processing and communicating signals and information through systems of devices. The major area courses are Mathematical Sciences 335, Electrical Engineering 331, 401, 430, 436, and one of Mathematical Sciences 353, 460, 463.

Computer Science and Engineering

This program is divided into the following three topics: (1) hardware engineering, (2) software engineering, and (3) discrete system modeling. The major area courses are Mathematical Sicences 381, Electrical Engineering 316, 321, 425, 416 or 420, 421 or 426.

Lasers, Microwaves, and Solid-State Electronics

This area of concentration permits undergraduate students to study and participate in several specialties, including laser fusion technology, optical communication systems, application and development of tunable laser devices, semiconductor devices capable of very high frequency oscillations and large gain bandwidth modulation, sensitive and fast infrared and submillimeter detector devices that can be used in astronomy, and integrated optics and circuits. The major area courses are Mathematical Sciences 340, Electrical Engineering 306, 459, 461, 462, 463.

In addition to the departmental requirements for the major, students seeking the B.A. degree must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 130 semester hours. For the B.S. degree, no fewer than 42 semester hours outside departmental requirements for a total of 132 semester hours are required. See Degree Requirements and Majors, pages 50-51.

Graduate Program. Requirements of a general nature for advanced degrees are outlined on pages 90-92. Students should consult departmental advisers for specific courses of study.

A candidate for the professional degree of Master of Electrical Engineering is required to complete an approved sequence of ten advanced courses. See Professional Degrees in Engineering, page 92-94.

A candidate for the Master of Science degree in the Department of Electrical Engineering is required to complete an approved course of study. In addition, the candidate is required to complete an approved research program and submit an acceptable thesis. A semester or more of supervised teaching is required as a valuable part of graduate education.

The granting of the Doctor of Philosophy degree presupposes academic work of high quality and demonstrated ability to do independent and creative research. To be admitted to candidacy, the student must obtain high standing in an approved course

program and perform satisfactorily on qualifying examinations. Normally, the candidate completes the requirements for an M.S. degree as part of the Ph.D. program. Qualified students may, upon recommendation of the department and approval of the Graduate Council, enter a program leading directly to the Doctor of Philosophy degree after completing the bachelor's degree. The candidate must participate in a program of supervised teaching. Emphasis is placed on research leading to a satisfactory dissertation. Each candidate takes a final oral examination. The doctoral candidate should expect to spend a minimum of three academic years of graduate study in this program.

In addition to the regular graduate programs, there are four interdisciplinary graduate programs designed particularly for those who received their previous degree(s) in mathematics, physics, chemistry, or other sciences, including undergraduate engineering science programs, but who have become interested in the engineering applications appropriate to a particular field of science. These programs are systems theory, solid-state electronics and materials science, computer science, and bioengineering.

Bioengineering

Electrical Engineering Courses

380a. Introduction to Medical Physiology and Biophysics I (3-0-3).
An introductory course in physiology and biophysics stressing the analytical approach to the study of living systems. This is the first course of a two-semester sequence that emphasizes the integrative nature of the vertebrate nervous system and external environments of the body. Engineering Science. *Mr. Clark*

381b. Introduction to Medical Physiology and Biophysics II (3-0-3).
This course consists of two parts; the first is a continuation of Electrical Engineering 380 that primarily treats autonomic nervous system control of the internal environment of the body. Several internal regulatory systems are discussed including the cardiovascular, pulmonary, and renal systems. The second half of the course deals with the basic elements of measurement in biological systems. Topics include the basic elements of bioinstrumentation, biopotential amplifiers, electrodes, blood pressure, and flow measurement techniques. A term project is required. Prerequisite: Electrical Engineering 380. Engineering Design. *Mr. Clark*

482a. Biomedical Instrumentation (3-0-3).
A survey of transducers and electronic instrumentation systems related to biomedical engineering and selected clinical problems. Topics include advanced topics in operational amplifier design and biomedical transduction, analog and digital computer applications in laboratory research and clinical medicine, medical ultrasonic techniques and various medical imaging systems. A laboratory project is required. Prerequisite: Electrical Engineering 380, 381, 342. Engineering Design. *Mr. Clark*

507a. Nonlinear Analysis (3-0-3).
An introduction to methods frequently employed in the analysis of nonlinear systems. Analytical methods, including singular point and phase plane analysis, perturbation methods, and describing function analysis, are presented first, followed by a treatment of analog and digital computer methods for solving nonlinear differential equations and simulating nonlinear systems. The techniques of sensitivity analysis and parameter estimation are also discussed. Prerequisite: Electrical Engineering 301, 401, or permission of instructor. *Mr. Clark*

580b. Mathematical Modeling of Physical Systems: Applications in Biomedical Engineering (3-0-3).
This course extends the material covered in Electrical Engineering 507 to the modeling of physical systems, including many interesting biological problems. Advanced topics on the numerical solution of ordinary and partial differential equations are covered, as well as advanced topics in sensitivity analysis and parameter estimation as they are applied to the modeling of physical systems. Examples are chosen from the areas of automatic control theory, transport processes in chemical reactors, and biological systems of many types. Prerequisite: Electrical Engineering 507 or permission of instructor. *Mr. Clark*

581a. Cardiovascular Dynamics (3-0-3).
Analysis of the properties and function of the cardiovascular system, including a detailed study of the hemodynamics; ventricular mechanics; neural regulation of blood pressure, heart rate, and myocardial contractility; conduction system defects, cardiovascular-pulmonary-renal system interactions; mechanical circulatory-assist and total replacement devices; x-ray and ultrasonic methods for cardiac imaging. Prerequisite: Electrical Engineering 380, 381, 482. Offered alternate years. *Mr. Clark*

587b. Computers in Biomedicine (3-0-3).
Modern treatment of techniques for digital signal processing. Curve fitting, Fourier analysis, and digital filtering are treated in one and two dimensions. Image processing and computer graphic methods are presented. Digital computers are used to solve practical problems of interest in biomedicine. Not offered every year. *Staff*

Circuits, Control, and Communication Systems

Electrical Engineering Courses

301a,b. Circuit and System Theory (3-0-3).
Analysis of linear systems using circuits as the primary example. Time and frequency domain analysis: solution of differential equation, convolution, and the Laplace transform. State-variable analysis. Limited enrollment. Prerequisite: Engineering 241. Engineering Science. *Mr. Parks, Mr. Johnson*

331a,b. Introduction to Applied Probability (3-0-3).
Concepts, interpretations, elementary techniques, and applications of modern probability theory, including a brief introduction to statistical inference. Prerequisite: Mathematics 102 or 103. Also offered as Mathematical Sciences 381. Engineering Science. *Mr. Lutes, Mr. Pfeiffer*

342a,b. Electronic Circuits (3-4-4).
Models of transistors, FETs and vacuum tubes. Biasing methods, two-port analysis, single and multistage amplifiers, frequency domain characteristics, feedback, stability, oscillators, power amplifiers. Prerequisite: Engineering 241. Engineering Design. *Mr. Leeds*

401a. Signals and Linear Systems (3-0-3).
Unified study of signals and linear systems. Representation and analysis of signals using Fourier transforms and convolution with application in modulation, sampling, and spectral analysis. Relation of Fourier, bilateral Laplace, and Z-transforms. Transfer function and state variable representation of linear systems. Prerequisite: Electrical Engineering 301 and a knowledge of complex variable theory. Engineering Science. *Mr. Burrus, Mr. de Figueiredo*

403a. Electromechanical Systems (3-0-3).
Magnetic circuits and transformers, energy and forces in electric and magnetic field systems, lumped parameter electromechanics, rotating machinery and transducers, dynamics and control of electromechanical systems. Prerequisite: Electrical Engineering 305. Offered alternate years. Engineering Science. *Mr. Leeds*

404b. Electrical Power Systems (3-0-3).
Power transmission lines; representation of power systems; transient behavior of machines; faults on power systems; control of power systems. Engineering Science. *Mr. Leeds*

430b. Introduction to Communication Theory and Systems (3-0-3).
Review of applied probability theory. Introduction to stochastic processes. Complex-signal analysis. AM and FM. Digital communication, PCM, signal transmission, optimum receiver theory, information theory and coding. Prerequisite: Electrical Engineering 401 and either Electrical Engineering 331 or Mathematical Sciences 382. Engineering Science. *Mr. Johnson*

436b. Control Systems I (3-0-3).
Representation, analysis, and design of simple control systems in the frequency domain. Prerequisite: Electrical Engineering 301. Engineering Design. *Mr. Pearson*

442a. Advanced Electronic Circuits (3-0-3).
Electronic circuits used in communication and other systems, including principles of feedback, modulation, detection, and active filtering. Emphasis on design using integrated circuits. Prerequisite: Electrical Engineering 342. Engineering Design. *Mr. Leeds*

501a. Linear System Theory (3-0-3).
Advanced topics in linear systems. Realization theory. Matrix fraction description of multivariable systems. Not offered every year. *Mr. Pearson*

502b. Network Synthesis (3-0-3).
Theoretical and practical aspects of network synthesis and filter design: realizability, one-port synthesis, approximation methods, two-port synthesis and filter design, and active filter synthesis. Prerequisite: Electrical Engineering 401. Offered alternate years.
Mr. Burrus

507a. Nonlinear Analysis (3-0-3).
Analytical methods, including singular point and phase plane analysis, perturbations, and describing function; analog and digital computer simulation; parameter identification.
Mr. Clark

530a. Digital Communication Theory (3-0-3).
Review of stochastic processes; Karhunen-Loeve expansion; transmission and reception of digital signals over a variety of channels; intersymbol interference and equalization. Additional topics vary from year to year in modern communication theory. Prerequisite: Electrical Engineering 430. *Mr. Johnson*

531a. Digital Filtering (3-0-3).
Digital filtering and signal processing. Sampling, quantization and signal representation, Z transform methods, recursive and nonrecursive filters, frequency and time domain approaches, the Fast Fourier Transform. Prerequisite: Electrical Engineering 401. *Mr. Burrus*

532b. Signal Theory (3-0-3).
Finite dimensional signal representation, choice of exponentials — Prony, Pade methods. Soectral estimation-maximum entropy, maximum likelihood. Speech coding, separation of overlapping signals. Interpolation and extrapolation. Prerequisite: Electrical Engineering 401, 531. *Mr. Parks*

533a. Second-Order Processes (3-0-3).
Concepts of random processes. Second-order processes: Hilbert space ideas, covariance analysis, spectral representation, and mean-square calculus. Prerequisite: introductory course in probability. Also offered as Mathematical Sciences 484. Not offered every year.
Ms. Abrahams

534a. Estimation Theory (3-0-3).
Review of stochastic processes with emphasis on Gaussian processes. The effects of linear and memoryless nonlinear systems on stochastic signals. Estimation techniques. Hilbert space concepts. Wiener and Kalman filtering. Prerequisite: Electrical Engineering 430 or an introductory course in stochastic processes. Also offered as Mathematical Sciences 581.
Mr. de Figueiredo

535b. Information and Coding Theory (3-0-3).
Introduction to information theory concepts; basic theorems of channel coding and source coding with a fidelity criterion. Techniques of channel coding, parity check codes, introduction to algebraic coding theory, introduction to convolutional codes. Variable-length source coding. Prerequisite: Electrical Engineering 331 or Mathematical Sciences 382. Also offered as Mathematical Sciences 585. Not offered every year. *Ms. Abrahams*

536a. Control Systems II (3-0-3).
Multivariable control system analysis and design. Controllability, observability, stabilizability. Introduction to linear, quadratic, Gaussian optimization. Multivariable gain and phase margin. Stability robustness. Prerequisite: Electrical Engineering 436.
Mr. Pearson

537b. Advanced Stochastic Processes (3-0-3).
Brief introduction to measure-theoretic probability. Separability and measurability, analytic properties of sample functions. Second-order processes, covariance analysis, spectral representation, mean-square calculus. Stochastic calculus. Introduction to continuous-parameter martingales. Prerequisite: Electrical Engineering 533 or 534. Also offered as Mathematical Sciences 582. Not offered every year. *Ms. Abrahams*

538b. Pattern Recognition (3-0-3).
Some or all of the following topics will be treated: statistical techniques for pattern classification, feature extraction, and supervised and unsupervised learning; elements of perception theory and cluster analysis; syntactic pattern recognition techniques. Prerequisite: Mathematical Sciences 480 or 481. Also offered as Mathematical Sciences 583. Not offered every year. *Mr. de Figueiredo*

539b. Digital Image Processing and Scene Analysis (3-0-3).
Image formation systems, image sampling and quantization, image transforms, image enhancement and restoration, image encoding, scene analysis. Not offered every year.
Mr. de Figueiredo

632b. Speech Signal Processing (3-0-3).
Acoustic models of speech production. Pitch and format structure of speech. Estimation of speech spectra: short-time Fourier analysis, filter banks, homomorphic signal processing, auto-regressive models. Pitch detection. Vocoding algorithm: channel vocoders, homomorphic vocoders, linear predictive vocoders. Prerequisite: Electrical Engineering 531. *Mr. Johnson*

695b. Digital Image Processing (3-0-3).
Includes an introductory review of image forming and processing systems. Sampling and quantization, transformation, enhancement, restoration, and encoding of images. Scene analysis concludes the course. Not offered every year. *Mr. de Figueiredo*

696b. Seminar in Digital Signal Processing (3-0-3).
Advanced topics in digital signal processing. *Mr. Burrus, Mr. Parks*

Computer Science and Engineering

Electrical Engineering Courses

220a,b. Introduction to Computer Science and Engineering (3-3-4).
Semi-self-paced introduction to programing for students in computer science and engineering. Also offered as Mathematical Sciences 220 and Computer Science 220. Engineering Design.

316a. Introduction to Discrete Structures (3-0-3).
Set theory; relations mapping; algebraic systems such as semigroups, groups, rings, and fields; graph theory; Boolean algebra; and propositional logic. Also offered as Mathematical Sciences 316 and Computer Science 316. Engineering Science.

320a,b. Computer Organization and Software (3-4-4).
Basic computer architecture and assembly language programing. Systems software, including loaders and assemblers. Input-output devices and programing. Prerequisite: Electrical Engineering 220. Also offered as Mathematical Sciences 320 and Computer Science 320. Engineering Design.

321a,b. Advanced Programing (3-3-4).
Advanced programing methods, including structured programing, team programing, data structures, searching and sorting, data management, and information retrieval. Also offered as Mathematical Sciences 321 and Computer Science 321. Prerequisite: Electrical Engineering 220. Engineering Design.

326a,b. Digital Logic Design (3-3-4).
Gates, flip-flops, combinational and sequential switching circuits, registers, data transfer and circuits, logical and arithmetic operators. Prerequisite: Electrical Engineering 220 and Computer Science 322. Also listed as Computer Science 326. Engineering Design.

416b. Automata and Formal Languages (3-0-3).
Finite automata, regular expressions, regular languages, pushdown automata, context-free languages. Turing machines, recursive languages, computability, and solvability. Prerequisite: Electrical Engineering 316. Also offered as Mathematical Sciences 416, Computer Science 416, and Linguistics 416. Engineering Science.

420b. Algorithms and Data Structures (3-3-4).
Design and analysis of computer algorithms. Models of computation, data structures, and efficiency considerations. Prerequisite: Electrical Engineering 316, 321. Also offered as Mathematical Sciences 420 and Computer Science 420. Engineering Science.

421a. Systems Programing (3-3-4).
Introduction to the design and construction of important software systems programs including assemblers, compilers, and operating systems. Introduction to concurrent programing. Prerequisite: Electrical Engineering 316, 320, 321. Also offered as Mathematical Sciences 421 and Computer Science 421. Engineering Design.

425b. Computer Systems (3-3-4).
Memory utilization, storage management, addressing, control, and input-output microprograming. Comparison of solutions to computer system design problems. Prerequisite: Electrical Engineering 320, 331. Also listed as Computer Science 425. Engineering Science.

426a. Digital System Design (3-3-4).
Digital system organization, microprogramed control units, bus architectures, microprocessors, memory organizations, and high speed arithmetic. Prerequisite: Electrical Engineering 320, 326. Also listed as Computer Science 426. Engineering Design.

427a. Pulse and Digital Circuits (3-3-4).
Oscillators; timing circuits; bistable, monostable, and astable circuits. Diode gates and selection matrices. Trigger circuits and blocking oscillators. Emphasis on discrete component solid-state technology. Prerequisite: Electrical Engineering 342. Engineering Design.

518a. Analysis Techniques for Combinatorial Algorithms (3-0-3).
Analysis of problem complexity; matrix multiplication, primality testing, string matching, NP-complete problems approximation algorithms, lower bound techniques. Outside reading and term project. Prerequisite: Electrical Engineering 416, 420. Also offered as Mathematical Sciences 518 and Computer Science 518.

520a. Operating Systems (3-3-4).
Operating systems as a resource manager; memory management, including allocation, virtual memory, and sharing; scheduling; concurrent processes, including process synchronization and communication and deadlocks; protection and file systems. Prerequisite: Electrical Engineering 331, 420, 421, 425. Also offered as Mathematical Sciences 520 and Computer Science 520.

521b. Artificial Intelligence (3-3-4).
Techniques for simulating intelligent behavior by machine: problem solving, game playing, pattern perceiving, theorem proving, semantic information processing, and automatic programing. Prerequisite: Electrical Engineering 420, Mathematical Sciences 381. Also offered as Mathematical Sciences 521, Computer Science 521, and Linguistics 521.

523b. Compiler Construction (3-3-4).
Advanced topics in the design of programing language compilers, including parsing, run-time storage management, code generation and optimization, and error recovery. Prerequisite: Electrical Engineering 416, 421. Also offered as Mathematical Sciences 523 and Computer Science 523.

525b. Advanced Computer Organization (3-0-3).
Advanced concepts in computer systems organization and computer architecture. Prerequisite: Electrical Engineering 425. Also offered as Computer Science 525.

527b. Advanced Digital Components (3-0-3).
Generation, distribution, and measurement of nanosecond pulses. Structure of high speed arithmetic units, especially pipe line form. Detailed analysis of particular high speed logic elements. Prerequisite: Electrical Engineering 427.

528a. Digital System Projects (1-6-3).
Design projects involving the specification design, construction, and testing of microprocessor-based digital systems. Prerequisite: Electrical Engineering 426. Also listed as Computer Science 528.

621b. Principles of Programing Languages (3-0-3).
The logical design and efficient implementation of programing languages. Prerequisite: Electrical Engineering 321, 416, 420. Also offered as Computer Science 621 and Mathematical Sciences 621.

623. Advanced Compiler Construction (3-0-3).
Advanced topics in construction of programing language translators. Prerequisite: Computer Science 523. Also offered as Computer Science 623 and Mathematical Sciences 623.

Lasers, Microwaves, and Solid-State Electronics

Electrical Engineering Courses

305a,b. Electromagnetic Fields and Waves (3-3-4).
Distributed systems. Transmission lines. Smith Charts and impedance matching. Static and oscillatory fields. Maxwell's equations. Interaction of waves with media antennae. Engineering Science. *Mr. Kim, Mr. Wilson*

306b. Electromagnetic Field Theory (3-0-3).
Electrostatic fields and boundary value problems. Magnetic fields and interaction with materials. Time dependent electromagnetic fields. Plane waves, waveguides, and resonators. Engineering Science. *Mr. Gordon*

459a. Introduction to Quantum Mechanics (3-4-4).
Schroedinger's equation; harmonic oscillators; band theory of solids; hydrogen molecule; spins and angular momentum; interaction of matter with radiation; spectroscopy; scattering processes and nonlinear susceptibility; quantum statistics; transport phenomena. Engineering Science. *Mr. Kim*

461a. Electrical Properties of Materials (3-0-3).
Properties and parameters of magnetic, dielectric, conducting, and semiconducting materials important in the understanding of device characteristics. Corequisite: Electrical Engineering 459. Engineering Science. *Mr. Rabson*

462b. Semiconductor Devices (3-4-4).
Physical principles and operational characteristics of semiconductor devices. Prerequisite: Electrical Engineering 461. Engineering Design. *Mr. Rabson*

463b. Quantum Electronic Devices (3-0-3).
Lasers, optoelectronics, integrated optics, nonlinear optics, holography and optical processing. Engineering Science. *Mr. Rabson*

505a. Advanced Electromagnetic Field Theory (3-0-3).
Boundary-value problems in electrostatics and magnetostatics. Propagation of electromagnetic waves in free space, in conducting media, and in anistropic dielectrics. *Mr. Tittel*

506. Applications of Electromagnetic Field Theory (3-0-3).
Waveguides and cavities, antennae, diffraction, holography, magnetohydrodynamics, and radiation from moving charges. Not offered every year. *Mr. Tittel*

560a. Very Large Scale Integration (3-0-3).
A study of VLSI technology and design. MOS devices, characteristics and fabrication. Logic design and implementation. VLSI design methodology, circuit simulation and verification. An actual circuit will be used as a study model, and variations on design and implementation will be investigated. *Mr. Burrus, Mr. Jump, Mr. Sinclair, Mr. Wilson*

561. Electronic Conduction in Materials (3-0-3).
Not offered every year. *Staff*

562a. Microwave Engineering (3-4-4).
Waveguides and resonant cavities. Scattering matrix, application to two-, three-, and four-port devices. Broadband transformers, couplers, and filters. Microwave generation. Tensor susceptibility and nonreciprocal devices. Prerequisite: Electrical Engineering 306. *Mr. Wilson*

563a. Introduction to Solid-State Physics I (3-0-3).
Fundamental concepts of crystalline solids, including crystal structure, band theory of electrons, and lattice vibration theory. Also listed as Physics 563 and Mathematical Sciences 563. *Mr. Rorschach*

564b. Introduction to Solid-State Physics II (3-0-3).
Continuation of Electrical Engineering 563, including scattering of waves by crystals, transport theory, and magnetic phenomena. Also listed as Physics 564 and Mathematical Sciences 564.

565. Dielectric and Optical Properties of Solids (3-0-3).
Static and dynamic models of dielectric media, dielectric dispersion, laser applications, nonlinear interactions between radiation and matter. Also offered as Chemistry 565, Physics 565, and Materials Science 565. Not offered every year.

566. Imperfections and Mechanical Properties of Crystalline Solids (3-0-3).
Effect of lattice imperfections, such as point defects, dislocations, phonons, electrons, etc., upon the physical and mechanical properties of crystals. Not offered every year.

567b. Magnetism and Magnetic Resonance (3-0-3).
Magnetic properties of solids: diamagnetism, paramagnetism, ferromagnetism, antiferromagnetism, and ferrimagnetism. Magnetic resonance: nuclear magnetic resonance, electron paramagnetic resonance, and ferromagnetic resonance. Prerequisite: Electrical Engineering 563 or equivalent. Also listed as Materials Science 567 and Physics 567. Not offered every year.

568b. Quantum Electronics Engineering (3-0-3).
Quantum theory of optical lasers involving photon statistics and nonlinear spectroscopy. Generation of optical laser pulses. Light scattering experiments. Parametric interaction of radiation with the plasma medium. *Mr. Kim*

591a. Optics (3-0-3).
Survey covering important aspects of classical optical theory, wave properties of light, and the Fourier analysis approach to physical optics. Holography, integrated optics, and fiber optics. *Mr. Tittel*

592b. Topics in Quantum Optics (3-0-3).
Latest developments in lasers, optical pumping, Raman and Brillouin spectroscopy, and mode locking. Not offered every year. *Mr. Rabson*

692. Advanced Topics in Microwave Engineering (1-0-1).
Not offered every year.

697. Seminar on Magnetics (3-0-3).
Not offered every year.

Research and Projects

Electrical Engineering Courses

490a,b. Electrical Engineering Projects (Credit variable).
Theoretical and experimental investigations under staff direction.

590a,b. Electrical Engineering Projects (Credit variable).
Theoretical and experimental investigations under staff direction.

690a,b. Research and Thesis (Credit variable).

700c. Summer Graduate Research.

800b. Degree Candidate Only.

Environmental Science and Engineering

The George R. Brown School of Engineering

Professor C.H. Ward, *Chairman*
Adjunct Professors Chambers, Characklis, Dunlap, Keeley, and Stallones
Associate Professors Bedient, Few, and Tomson
Adjunct Associate Professors Gesell, Pier, and Schaezler
Adjunct Assistant Professor J.T. Wilson

Degrees Offered: B.A., M.E.E., M.E.S., M.S., Ph.D.

Undergraduate Program. The major in environmental science (offered only as a double major with other fields of science or engineering) is intended for students wishing academic training oriented toward the solution of technical environmental problems and leads to the B.A. degree.

General requirements during the first two years include: two years of mathematics, two years of chemistry, and one year of physics. Specific courses to satisfy these requirements vary somewhat and should be determined in consultation with a departmental adviser. For the B.A. degree, a minimum of twelve semester hours of environmental science and engineering courses are required during the junior and senior years. The undergraduate B.A. double major curriculum has been designed with maximum flexibility and minimum specific requirements to encourage interdepartmental study with all other fields of science and engineering. A list of suggested electives in various fields of science, engineering, humanities, and social science is available for students desiring additional guidance or specialization.

The total number of semester hours required for the B.A. with a double major depends on departmental requirements for the other major. Generally, however, in addition to the departmental requirements for the majors, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 50-51.

Undergraduates interested in environmental engineering should contact the Department of Civil Engineering for information on the B.S. degree program with an environmental option.

The introductory course, Environmental Science 201, is intended for both majors and nonmajors. Humanities majors are encouraged to consider this course for science distribution requirements.

Successful completion of the four-year curriculum leading to the Bachelor of Arts with environmental science as part of a double major qualifies the student for possible admission to a fifth year of specialized study leading to the degree of Master of Environmental Science. Completion of a four-year curriculum leading to the Bachelor of Science in any field of engineering (civil and chemical preferred) qualifies the student for possible admission to a fifth year of specialized study leading to the degree of Master of Environmental Engineering. These recognized professional degrees in the environmental field are differentiated on the basis of science or engineering orientation. Outstanding students wishing to pursue careers in teaching and research are qualified for graduate study after the B.A., B.S., M.E.S., M.E.E., and M.S. degrees.

Graduate Program. The graduate programs in environmental science and environmental engineering are interdepartmental activities and lead to the Master of Science and Doctor of Philosophy degrees. Applicants for admission to the environmental science program may hold the baccalaureate or master's degree in any of the sciences or mathematics. Applicants for the environmental engineering program must hold accredited baccalaureate or master's degrees in an area of engineering. Although the main research activities in the department are concerned with water and waste water engineering, water resource management, and applied water chemistry, the program serves as the focal point for universitywide study and research in the broad human-environment problem spectrum. Faculty members from the Departments of Chemical and Electrical Engineering, Architecture, Biology, Geology and Economics participate in this interdisciplinary research. Graduate students enrolled in any of these departments and interested in environmental problems for thesis topics may use facilities of the Department of Environmental Science and Engineering and are eligible for financial assistance in the form of graduate traineeships, research assistantships, and fellowships.

Candidates for the Master of Science or Doctor of Philosophy degrees may pursue course programs designed to both complement and supplement their

backgrounds through major and minor emphasis areas. However, formal minors are not required. University requirements for the advanced degrees are presented on pages 90-92.

Graduate students in environmental science or engineering take the majority of their courses in other departments. A candidate for the Master of Science degree must complete a minimum of eight approved semester courses and present and defend, in oral examination, a research thesis. Normally, two academic years and the intervening summer are required for the degree.

Candidates for the Doctor of Philosophy must demonstrate their competence in three areas through qualifying examinations. The areas of competence may correspond to the candidate's areas of major and minor course emphasis. The thesis must document and be defensible evidence of the candidate's ability to do original research in a specialized phase of environmental science or engineering.

Environmental Science and Engineering Courses

201a. Introduction to Environmental Systems (3-3-4).
Chemical, physical, and biological components of the environment and the effects of pollution on their maintenance and utilization. *Mr. Ward*

311a. Applied Fluid Mechanics (3-3-4).
Fundamental principles of fluid statics and fluid flow in closed conduits; laboratory exercises. Also offered as Civil Engineering 363. *Mr. Bedient*

401a. Measurements in Environmental Systems (2-6-4).
Various analytical and instrumental techniques for measurement of the physical and chemical properties of air and water. *Mr. Tomson*

402b. Laboratory Study of Environmental Processes (2-6-4).
Unit process experiments demonstrate the use of natural and modulated water pollution control. *Mr. Tomson*

403a. Urban Water Systems (3-0-3).
Municipal water cycle, including water supply, disbribution, and consumption, and waste water collection, treatment, and disposal. *Staff*

405a. Fundamentals of Air Pollution (3-0-3).
Human health effects; sources of air pollution. Properties and processes of the atmospheric medium; stability, turbulence, mixing, transport of pollutants, radiation, photochemistry, aerosol physics, and precipitation. Also offered as Mechanical Engineering 479 and Chemical Engineering 427. *Staff*

406b. Introduction to Environmental Law (3-0-3).
Legal techniques used by societies to plan and regulate the use of environmental resources. *Staff*

412b. Hydrology and Watershed Analysis (3-3-4).
Fundamentals of the hydrologic cycle, hydrograph techniques, flood routing, and open channel flow; local watershed application. Also offered as Civil Engineering 464. *Mr. Bedient*

443a. Introduction to Atmospheric Science (3-0-3).
Fundamentals of meteorology, climatology, and predictive meteorology and climatology. Also offered as Space Physics 443 and Mechanical Engineering 477. Not offered 1982-83. *Mr. Few*

444b. Atmospheric Dynamics (3-0-3).
Hydrodynamic equations of motion on a rotating planet are derived and used to study mesoscale and macroscale weather systems on the earth and other planets. Also offered as Space Physics 444 and Mechanical Engineering 478. Not offered 1982-83. *Mr. Few*

446a. Seminar on Natural Environmental Factors in Community Development (3-0-3).
Readings, discussion, and review of data sources on natural environmental factors affecting and affected by the development of the built environment. Also listed as Architecture 646. *Mr. Blackburn*

458b. Explorations in Energy Supply and Demand (3-0-3).
Overview of potential future sources of energy and alternatives for demand reduction. In addition to numerous lectures concerning specific alternatives, special attention is directed to the environmental issues attendant to various alternative courses of action. Also listed as Architecture 458/658. *Mr. Blackburn*

490b. Special Study and Research for Undergraduates (0-9-3).
Open to environmental science or engineering majors with superior records and with permission of the chairman. Written thesis required. *Staff*

511a, 512b. Environmental Physiology and Toxicology (3-0-3 each semester).
Physical and chemical environment as it affects the physiology and population dynamics of organisms (including humans). Stability and maintenance of biogeochemical cycles. *Staff*

517a. Water Resource Systems (3-0-3).
Theories of urban hydrology, stream pollution analysis, and water quality modeling of storm runoff and reservoir systems. Offered alternate years. *Mr. Bedient*

518b. Groundwater Hydrology and Pollutant Transport (3-0-3).
Topics include groundwater hydrology, chemistry, and geology. Concepts of pollutant transport applied to groundwater contamination problems will be covered and applied to actual case studies. Offered alternate years. *Mr. Bedient*

528b. Air Pollution and Its Abatement (3-0-3).
Atmospheric physics and chemistry of gaseous and particulate pollutants: relationship between emissions and air quality; engineering, economics, and politics of abatement. Also offered as Chemical Engineering 528. *Staff*

536b. Microbial Engineering (3-0-3).
Synthesis of water and waste water treatment systems. Biological processes as applied to industrial waste treatment. *Staff*

550b. Applied Water Chemistry (3-0-3).
Designed to provide a theoretical basis for considering the chemistry of natural and waste waters and treatment processes. *Staff*

601a, 602b. Seminar (3-0-3 each semester).
Continuing seminar on environmental research. *Staff*

631a, 632b. Advanced Topics in Microbial and Chemical Engineering Processes (Credit variable).
Emphasizes topics of water quality control and chemical production. *Staff*

633a, 634b. Advanced Topics in Urban Water Quality (Credit variable).
Lecturers in general areas of urban hydrology, water quality models, and computer techniques. Emphasizes student projects and reports. *Mr. Bedient*

635a, 636b. Advanced Topics in Water Chemistry (Credit variable).
Formal lecture and assigned reading in topics such as redox kinetics and thermodynamics, adsorption and desorption, and the associated mathematics. *Mr. Tomson*

641a, 642b. Advanced Topics (3-0-3 each semester).
Discussion and interpretation of current literature and research relevant to the environmental sciences in a seminar setting. *Staff*

651a, 652b. Research and Thesis (Credit variable).
For the Master of Science.

700c. Summer Research (Credit variable).

751a, 752b. Research and Thesis for the Doctorate (Credit variable).

800b. Degree Candidate Only.

Mechanical Engineering and Materials Science

The George R. Brown School of Engineering

Professor W.F. Walker, *Chairman*
Professors Beckmann, Bowen, Brotzen, Chapman, Cheatham, McLellan, Miele, J.M. Roberts, Wang (on leave fall 1981), **and Wierum**
Adjunct Professor Paslay
Associate Professor Bayazitoglu
Adjunct Associate Professor Lawrie
Assistant Professor Pharr
Adjunct Assistant Professor Harkins

Degrees Offered: B.A., B.S., M.M.E., M.M.S., M.S., Ph.D.

Undergraduate Program. Undergraduate programs offered by this department lead to the degrees of Bachelor of Arts (with a major in mechanical engineering or materials science), Bachelor of Science in Mechanical Engineering, and Bachelor of Science in Materials Science.

The programs in mechanical engineering may, by proper choice of electives, lead to specialization in one of several options: thermal sciences and energy conversion, gas dynamics, hydrodynamics and ocean engineering, stress analysis and mechanical behavior of materials, aerospace engineering, and materials engineering. The programs in materials science provide the student with knowledge of the production, fabrication, and properties of materials used by engineers. The B.A. programs are highly flexible, involve less technical content, and allow the student to pursue more deeply areas of interest outside of engineering. The B.S. programs, both accredited by the Accreditation Board for Engineering and Technology, have higher content of scientific and technical courses and prepare the student for the professional practice of engineering.

The basic university requirements for the B.A. and B.S. programs are summarized under Degree Requirements and Majors (pp. 50-51) and Engineering and Applied Science (pp. 154-55). The detailed requirements are summarized below. Lists of representative courses and their normal sequence during the students' undergraduate years are available from the department for either the B.A. or B.S.programs in both mechanical engineering or materials science.

Students seeking the B.A. degree with a major in mechanical engineering must satisfy the university distribution requirements while completing not less than 75 semester hours in courses specified by the department and not less than 60 additional semester hours. Those seeking the B.A. degree with a major in materials science must satisfy the university distribution requirements while completing not less than 54 semester hours in courses specified by the department and not less than 75 additional semester hours.

Students seeking the accredited B.S. in Mechanical Engineering must satisfy the university distribution requirements while completing not less than 42 semester hours in courses unspecified by the department and not less than the 92 semester hours comprised by the following courses.

Mathematics 101, 102, 211, 212
Mathematical Sciences 343
Physics 101 or 111, 102 or 112, and 132
Chemistry 101, 102, 107

Engineering 200, 211, 240, 241
Materials Science 395, 397
Mechanical Engineering 311, 312, 331, 332, 340, 371, 372, 402, 411, 412, 431, 432, 471, 481, 591
One approved major course of three semester hours

Students seeking the accredited B.S. in Materials Science must satisfy the university distribution requirements while completing not less than 47 semester hours in courses unspecified by the department and not less than the 87 semester hours comprised by the following courses:

Mathematics 101, 102, 211, 212
Mathematical Sciences 340 or 343
Physics 101 or 111, 102 or 112, and 132
Chemistry 101, 102, 107
Engineering 211, 240, 241
Mechanical Engineering 311
Materials Science 395, 397, 401, 402, 404, 406, 411, 535, 537
Two of the following: Materials Science 415, 453, 502, 541, 563, 569, 593
One of the following: Materials Science 543, 561, 562
One of the following: Chemistry 311, Engineering 200, Materials Science 245
One of the following: Chemistry 312, Physics 201, Physics 211
One approved major course of three semester hours

A suggested sequence in which courses should be taken is available from the department.

Professional and Graduate Programs. Advanced level programs offered by this department lead to the professional degrees of Master of Mechanical Engineering and Master of Materials Science and to the research degrees of Master of Science and Doctor of Philosophy in either mechanical engineering or materials science.

The professional degrees involve a fifth year of specialized study, integrated with the four prior years leading to either the B.A. or B.S. degrees in the same areas of interest described in the foregoing discussion of the undergraduate programs. The professional programs are open to students who have shown academic excellence in their undergraduate studies. Detailed university requirements for professional degrees are described under Professional Degrees (pp. 92-94) and involve the successful completion of 30 semester hours of course work. Suggested lists of courses are available from the department; however, specific programs are developed for each student according to interest.

The programs leading to the research degrees of M.S. and Ph.D. are open to students who have demonstrated outstanding performance in their undergraduate studies. The general university requirements for these degrees are outlined under Requirements for Research Degrees (pp. 90-92). Specific course requirements are variable, depending on preparation and performance in courses and on qualifying examinations, etc. The granting of a graduate degree presupposes superior quality academic work and a demonstrated ability to do original research. For both the M.S. and Ph.D. degrees, a thesis must be presented that comprises an original contribution to knowledge, and it must be defended in a public oral examination.

The research interests of the faculty and the laboratory equipment available provide the following areas of specialization: (1) engineering mechanics; (2) materials science; (3) fluid dynamics, gas dynamics, heat transfer, physical oceanography; (4) aeroastronautics; and (5) bioengineering.

Mechanical Engineering Courses

311a. Mechanics of Deformable Solids (3-0-3).
Analysis of stress and deformation of solids with applications to beams, circular shafts, and columns. Prerequisite: Engineering 211.

312b. Advanced Mechanics of Deformable Solids (3-0-3).
Torsion of noncircular sections, axially symmetric problems, beams on elastic foundations, energy methods, elastic stability, numerical methods. Prerequisite: Mechanical Engineering 311 or equivalent.

331a. Junior Laboratory I (0-3-1).
Static and impact testing of engineering materials. Beam deflection and shear center experiments are included. Strain gauges are applied and tested.

332b. Junior Laboratory II (0-3-1).
Instruction in fluid mechanics and thermodynamics.

340a,b. Industrial Process Laboratory (0-3-1).
Practical experience in and observation of selected industrial processes.

343. Mechanical System Dynamics and Analysis (4-0-4).
A study of the dynamics of mechanical systems and the development of the necessary analytical techniques. Prerequisite: Mathematics 211. Not offered every year.

371a. Fluid Mechanics I (3-0-3).
Introduction to fluid statics and dynamics; the development of the fundamental equations of fluid mechanics and their application to problems of engineering interest. Prerequisite: Engineering 200, 211, Mathematics 212.

372b. Fluid Mechanics II (3-0-3).
Continuation of Mechanical Engineering 371 devoted to airfoil theory, lubrication, boundary layers, and turbulence. Prerequisite: Mechanical Engineering 371.

378b. Acoustics (3-0-3).
Acoustic theory, atmospheric acoustics, room acoustics, attenuation, nonlinear effects, measurement techniques, transducers, and acoustical standards. Also offered as Electrical Engineering 308. Not offered every year.

402b. Mechanical Engineering Design (3-0-3).
Kinematics of linkages and cams, gears and gear trains; material properties; working stresses; safety factors; design of machine elements; design project. Prerequisite: Mechanical Engineering 311 or equivalent.

406b. Experimental Methods (3-3-4).
Instrumentation methods, analogs, analysis of experimental results, applications in controls. Prerequisite: permission of instructor. Also offered as Civil Engineering 406.

411a. Advanced Engineering Mechanics (3-0-3).
Application of energy methods in the study of particle and rigid-body dynamics, electric circuits, electromechanical systems, and continuous dynamic systems. Prerequisite: Engineering 211.

412b. Vibrations (3-0-3).
Analysis of discrete and continuous linear, mechanical, vibrating systems with particular emphasis upon multi-degree-of-freedom systems. Approximate methods are included. Prerequisite: Mechanical Engineering 411.

431a. Senior Laboratory I (0-3-1).
Instruction in gasdynamics, heat transfer, applied thermodynamics, and engine cycles.

432b. Senior Laboratory II (0-3-1).
Independent laboratory design and performance of reserach project of the student's choice under the direction of a staff member.

434b. Laboratory Project (0-9-3).
Designed for students who wish to pursue a special mechanical engineering design or laboratory project.

463a. Minimization of Functions (3-0-3).
Theory of maxima and minima. Analytical methods. Numerical methods. Also offered as Mathematical Sciences 463.

464b. Minimization of Functionals (3-0-3).
Optimal control theory. Calculus of variations. Analytical methods. Numerical methods. Also offered as Mathematical Sciences 464.

471b. Applications of Thermodynamics (3-0-3).
Applications of thermodynamics to various systems of interest in mechanical engineering with particular attention to energy conversion, refrigeration, and psychrometrics. Prerequisite: Engineering 200.

475a. Modeling and Model Testing (3-0-3).
Modeling laws for different flow phenomena are derived, and accuracy of test data is established.

476b. Fluid Machinery (3-0-3).
Emphasis on continuous flow mechanism, such as turbines and ship propellers. Prerequisite: Mechanical Engineering 371.

477a. Introduction to Atmospheric Science (3-0-3).
Fundamentals of meteorology and climatology including radiation transfer. Also offered as Space Physics 443. Not offered every year.

478b. Atmospheric Dynamics (3-0-3).
Hydrodynamic equations of motion on a rotating planet are derived and solutions demonstrated for static, stable, perturbed, and unstable flows. Also offered as Space Physics 444. Not offered every year.

479a. Fundamentals of Air Pollution (3-0-3).
Human health effects; sources of air pollution. Properties and processes of the atmospheric medium: stability, turbulence, mixing, transport of pollutants, radiation, photochemistry, aerosol physics, and precipitation. Also offered as Environmental Science and Engineering 405. Not offered every year.

481a. Heat Transfer (4-0-4).
General study of the principles of heat transfer by conduction, convection, and radiation and their application to problems of engineering practice.

482. Thermal Environmental Engineering (3-0-3).
Application of the principles of thermodynamics and heat transfer to the anaylsis of human comfort. Prerequisite: Mechanical Engineering 481. Not offered every year.

508. Perturbation Methods (3-0-3).
Approximate solutions of nonlinear equations using perturbation techniques. Not offered every year.

511a. Elements of Continuum Mechanics I (3-0-3).
Concepts and general principles common to all branches of solid and fluid mechanics. Applications include non-Newtonian fluid mechanics and nonlinear elasticity.

512. Elements of Continuum Mechanics II (3-0-3).
Applications of the concepts developed in Mechanical Engineering 511. Topics selected from thermoelasticity, electroelasticity, viscoelasticity, nonequilibrium thermodnynamics, and porous media theories. Not offered every year.

513b. Theory of Elasticity (3-0-3).
Fundamentals of linear elasticity and thermoelasticity. Applications include static and dynamic problems. Prerequisite: a first course in the mechanics of deformable bodies. Not offered every year.

514a. Theoretical Plasticity (3-0-3).
Isotropic and anistropic plastic flow; yield and loading surfaces, normality and convexity requirement, and hardening rules; plane plastic flow problems and slip-line field theory. Also offered as Civil Engineering 514. Not offered every year.

515b. Applied Plasticity (3-0-3).
Problems in limit analysis and design; plastic behavior of structures; flexure and torsion of prismatic members. Also offered as Civil Engineering 515. Not offered every year.

516. Advanced Dynamics (3-0-3).
Dynamics of a particle and systems of particles. Not offered every year.

517a. Finite Element Methods in Engineering (3-0-3).
Introduction to the finite element analysis with applications to problems in fluid and solid mechanics. Not offered every year.

518b. Elements of Flow in Porous Media (3-0-3).
Introduction to the dynamics of fluids flowing in deformable porous materials. Not offered every year.

521. Flight Mechanics (3-0-3).
Introduction to the performance, stability, and control of flight vehicles. Not offered every year.

530. Heat Exchanger Design (3-0-3).
Introduction to the fundamentals of the thermal design of heat exchangers; the design of a heat exchanger for a specified application. Not offered every year.

531. Solar Power (3-0-3).
A presentation of the basic scientific and engineering knowledge needed in the technical analysis of solar energy applications. Not offered every year.

563a. Minimization of Functions (3-0-3).
Same as Mechanical Engineering 463, with one exception: emphasis is placed on computer methods. Also offered as Mathematical Sciences 563.

564b. Minimization of Functionals (3-0-3).
Same as Mechanical Engineering 464, with one exception: emphasis is placed on computer methods. Also offered as Mathematical Sciences 564.

571a. Ocean Fluid Dynamics and Meteorology I (3-0-3).
Introduction to the fundamentals of ocean motion. Prerequisite: Mechanical Engineering 371, Chemical Engineering 401, or Civil Engineering 463.

572b. Structural Ocean Engineering (3-0-3).
Continuation of Mechanical Engineering 571 with applications to the static and dynamic response of structures. Prerequisite: Mechanical Engineering 571.

575. Energy Technology (3-0-3).
Energy utlization and resources; conventional conversion systems; central station power from fossil fuels; power plant design; alternative fuels; energy conversion systems. Not offered every year.

576. Propulsion (3-0-3).
Basic principles of gasdynamics, thermodynamics, and chemistry applied to prediction of the behavior of airbreathing and rocket propulsion devices. Not offered every year.

578. Combustion (3-0-3).
Study of physical and chemical processes of combustion with application. Not offered every year.

591a. Gasdynamics (3-0-3).
Fundamentals of compressible, one-dimensional gas flows with area change, normal shocks, friction, and heat addition; oblique shocks and Prandtl-Meyer flows. Prerequisite: Mechanical Engineering 371.

592b. Advanced Gasdynamics (3-0-3).
Principles and application of generalized one-dimensional gas dynamics. One-dimensional unsteady and two-dimensional steady compressible flows. Not offered every year.

593a,b. Mechanical Engineering Problems (Credit variable).
With approval, mechanical engineering students may elect an investigation or design project under the direction of a member of the staff.

594. Advanced Aerodynamics (3-0-3).
Development of theories for the prediction of aerodynamic forces and moments acting on airfoils, wings, and bodies and their design applications. Not offered every year.

600a,b. Research and Thesis (Credit variable).

601a,b-605a,b. Special Topics (Credit variable).

617, 618. Continuum Mechanics I, II (3-0-3 each semester).
Advanced topics in continuum mechanics. Not offered every year.

626. Theory of Elasticity II (3-0-3).
Special topics in the linear theory of elasticity. Not offered every year.

627. General Theory of Shells (3-0-3).
General linear theory of bending of elastic shells of arbitrary shape. Solution of problems of technical interest by exact and approximate methods. Not offered every year.

671, 672. Nonequilibrium Thermodynamics I, II (3-0-3 each semester).
Foundations of the thermodynamics of irreversible processes. Not offered every year.

673a, 674b. Advanced Fluid Mechanics I, II (3-0-3 each semester).
Conservation equations for viscous compressible fluids. Applications to viscous and inviscid flows. Simple flows of non-Newtonian fluids. Not offered every year.

675. Special Application of Fluid Dynamics (3-0-3).
Geostropic flows in oceanography investigated and applied to secondary flow phenomena of laminar and turbulent character. Not offered every year.

676. Turbulence (3-0-3).
General introduction to turbulence covering isotropic, free shear, and wall shear turbulence. Not offered every year.

682. Convective Heat Transfer (3-0-3).
Rigorous study of the transfer of heat by free and forced convection. Not offered every year.

683. Radiative Heat Transfer I (3-0-3).
Rigorous study of the transfer of heat by radiant exchange in the absence of absorbing media. Not offered every year.

684. Radiative Heat Transfer II (3-0-3).
Radiative transfer in the presence of absorbing, emitting, and scattering media; combined radiation, conduction, and convection. Heat transfer in furnaces, fire propagation, and air pollution problems. Not offered every year.

685. Conduction Heat Transfer (3-0-3).
Formulation and solution of steady, unsteady, and multidimensional conduction in different geometrics. Not offered every year.

697. Hypersonic Gasdynamics (3-0-3).
Not offered every year.

698. Physical Gasdynamics (3-0-3).
Equilibrium and nonequilibrium phenomena in the dynamics of high temperature gases. Not offered every year.

700c. Summer Graduate Research.

800b. Degree Candidate Only.

Materials Science Courses

245a. Thermodynammics of Engineering Materials (3-0-3).
Introduction to the kinetics and thermodynamics of engineering materials.

395a,b. Materials Science (3-0-3).
Introduction to the science of solid materials covering metals, ceramics, plastics, and semiconductors. The properties of solid materials from atomic and macroscopic points of view. Prerequisite: Mathematics 101.

397a,b. Materials Science Laboratory (0-3-1).
Introductory laboratory course composed of experiments which complement the lecture material of Materials Science 395.

401a. Thermodynamics and Transformations in Alloys (3-0-3).
Thermodynamics applied to systems of solid solutions and intermetallic compounds. Phase law and phase equilibrium. Determining free energies in binary systems. Simple models for transformations.

402a. Mechanical Properties of Materials (3-0-3).
Basic, fundamental properties of dislocations in crystals. Applications to mechanical behavior: creep, work hardening, internal friction, fracture, and other structure sensitive phenomena of materials. Prerequisite: Mathematics 211.

404b. Materials Engineering and Design (2-3-3).
Technological aspects of materials selection, design, failure, and analysis. Laboratory time is spent in an industrial setting. Prerequisite: Materials Science 395.

406b. Physical Properties of Solids (3-0-3).
Survey of electrical, magnetic, and optical properties of metals, semiconductors, and dielectrics based upon elementary band theory concepts. Prerequisite: Mathematics 211.

411b. Metallography and Phase Relations (3-0-3).
Microstructures which may be observed in metals and alloys; optical metallography in addition to more sophisticated techniques. Prerequisite: Materials Science 395.

415. Ceramics and Glasses (3-0-3).
Fundamentals of ceramic and glassy materials, including phase relations, theoretical properties, structure, and bonding. Prerequisite: Materials Science 395. Not offered every year.

453b. Extractive and Chemical Metallurgy (3-0-3).
Survey of nonclassical benefication, reduction, oxidation, and refining processes for the preparation of research and reactor grade metals. Prerequisite: Mathematics 101 and Engineering 200 or their equivalents.

502b. Imperfections in Solids (3-0-3).
Point, line, and planar defects in ionic, homopolar, and metallic solids. Prerequisite: Mathematics 101.

535a. Introduction to X-Ray Diffraction and Electron Microscopy (3-0-3).
Study of crystals by x-ray and electron diffraction and electron microscopy. Basic diffraction theory and methods for characteriziation of structure and constitution of materials. Prerequisite: Mathematics 101.

537a. X-Ray Diffraction and Electron Microscopy Laboratory (0-3-1).
Selected laboratory experiments to complement the lecture material of Materials Science 535.

541b. Physical Metallurgy (3-0-3).
Fundamentals of solidification, alloying, and heat treatment. The mechanical and nonmechanical properties of metallic systems from atomic and electronic theory. Prerequisite: Materials Science 395.

543b. Physical Metallurgy Laboratory (0-3-1).
Experiments to complement the course work of Materials Science 541. Prerequisite: Materials Science 541.

561a, 562b. Advanced Metallurgical Laboratory I, II (0-4-1 each semester).
Students whose interest lies primarily in the field of materials and metallurgy are given the opportunity for research in these fields. Prerequisite: permission of instructor.

563a. Introduction to Solid-State Physics I (3-0-3).
Fundamental concepts of crystalline solids, including crystal structure, band theory of electrons, and lattice vibration theory. Also offered as Electrical Engineering 563 and Physics 563.

564b. Introduction to Solid-State Physics II (3-0-3).
Continuation of Materials Science 563, including scattering of waves by crystals, transport theory, and magnetic phenomena. Prerequisite: Materials Science 564. Also offered as Electrical Engineering 564 and Physics 564.

565. Special Topics in Solids I (3-0-3).
Also offered as Electrical Engineering 565 and Physics 565. Not offered every year.

566. Special Topics in Solids II (3-0-3).
Also offered as Electrical Engineering 566 and Physics 566. Not offered every year.

567b. Magnetism and Magnetic Resonance (3-0-3).
Magnetic properties of solids. Diamagnetism, paramagnetism, ferromagnetism, antiferromagnetism, and ferrimagnetism. Nuclear magnetic resonance, electron paramagnetic resonnance, and ferromagnetic resonance. Also offered as Chemistry 567, Electrical Engineering 567, and Physics 567. Not offered every year.

569b. Corrosion Science and Engineering (3-0-3).
Survey of surface activity and corrosion processes on metals, semiconductors, and insulating materials. Prerequisite: Materials Science 395.

593a, 594b. Polymer Science and Engineering I, II (3-0-3 each semester).
Basic concepts in macromolecular chemistry and physics and their application in the production, processing, and use of synthetic polymers. Also offered as Chemical Engineering 593, 594. Prerequisite: Chemistry 211 and Materials Science 395 for 593; Materials Science 395 for 594.

604b. Defect Structure of Synthetic and Biological Polymers (3-0-3).
Theory of disclinations in solids. Application of the theory to organic polymers, liquid and Mobias crystals, and insect muscle. Not offered every year.

609b. Fracture Mechanics (3-0-3).
Theory of elasticity and theory of plasticity pertinent to fracture mechanics. Not offered every year.

615a,b. Special Topics (3-0-3).
Detailed course offering is based upon graduate student interest. Not offered every year.

634a. Thermodynamics of Alloys (3-0-3).
Relations between classical thermodynamics and statistical mechancis applied to understanding solid and liquid alloys. Solid-solid, liquid-solid, and gas-solid equilibria in metallurgy. Not offered every year.

635b. Transformations in Alloys (3-0-3).
Diffusion in metals and alloys. Mechanism and phenomenology of diffusion-controlled transformations. Precipitation from saturated alloys and liquid solutions. Transformations in heat treated alloys. Not offered every year.

636. Diffraction of Nonideal Crystals (3-3-4).
Advanced x-ray diffraction theory and experimental methods. Applications include crystal structure determination, order-disorder, thermal vibration, mechanical deformation, structure of amorphous materials, and others. Not offered every year.

646a. Mechanical Metallurgy (3-0-3).
Elastic, plastic, and viscous behavior of metallic and nonmetallic solids. The interpretation of mechanical behavior in terms of lattice-imperfection theory. Prerequisite: Materials Science 402 or 566. Not offered every year.

649. Ferromagnetic Theory and Devices (3-0-3).
Theory of magnetism. Magnetostatics. Dynamic behavior of magnetic materials. Magnetic thin films. Magnetic tape cores. Device characteristics. Prerequisite: an introductory course in solid-state theory. Also offered as Electrical Engineering 560. Not offered every year.

English

Professor Grob, *Chairman*
Professors Apple, Dowden, Huston, Isle,
Meixner (on leave spring 1981),
Morris (on leave spring 1981), **Nitzsche,**
Patten, Piper (on leave spring 1981),
Spears, and J.A. Ward
Associate Professors Doody, Doughtie, Driskill, and Skura
Assistant Professor R. Jones
Visiting Assistant Professor Roney
Instructor A.E. Williams
Lecturer Stout

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. A major in English requires thirty-six semester hours in English; at least twenty-four semester hours must be courses at or above the 300 level. A double major requires thirty semester hours in English, with at least eighteen hours at the advanced level. All English majors must take Masters of English Literature (English 251, 252) as a preparatory survey.

An English major must also take advanced courses in the following categories: (1) six semester hours in English literature before 1800, of which one course must be Chaucer, Shakespeare, or Milton; (2) three semester hours in English literature after 1800; (3) three semester hours in American literature.

It is recommended that all English majors take some formal instruction in English and American history and, if they plan to do graduate work, at least six semester hours at the advanced level in a foreign language.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 50-51.

The Graduate Program. The graduate program in English is designed for thorough training of a limited number of carefully selected students. Both the M.A. and Ph.D. degrees are offered to students interested in all fields of British and American literature and in literary theory.

As a part of their training, all graduate students are expected to serve as research assistants, to participate in the teaching activities of the department, or to assist the editor of *Studies in English Literature,* published by Rice University.

Within the limits of available funds, graduate scholarships and fellowships are awarded to qualified students. Scholarships provide a waiver of tuition; fellowships include a stipend and a waiver of tuition.

Requirements for the Degree of Master of Arts. Students admitted to the graduate program may take the master's degree by meeting four requirements:

1. If they have not done so before entering the program, they must satisfactorily complete at least three semester hours at the junior or senior level in the literature of a foreign language, not in translation, either at Rice or another accredited institution.
2. They must satisfactorily complete at least thirty semester hours of course work in English, including six hours credit for the thesis.
3. They must pass two three-hour qualifying exmainations covering two of the following fields: British literature to 1660; British literature, 1660-1900; and American literature to the present and British literature, 1900 to the present.

These examinations may both be taken in the first year; at least one of them must be taken no later than the beginning of the student's third semester in the graduate program.

4. They must complete a thesis of approximately fifty pages and must defend it in an oral examination. For students admitted to candidacy for the Ph.D. degree, the requirement of a thesis will be waived.

Requirements for the Degree of Doctor of Philosophy. Candidates for the doctoral degree must complete five requirements:

1. If they have not done so before entering the program, they must satisfactorily complete at least six semester hours at the junior or senior level in the literature of a foreign language, not in translation. Although this work may be done at Rice or another accredited institution, it should directly relate to the student's research interests, and it must be approved by the Graduate Studies Committee.
2. They must satisfacorily complete at least forty-two semester hours of course work in English, exclusive of the thesis.
3. They must satisfactorily complete a set of qualifying examinations, which consists of three three-hour written examinations covering the following periods: (1) British literature to 1660; (2) British literature, 1660-1900; and (3) American literature to the present and British literature, 1900 to the present. Although the timing and order of these examinations may vary, at least one of them must be taken by the beginning of a student's third semester in the graduate program; and it is expected that all three will be completed by the beginning of a student's fifth semester.
4. They must satisfactorily complete a preliminary examination, which consists of a six-hour written examination and a one-hour oral examination, covering a field of specialization chosen by the student from the following: (1) British literature to 1500; (2) British literature, 1500-1660; (3) British literature, 1660-1800; (4) British literature, 1800-1900; (5) American literature to 1900; (6) British and American literature, 1900 to the present; and (7) literary theory. This examination will usually be taken at the end of the second semester folllowing completion of the qualifying examination.
5. They must complete a dissertation which demonstrates a capacity for independent work of high quality in either traditional scholarship, critical interpretation, or critical theory; and they must pass an oral examination on the thesis and related fields.

In order to qualify for continuing financial aid, students must be approved for candidacy for the Ph.D. by the beginning of the seventh semester at Rice. To secure approval, they must satisfy the foreign language requirement, pass both the qualifying and the preliminary examinations, and have a dissertation prospectus approved by the department's graduate studies committee.

English Courses

101a. Critical Reading and Writing (3-0-3).
Analysis and discussion of literary texts: poetry, drama, prose fiction. Students submit frequent essays. *Staff*

102b. Critical Reading and Writing (3-0-3).
Continuation of English 101, with sections giving special emphasis to individual genres: fiction, drama, and poetry. *Staff*

103a, 104b. Basic Composition (3-0-3 each semester).
Intended primarily for students whose English Competency Examination is below standard. *Ms. Driskill*

231. World Drama to 1660 (3-0-3).
Reading of major plays from ancient drama and from the English and French stage prior to 1660. *Ms. Skura*

232. World Drama: Ibsen to the Present (3-0-3).
Readings from major playwrights of the modern era. *Mr. Dowden*

241a. World Literature to 1600 (3-0-3).
Major works from ancient, medieval, and Renaissance literature. Not offered 1981-82.
Staff

242b. World Literature: 1600 to the Present (3-0-3).
Major works from the later Renaissance, the Enlightenment, and the nineteenth and twentieth centuries. Not offered 1981-82. *Staff*

251. Major British Writers: Chaucer to 1800 (3-0-3).
Readings in British major authors of the Middle Ages, the Renaissance, and the eighteenth century. Required of English majors. *Mr. Huston*

252b. Major British Writers: 1800 to the Present (3-0-3).
Readings in major British authors of the nineteenth and twentieth centuries. Required for English majors. *Mr. Doody*

271a, 272b. Aspects of Modern Literature (3-0-3 each semester).
Modern literature in short story, drama, poetry, novel, and nonfiction, drawn from American, British, and European sources of the ninteenth and twentieth centuries. *Mr. Isle, Mr. Morris, Mr. Jones*

302. Ballad and Folksong (3-0-3).
About two-thirds of this course is devoted to British and American folk ballads; the rest surveys American folk lyrics, spirituals, work songs, and blues. Not offered 1981-82.
Mr. Doughtie

303. Afro-American Literature (3-0-3).
A survey of major literary works by Afro-Americans. *Mr. Jones*

304. Images of Women in Literature (3-0-3).
Literary works by female writers in Britain and America. *Ms. Stout, Ms. Nitzsche*

307. Science Fiction (3-0-3).
A study of modern science fiction in its relation to fantasy and satire. *Mr. Isle*

308. Detective Fiction (3-0-3).
Readings and discussions of representative examples of detective fiction, including works by Christie, Sayers, Hammett, Chandler, and MacDonald. Not offered 1981-82.
Mr. Huston

311a, 312b. Fiction Writing (3-0-3 each semester).
Discussion and analysis of student fiction. *Mr. Apple*

313. Dramatic Writing (3-0-3).
The emphasis, depending on individual students, will be on the writing of drama in one of several of the chief modes of the performing arts: plays, films, musicals, opera, even dance.
Mr. Meixner

314. Poetry Writing (3-0-3).
Extensive reading in modern poetry as well as regular practice in the writing of various forms will be required. *Mr. Meixner, Mr. Spears*

315. Expository Writing (3-0-3).
A course in the composition of personal essays. *Mr. Piper*

317. Technical Writing (3-0-3). *Ms. Driskill*

319. Publishing Procedures (3-0-3). *Ms. Driskill*

323. Chaucer (3-0-3).
Readings in the *Canterbury Tales* and other writings of Chaucer. *Ms. Nitzsche*

328. Middle English Literature (3-0-3).
Major works of the Middle English period exclusive of Chaucer.
Ms. Nitzsche, Ms. Roney

329. Sixteenth-Century British Literature (3-0-3).
A survey focusing on the nondramatic works of Shakespeare, Sidney, Spenser, More, Wyatt, and their contemporaries. *Mr. Doughtie*

334. Elizabethan and Jacobean Drama (3-0-3).
Close critical reading of Elizabethan and Jacobean plays with particular emphasis on the works of Marlowe and Jonson. *Mr. Huston*

339a, 340b. Shakespeare (3-0-3).
Each semester representative plays including tragedies, comedies, histories, and romances will be read. *Mr. Grob, Ms. Skura*

343. Seventeenth-Century British Literature (3-0-3).
Poetry and prose of the seventeenth century, excluding Milton. Not offered 1981-82. *Staff*

344. Milton (3-0-3).
Major poems and prose of John Milton. *Staff*

345. Restoration Literature (3-0-3).
Drama, poetry, and prose of the latter part of the seventeenth century. Not offered 1981-82. *Mr. Piper*

346. Eighteenth-Century British Literature (3-0-3).
Major writers of the eighteenth century, with particular attention given to Swift, Pope, and Johnson. *Mr. Spears, Mr. Piper*

351. British Literature of the Romantic Period (3-0-3).
The major writings of Blake, Wordsworth, Coleridge, Byron, Shelley, and Keats. *Mr. Dowden, Mr. Grob*

357. British Literature of the Victorian Period (3-0-3).
The poetry of Tennyson, Browning, Arnold, and Hopkins and the prose of Carlyle, Ruskin, Newman, Arnold, and Mill. Not offered 1981-82. *Mr. Grob*

361. Eighteenth-Century British Fiction (3-0-3).
A course dealing chiefly in the novels of Fielding, Stern, Smollet, and Austen. *Mr. Piper, Mr. Patten*

362. Ninteenth-Century British Fiction (3-0-3).
The novel from Austen to Hardy. *Mr. Doody, Mr. Patten*

363. Twentieth-Century British Fiction (3-0-3).
Forster, Woolf, Lawrence, Joyce, and their contemporaries. Particular attention will be given to *Ulysses*. *Mr. Doody, Mr. Meixner*

364. Twentieth-Century British Poetry (3-0-3).
Survey from 1890 to the present: emphasis on Hopkins, Yeats, Lawrence, Graves, Auden, Larkin, and Hughes. *Mr. Spears*

367. Modern Drama: Ibsen to 1940 (3-0-3).
Plays by Ibsen, Chekhov, Strindberg, Wilde, Shaw, Synge, O'Casey, Pirandello, and T.S. Eliot. *Mr. Meixner*

368. Modern Drama: 1940 to the Present (3-0-3).
O'Neill, Miller, and Williams; French moderns; absurdism and recent trends. *Ms. Skura*

378. American Literature to 1860 (3-0-3).
Poe, Emerson, Thoreau, Melville, Hawthorne, Whitman, and other American writers. *Mr. Ward*

379. American Literature: 1860-1910 (3-0-3).
A study of Mark Twain, Emily Dickinson, Stephen Crane, Henry James, and others. Not offered 1981-82. *Mr. Ward*

383. American Fiction: 1910-40 (3-0-3).
Hemingway, Fitzgerald, Faulkner, and their contemporaries. *Mr. Ward, Mr. Isle*

384. American Fiction: 1940 to the Present (3-0-3).
Survey with emphasis on the work of Bellow, Mailer, Barth, and Pynchon. *Mr. Isle*

387. Twentieth-Century American Poetry (3-0-3).
Frost, Pound, Eliot, and Stevens with some attention to the other poets of the twentieth century. *Mr. Doody*

394. Structure of the English Language (3-0-3).
Also offered as Linguistics 394. See Linguistics 394 for description.

395. History of the English Language (3-0-3).
Also offered as Linguistics 395. See Linguistics 395 for description.

396. Language and Philosophy in Literature (3-0-3).
Readings and discussions of issues in the philosophy of language: representation, metaphor, structure, speech. Among the writers studied will be Lacan, Derrida, Heidegger, Cassirer, Saussure, Wittgenstein, Plato, Aristotle. Not offered 1981-82. Also offered as Linguistics 396. *Mr. Morris*

399. Literary Criticism: History (3-0-3).
A survey of the history of literary criticism from Plato to the twentieth century. Not offered 1981-82. *Mr. Morris*

400. Literary Criticism: Theory (3-0-3).
Recent developments in critical theory. *Mr. Morris*

401, 402. Topics in Literature (3-0-3 each semester).
The topics vary from year to year. May be repeated for credit. Topic for fall 1981: continental backgrounds to medieval English literature. *Ms. Roney*

403, 404. Studies in a Major British Author (3-0-3 each semester).
The topics vary from year to year. May be repeated for credit. Topic for spring 1981: Joseph Conrad. *Mr. Dowden*

405, 406. Studies in a Major American Author (3-0-3 each semester).
The topics vary from year to year. May be rpeated for credit. Topic for fall 1981: Henry James. *Mr. Ward*

407, 408. Studies in Literary Types (3-0-3 each semester).
The topics vary from year to year. May be repeated for credit. Not offered every year. *Staff*

411, 412. Studies in Modern Literature (3-0-3 each semester).
The topics vary from year to year. May be repeated for credit. Not offered every year. *Staff*

413, 414. Studies in Literary Criticism (3-0-3 each semester).
The topics vary from year to year. May be repeated for credit. Not offered every year. *Staff*

421a, 422b. Directed Reading (3-0-3 each semester).

423a, 424b. Senior Thesis (3-0-3 each semester).

501, 502. Topics in British and American Literature or Literary Theory (3-0-3 each semester). *Staff*

511, 512. Graduate Seminar in Literature. (3-0-3).
The topics vary from year to year. May be repeated for credit. Not offered every year. *Staff*

521. Old English (3-0-3).
The language and literature of the Old English period. *Ms. Nitzsche*

523. Chaucer (3-0-3). *Ms. Nitzsche*

528. Middle English Literature (3-0-3).
An enriched version for graduate students of English 328. Additional readings, papers, or meetings to be assigned by the instructor. *Ms. Nitzsche, Ms. Roney*

529. Sixteenth-Century British Literature (3-0-3).
An enriched version for graduate students of English 329. Additional readings, papers, or meetings to be assigned by the instructor. *Mr. Doughtie*

534. Elizabethan and Jacobean Drama (3-0-3).
An enriched version for graduate students of English 334. Additional readings, papers, or meetings to be assigned by the instructor. *Mr. Huston*

539, 540. Shakespeare (3-0-3).
An enriched version for graduate students of English 339, 340. Additional readings, papers, or meetings to be assigned by the instructor. *Mr. Grob, Ms. Skura*

543. Seventeenth-Century British Literature (3-0-3).
An enriched version for graduate students of English 343. Additional readings, papers, or meetings to be assigned by the instructor. *Staff*

544. Milton (3-0-3).
An enriched version for graduate students of English 344. Additional readings, papers, or meetings to be assigned by the instructor. *Staff*

545. Restoration Literature (3-0-3).
An enriched version for graduate students of English 345. Additional readings, papers, or meetings to be assigned by the instructor. *Mr. Piper*

551. British Literature of the Romantic Period (3-0-3).
An enriched version for graduate students of English 351. Additional readings, papers, or meetings to be assigned by the instructor. *Mr. Dowden, Mr. Grob*

557. British Literature of the Victorian Period (3-0-3).
An enriched version for graduate students of English 357. Additional readings, papers, or meetings to be assigned by the instructor. *Mr. Grob*

561. Eighteenth-Century British Fiction (3-0-3).
An enriched version for gradute students of English 361. Additional readings, papers, or meetings to be assigned by the instructor. *Mr. Piper, Mr. Patten*

562. Nineteenth-Century British Fiction (3-0-3).
An enriched version for graduate students of English 362. Additional readings, papers, or meetings to be assigned by the instructor. *Mr. Doody, Mr. Patten*

563. Twentieth-Century British Fiction (3-0-3).
An enriched version for graduate students of English 363. Additional readings, papers, or meetings to be assigned by the instructor. *Mr. Doody, Mr. Meixner*

564. Twentieth-Century British Poetry (3-0-3).
An enriched version for graduate students of English 364. Additional readings, papers, or meetings to be assigned by the instructor. *Mr. Spears*

578. American Literature to 1860. (3-0-3).
An enriched version for graduate students of English 378. Additional readings, papers, or meetings to be assigned by the instructor. *Mr. Ward*

579. American Literature: 1860-1910 (3-0-3).
An enriched version for graduate students of English 379. Additional readings, papers, or meetings to be assigned by the instructor. *Mr. Ward*

583. American Fiction: 1910-40 (3-0-3).
An enriched version for graduate students of English 383. Additional readings, papers, or meetings to be assigned by the instructor. *Mr. Ward, Mr. Isle*

584. American Fiction: 1940 to the Present. (3-0-3).
An enriched version for graduate students of English 384. Additional readings, papers, or meetings to be assigned by the instructor. *Mr. Isle*

587. Twentieth-Century American Poetry (3-0-3).
An enriched version for graduate students of English 387. Additional readings, papers, or meetings to be assigned by the instructor. *Mr. Doody*

599. Literary Criticism: History (3-0-3).
An enriched version for graduate students of English 399. Additional readings, papers, or meetings to be assigned by the instructor. *Mr. Morris*

600. Literary Criticism: Theory (3-0-3).
An enriched version for graduate students of English 400. Additional readings, papers, or meetings to be assigned by the instructor. *Mr. Morris*

621a, 622b. Directed Reading (3-0-3 each semester).

631a, 632b. Teaching of Literature (1-0-1 each semester).

633a, 634b. Teaching of Composition (1-0-1 each semester).

701a, 702b. Topics in British and American Literature or Literary Theory (Credit variable).

800b. Degree Candidate Only.

French and Italian

Professor P. Brady, *Chairman*
Professors Carrington, Raaphorst, and Topazio
Associate Professors Alcover (on leave fall 1981)
and Nelson (on leave spring 1982)
Assistant Professors Aresu and Konrad
Lecturer Pagnucci

Degrees Offered: B.A., M.A., Ph.D.

French

Undergraduates may major in French, and there is a graduate program in French leading to the degrees of Master of Arts and Doctor of Philosophy. A fully equipped language laboratory is in operation, and laboratory work is an important part of the elementary courses in French.

Undergraduate Program. A minimum of thirty semester hours (ten courses) in advanced French courses is required for the major in French. However, only twenty-four semester hours (eight courses) of advanced study are required for double majors or area majors. The following courses are required unless the student is exempted by his or her major adviser: French 311, 312, 391, and 392. Students who have taken French 300- and 400-level courses cannot enroll simultaneously or afterwards in French 200-level courses for credit. Students with a diploma from French-speaking institutions must consult with the department before enrolling in courses.

Students are urged to take some work in European history, English, another European literature, or other courses closely related to French literature and culture. All majors and prospective majors must have their programs approved by a representative of the department.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 50-51.

In addition to courses at the 100 and 200 levels, the department particularly recommends French 303, 304, 305, and 306 to meet the university distribution requirements. These four courses, designed to interest a wide range of students, are taught in English and do not require previous knowledge of French. They may be accepted for an area major when approved by the departments involved.

An honors program in French is available to qualified students. French majors who have taken French 311 and 312 in their first or second years are eligible to apply for admission to the program. For detailed information, they should consult their French instructor or the departmental adviser. A $1,500 summer travel scholarship

is presented each year by the Alliance Francaise for university students in the Houston area. Members of the department are available for discussion of the numerous programs of study and travel in France sponsored by both American and French institutions. There is an active chapter of the French honorary society of Pi Delta Phi.

Graduate Programs. Admission to graduate study in French will be granted to a limited number of qualified students. A distinguished undergraduate record in the study of French literature and a capacity for independent work are essential. The award of advanced degrees is not based solely on accumulation of credits or compliance with formal requirements. Candidates are expected to attain a wide general knowledge of the appropriate history and literature and to demonstrate their command of the French language. In most cases, two years will be required for the completion of work for the degree of Master of Arts. All courses are given in French.

Requirements for the Degree of Master of Arts:

1. Completion with high standing of a program approved by the department: normally, this will include twenty-four semester hours in advanced courses plus thesis work (six semester hours)
2. Satisfactory performance on a reading examination in one language other than French approved by the department
3. Satisfactory performance on preliminary written and oral examinations in French on the French authors indicated in a reading list provided
4. Completion of an acceptable thesis
5. Satisfactory performance on a final oral examination

Requirements for the Degree of Doctor of Philosophy:

1. Completion with high standing of a program approved by the department: normally, this will include fifty-four semester hours (including those required for the degree of Master of Arts) plus thesis work (six semester hours)
2. Satisfactory performance on a reading examination in two languages other than French approved by the department
3. Satisfactory performance on a preliminary written and oral examination on the authors indicated in a reading list provided and on the literature, culture, and civilization of France. The oral examination may be taken only after the successful completion of the written examination. Students have a choice between passing a preliminary examination in a second field of literature or taking one or two courses in a closely related field approved by the graduate faculty. If the student chooses to take two courses in such a "minor" field, only three semester hours will count toward the requirements for the Ph.D.
   Note: Requirements 2 and 3 must be fulfilled one year before the submission of a dissertation.
4. Completion of a dissertation approved by the department; the dissertation is expected to represent an original contribution
5. Satisfactory performance on a final oral examination on the dissertation and related fields
   Note: Regardless of the type of appointment held by the graduate student, he or she may be required to undertake research or teaching assignments, depending upon the background of the graduate student and the needs of the department.

French Courses

101a,b, 102a,b. Elementary French (3-1-4 each semester).
Introductory French. The course is supplemented by films and language laboratory work.
Ms. Nelson, Staff

103a. Accelerated Elementary French (6-2-8).
Accelerated review of French for those wishing to enter French 201 in the spring semester. Equivalent to French 101, 102. *Staff*

110b. French for Graduate Students (3-0-0).
Comprehensive study of French grammar with special emphasis on syntactical difficulties encountered in the comprehension of the written language. Includes readings in the various graduate disciplines. (Noncredit course restricted to graduate students preparing for the graduate language reading exams.) With the student's departmental approval, the passing of a final examination in the course satisfies the foreign language reading knowledge requirement. Offered if demand sufficient. *Staff*

201a,b; 202a,b. Intermediate French (3-0-3 each semester).
Intense oral and written grammar review; reading of modern prose; composition; film program. *Mr. Aresu, Staff*

203a, 204b. Intermediate French Conversation and Composition (3-0-3 each semester).
Oral French practice at the intermediate level; dictation and class discussions based on short texts on contemporary issues. *Mr. Aresu, Staff*

303, 304. French Literature in Translation (3-0-3 each semester).
Not offered every year. *Staff*

305. The French and World Novel (3-0-3).
Comparative study of novelists of the twentieth century in translation. Not offered every year. *Mr. Brady*

306b. The French and World Novel (3-0-3).
As above. Offered spring 1982. *Mr. Brady*

309a. French Civilization (3-0-3).
Development of French culture. The historical social and artistic achievements of the French from ca. 1000 to ca. 1850. Taught in French. Prerequisite: French 202, 204, or placement exam. Offered fall 1981. *Ms. Nelson*

310. French Civilization (3-0-3).
Not offered every year. *Ms. Konrad*

311a. Introduction to French Literature (3-0-3).
Main currents in French literature from its beginning to the nineteenth century. Required for French majors. Taught in French. Prerequisite: French 202, 204, or placement exam. *Mr. Carrington*

312b. Introduction to French Literature (3-0-3).
Main currents in French literature from the nineteenth century to the present. Required for French majors. Open to first-year students. Lectures and discussions in French. Prerequisites: French 202 or placement exam. *Mr. Aresu*

318. The Middle Ages and Renaissance (3-0-3).
Not offered every year. *Mr. Carrington, Ms. Nelson*

321a/b. The Seventeenth Century (3-0-3).
Not offered every year. *Ms. Alcover*

331a. The Eighteenth Century (3-0-3).
Evolution of the "esprit philosophique" and of the literary genres during the century. Selected readings of Montesquieu, Voltaire, Rousseau, Diderot, Beaumarchais, Marivaux. Offered fall 1981. *Mr. Topazio*

351. French Romanticism (3-0-3).
Not offered every year. *Mr. Brady*

353. Romantic Drama (3-0-3).
Not offered every year. *Ms. Konrad*

391a. French Phonetics and Grammar (3-0-3).
Intensive study of French phonetics: practice in intonation and pronunciation. Partial review of the grammar. Supervised laboratory emphasizing practice in intonation and pronunciation from controlled French texts. Open to first-year students. *Ms. Alcover, Mr. Aresu*

392b. French Conversation and Composition (3-0-3).
Completion of the grammar review. Controlled English to French composition; free compositions based on "research" from current French periodicals. Conversational sessions. A supervised laboratory emphasizes French dictées and continued exercises in intonation and pronunciation. Placement exam is given the first day of class. *Ms. Alcover, Mr. Aresu*

403a, 404b. Directed Study and Honors Thesis (0-0-3).
Departmental approval required. *Staff*

411a. Introduction to Old French (3-0-3).
Presentation of the phonology and syntax of Old French. Selected readings from the principal literary genres of the medieval period. Prerequisite: French 311 or 312. Offered fall 1981. *Ms. Nelson*

451. Nineteenth-Century Poetry (3-0-3).
Not offered every year. *Ms. Raaphorst*

452. French Realism and Naturalism (3-0-3).
Not offered every year. *Mr. Brady*

480. Modern French Drama (3-0-3).
Not offered every year. *Staff*

482a. Modern French Novel (3-0-3).
Offered fall 1981. *Ms. Raaphorst*

483b. Twentieth-Century French Literature (3-0-3).
Offered spring 1982. *Mr. Aresu*

487a. Syntax and Translation (3-0-3).
Offered fall 1981. *Mr. Brady*

488b. Translation and Interpretation (3-0-3).
Offered spring 1982. *Mr. Brady*

491a,b. Special Topics (3-0-3).
Qualified students may, on the recommendation of the department, undertake a special research assignment. May be repeated for credit with the assignment of another topic. *Staff*

501a, 502b. Graduate Research (0-0-3).
Graduate research and thesis in partial fulfillment of the requirements for the degree of Master of Arts.

512. Topics in Medieval Literature (3-0-3).
Not offered every year. *Staff*

517a/b. Seminar in Renaissance Literature (3-0-3 each semester).
The topic changes from year to year. May be repeated for credit. Topic for spring 1982: The Pleiade and Baroque poets. *Mr. Carrington*

526a/b. Seminar in Seventeenth-Century Literature (3-0-3 each semester).
The topic changes from year to year. May be repeated for credit. Offered spring 1982. *Ms. Alcover*

535a/b. Seminar in Eighteenth-Century Literature (3-0-3 each semester).
The topic changes from year to year. May be repeated for credit. Offered fall 1981. *Mr. Topazio*

555a/b. Seminar in Romanticism (3-0-3 each semester).
The topic changes from year to year. May be repeated for credit. Not offered 1981-82. *Mr. Brady*

568a/b. Seminar in Realism and Naturalism (3-0-3 each semester).
Not offered 1981-1982. *Mr. Brady*

571a/b. Seminar in Modern Literature to 1950(3-0-3 each semester).
The topic changes from year to year. May be repeated for credit. Not offered 1981-1982. *Ms. Raaphorst*

577a/b. Seminar in Contemporary Literature (3-0-3 each semester).
Not offered every year. The topic for fall 1981: La Nouvelle Critique. *Mr. Brady*

579a/b. Studies in French Poetry (3-0-3 each semester).
Offered spring 1982. *Ms. Raaphorst*

592a/b. French and English Stylistics (3-0-3 each semester).
Not offered every year. *Mr. Brady*

595a,b. Special Topics in French Literature (0-0-3).
In very rare cases, on the recommendation of the graduate French faculty, candidates in their last year on the campus may be allowed to take this course to fill a particular lacuna. *Staff*

601a, 602b. Graduate Research (0-0-6).
Graduate research and dissertation in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

700c. Summer Graduate Research.

800b. Degree Candidate Only.

Italian

Italian Courses

101a, 102b. Elementary Italian (3-2-4).
Emphasis on the development of audiolingual skills. Graded readings introduce basic elements of Italian culture and civilization. Language laboratory work required. *Staff*

201a, 202b. Intermediate Italian (3-0-3).
Emphasis on intensified oral and written practice. Review of grammar. Introduction to the culture and civilization of Italy. *Staff*

Geology

Professor Bally, *Chairman*
Professor Avé Lallemant, *Vice-Chairman*
Professors J.A.S. Adams, D.R. Baker, Casey, De Bremaecker, and Heymann (on leave fall 1981)
Adjunct Professors M.B. Duke, D.M. Curtis, J.L. Wilson, and Warme
Associate Professors J.B. Anderson, H.C. Clark, and Leeman
Adjunct Associate Professor Schwarzer
Assistant Professors Oldow and Valley
Adjunct Assistant Professor Wegner

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. The following courses are required for completion of the degree of Bachelor of Arts with a major in geology:

Geology 101, 111, 102, 112, which constitute a one-year sequence in introductory geology with credit of four semester hours each semester. It is advisable to take Geology 101 and 102 in sequence; the laboratories 111 and 112 should be taken concurrently with Geology 101 and 102.

Geology 311, 312, 331, 332, 334, 390, 401, and 441

Two additional courses in geology at the 300 level or higher

The following supporting courses are also required:

Mathematics 101, 102, 211

Chemistry 101, 102, 107

Physics 101, 102 or 111, 112; Physics 132

Mathematical Sciences 220, Engineering 220, or Computer Science 220

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 137 semester hours. See Degree Requirements and Majors, pages 50-51.

The Department of Geology offers an approved curriculum leading to certification in earth science as a second teaching field. The curriculum consists of twenty-five semester hours of introductory courses which would most benefit a secondary school teacher: i.e., physical and historical geology; study of minerals, rocks, and fossils; some work in astronomy, meteorology, and oceanography; and a three-week field course.

Graduate Program. Graduate work is conducted in those specialties that are compatible with the equipment available and with the interests of the staff. At present, the Department of Geology is prepared to offer advanced work in geochemistry, geophysics, igneous and metamorphic petrology, marine geology-oceanography, meteoritics and planetology, stratigraphy, sedimentation, sedimentary petrology, structural geology and rock mechanics, paleontology, micropaleontology, and paleoecology. Graduate work in geology is oriented toward the theoretical and fundamental aspects of the subject rather than directly toward its many applied aspects.

Requirements for Advanced Degrees:

1. Completion of a program of courses equivalent to that for the undergraduate major in geology at Rice. This may be completed while in residence at Rice if it has not been done before entering.
2. Completion at a high level of an approved program in geology and related subjects. All students must take Geology 403, which is the only required course. All students, regardless of the degree with which they enter, must earn a total of fifteen credit hours in courses other than research courses, with a 6/6/3-type distribution over the three major areas of:
   Geophysics — Structure
   Mineralogy — Petrology — Geochemistry
   Stratigraphy — Sedimentation — Oceanography — Paleontology.
   (The three hours can be satisfied in any one of the three areas.) During the second semester of the first year of residence, all students must register for the preparation of a thesis proposal in Geology 579a, 580b.
3. Satisfactory performance on an M.A. and/or a Ph.D. qualifying exam, each structured around an accepted thesis proposal. The former exam should be taken before the end of the first year of residence, the latter soon after the Ph.D. thesis proposal is approved.
4. Completion for publication of a thesis which represents an original contribution to science plus an oral defense of the research work and of the conclusions of the thesis.
5. Regardless of the type of graduate appointment, satisfactory performance in a limited amount of teaching assistance in undergraduate courses.

Most graduate students can expect to spend two years beyond the bachelor's degree in order to complete requirements for the master's degree and an additional two years for the doctoral degree. Some students of very high ability may be allowed to bypass the M.A. and work directly for the Ph.D.

Geology Courses

101a. The Earth (3-0-3).

Nature of the earth and the physical processes that control and change it: plate tectonics to the central core, from ocean deep to mountains. Also offered as Geography 101.

Mr. Clark

102b. Heritage of the Earth (3-0-3).
Introduction to earth history, tracing the origin and development of earth, atmosphere, hydrosphere, and life and the movement of continents through time. Also offered as Geography 102. *Staff*

111a. Laboratory Study of the Earth (0-3-1).
Study of rocks and minerals, maps, and air photos. Also offered as Geography 111. *Mr. Clark*

112b. Laboratory for Heritage of the Earth (0-3-1).
Study of sedimentary rocks, fossils, and geologic maps with application toward unraveling earth history. Also offered as Geography 112. *Staff*

311a. Mineralogy (3-6-5).
Basic introduction to crystallography, crystal chemistry, systematics and classification, physical and chemical properties, distribution, occurrence and genesis of minerals, and optical mineralogy. *Mr. Leeman, Mr. Valley*

312b. Petrology (3-6-5).
Description and interpretation of igneous and metamorphic rocks. Laboratory work emphasizes study of rock thin sections with petrographic microscope. *Mr. Baker*

321a. Environmental Geology. (3-0-3).
Study of evolutionary mechanisms by which life has adjusted to terrestrial conditions and industrial impact on these adjustments. *Mr. Adams*

322b. Mineral Resources (3-0-3).
Study of geologic, legal, economic, and political interrelationships that create the energy and material mixes. *Mr. Adams*

331a. Structural Geology (3-3-4).
Introduction to deformation mechanics, structural analysis of faults and folds, and elementary tectonics. Laboratory emphasizes practical use of structural theory. *Mr. Oldow*

332b. Sedimentation (3-3-4).
Processes in sedimentation and sedimentary rocks; includes both clastic and carbonate rocks. *Mr. Anderson*

333a. Structural Geology (3-0-3).
Same course as Geology 331 without the laboratory. For nonmajors only. *Mr. Oldow*

334b. Introduction to Field Mapping Techniques (0-6-2).
Beginning field techniques taught in approximately seven field days plus class meetings. Geologic map and report to be completed. *Mr. Avé Lallemant, Mr. Oldow*

341a. The Oceans (3-0-3).
Introduction to science of oceanography; survey of the geological, physical, and biological aspects. Mainly for nonscience majors. *Mr. Anderson, Mr. Casey*

343a. Laboratory Study of the Oceans (0-3-1).
Investigation in the laboratory and field of topics covered in Geology 341. Not offered 1982-83. *Mr. Anderson, Mr. Casey*

352b. Engineering Geology (3-3-4).
Analysis, in terms of engineering and environmental applications, of earthquakes, faults, landslides, shorelines, ground water, subsidence, and other geologic phenomena. Techniques of engineering geology investigation. Not offered 1981-82. *Staff*

390. Field Geology (0-12-4).
Summer field course taken at any of several approved camps operated by various universities or Rice University Field Course. *Staff*

401b. Stratigraphy and Advanced Historical Geology (3-3-4).
Principles of stratigraphy and environmental interpretation of stratigraphic sequences. Not offered 1982-83. *Mr. Casey*

402a. Paleontology (3-3-4).
Introduction to morphology and geologic record of major animal groups characterized by significant fossil representation; principles of evolution, paleoecology, correlation, and taxomony. Not offered 1981-82. *Staff*

403a. Advanced Studies in Physical Geology (1-0-1).
Introduction to current research in geology. Each faculty member in department participates by describing his research and some of the techniques involved. *Staff*

405a. Micropaleontology (2-6-4).
Study of microfossils, emphasis on identification, ecology, paleoecology and biostratigraphy of radiolaria and foraminifera. Prerequisite: Geology 402 or permission of department. Not offered 1981-82. *Mr. Casey*

411a. Metamorphic Petrology (3-3-4).
Evaluation of sub-solidus mineral equilibria through consideration of natural assemblages, thermodynamic calculations, and experiments. Labs will stress thin section petrography. Not offered 1981-82. *Mr. Valley*

412b. Igneous Petrology (3-3-4).
Evaluation of the origin and evolution of igneous rocks in the earth's crust and mantle. Topics will include phase equilibria, experimental studies, geochemistry. Labs will stress thin section petrography. Not offered 1982-83. *Mr. Leeman*

417b. Physical and Chemical Oceanography (3-3-4).
Study of physical and chemical aspects of oceanography, especially water masses, circulation, waves, and their effect on geological and biological oceanography. Not offered 1981-82. *Mr. Casey*

418b. Geological Oceanography (3-3-4).
Study of geological aspects of oceanography, including geomorphology, nearshore processes, seafloor spreading, plate tectonics, marine geophyiscs, marine sediments, and paleooceanography. Not offered 1982-83. *Mr. Anderson, Mr. Clark*

419b. Biological Oceanography (3-3-4).
Study of the biological aspects of oceanography emphasizing planktonic organisms; nektonic and benthonic organisms and paleooceanography also considered. Not offered 1982-83. *Mr. Casey*

441a. Introduction to Geophysics (3-3-4).
Description and analysis of gravity and magnetic, thermal, and seismic properties of the earth and their bearing on plate tectonics. *Mr. De Bremaecker*

442b. Introduction to Exploration Geophysics (3-3-4).
Basic principles and field procedures of geophysical prospecting, including magnetic and well logging methods and the recording, processing, and interpretation of seismic data and gravity. Prerequisite: Geology 441. *Mr. Clark*

456b. Geochemistry (3-3-4).
Study of terrestrial mechanisms governing the distribution of the chemical elements.
Mr. Adams, Mr. Heymann

459a. Models in Geology (3-3-4).
Discussion of models in general; numerical solutions of heat transfer, folding, convection. Prerequisite: differential equations, computer programing. Not offered 1981-82.
Mr. De Bremaecker

461a. Geophysics (3-3-4).
Use of gravity and magnetic fields, temperatures, and paleomagnetism in determining the structure of the earth's crust, mantle, and deep interior. Prerequisite: Mathematics 211 or equivalent and Geology 441. *Mr. De Bremaecker, Mr. Clark*

462b. Geophysics (3-3-4).
Seismology — a study of elastic waves in infinite and layered media. Determination of the internal structure of the earth from surface observations. Prerequisite: Mathematics 211 or equivalent and Geology 441. *Mr. De Bremaecker, Mr. Clark*

463a. Advanced Tectonics (3-3-4).
Mechanics of rock deformation in theory, in experiments, and in nature.
Mr. Avé Lallemant

464b. Fundamentals of Plate Tectonics (3-3-4).
Introduction of plate tectonic theory concerning geometric constraints to plate motions, driving mechanisms, behavior at plate boundaries, and intraplate tectonism. Not offered 1982-83. *Mr. Oldow*

466b. Tectonic Evolution of Fold and Thrust Belts (3-0-3).
Global investigation of fold-thrust belts, their relationship to convergent plate boundaries, associated structural and stratigraphic relations, and the mechanics of deformation. Not offered 1981-82. *Mr. Oldow*

481a, 482b. Senior Research in Geology (Credit variable).
Advanced work adapted to the needs of the individual student. *Staff*

491a, 492b. Special Studies (Credit variable).
Study in specific fields under the guidance of a staff member. *Staff*

501a, 502b. Special Studies (Credit variable).
Advanced work in certain phases of geology adapted to the needs of individual graduate students. Prerequisite: permission of department. *Staff*

504a. Clastic Sedimentary Environments and Facies (3-3-4).
Study of modern and ancient sedimentary environments with emphasis on field work. Depositional models examined in relation to climatic, oceanographic, and tectonic influences. *Mr. Anderson*

511a-530a. Seminars in Geology (3-0-3).
Courses covering subjects listed under Geology 581-598. Individual seminars cover different topics in different years and may be taken more than once. *Staff*

535a. Stable Isotope Geochemistry (3-0-3).
Review of basic principles of isotope fractionation mechanisms and distributions of isotopes with focus on signficance to major geological problems. Not offered 1982-83. *Mr. Baker, Mr. Valley*

536a. Organic Geochemistry (3-0-3).
Principles and Procedures of organic geochemistry applied to important geological problems, petroleum evolution, physical and chemical history of sediments. Not offered 1981-82. *Mr. Baker*

537a. Advanced Sedimentary Geology I (3-3-4).
Lecture, lab, and field problems focusing on sedimentology and sedimentary petrography. *Staff*

538b. Advanced Sedimentary Geology II (3-3-4).
Lecture, lab, and field problems focusing on stratigraphic sequences and paleoenvironmental analysis. *Staff*

539a, 540b. Advanced Petrology (3-3-4 each semester).
Advanced topics in igneous and metamorphic petrology with emphasis on interests of the staff. Modern developments are rigorously examined in physiochemical terms. Offered alternate years (539a: 1981-82). *Mr. Leeman*

551a. Chemical Geology I (3-3-4).
Application of physical chemistry to geology. Includes basic thermodynamics, phase and mineral equilibria, solution chemistry, chemical bonding. Not offered 1981-82. *Mr. Heymann*

552a. Chemical Geology II (3-3-4).
An advanced survey of solution chemistry, chemistry of ocean water, hydrothermal solutions, brines, interaction of solids and aqueous solutions. Not offered 1981-82. *Mr. Heymann*

555a. Advanced Topics in Geochemistry (3-3-4).
Study of selected topics, particularly geochronology, radiometry, isotope and trace element analysis. Not offered 1982-83. *Mr. Adams*

556b. Radiogeology (3-3-4).
The determination of natural and artificial radioactivities, emphasizing the mobilization, transportation and fixation in the lithosphere, hydrosphere, atmosphere, and biota. Not offered 1982-83. *Mr. Adams*

561a. Advanced Topics in Geophysics (3-3-4).
Content varies from year to year: convection, advanced wave propagation, tectonophysics, etc. *Mr. De Bremaecker*

562b. Advanced Topics in Geophysics (3-0-3).
Folding and faulting studied from three points of view: laboratory data, field data, and computer models. *Mr. De Bremaecker*

566b. Experimental Structural Geology (2-3-3).
Selected topics, such as elasticity and plasticity of minerals and rocks. Laboratory work includes experimental rock deformation. Not offered 1982-83. *Mr. Avé Lallemant*

568b. Structural Analysis of Deformed Rocks (2-3-3).
Studies of structures, textures, and petrofabrics of deformed rocks; stress and strain analysis. Not offered 1981-82. *Mr. Avé Lallemant*

574b. Electron Microprobe/Scanning Electron Microscope: Theory (2-2-2).
Fundamental principles, techniques, and applications of the Electron Microprobe/SEM. Emphasis on quantitative analysis and geological problems. Practical laboratory instruction and experience in analytical techniques. *Mr. Valley*

579a, 580b. Research in Earth Sciences (0-9-3).
Preparation of M.A. and Ph.D. thesis proposal. *Staff*

581a, 582b. Research in Physical and Structural Geology (0-9-3 each semester). *Staff*

583a, 584b. Research in Sedimentology (0-9-3 each semester). *Staff*

585a, 586b. Research in Petrology (0-9-3 each semester). *Staff*

587a, 588b. Research in Geochemistry and Meteoritics (0-9-3 each semester). *Staff*

589a, 590b. Research in Geophysics (0-9-3 each semester). *Staff*

591a, 592b. Research in Paleontology and Stratigraphy (0-9-3 each semester). *Staff*

593a, 594b. Research in Economic Geology (0-9-3 each semester). *Staff*

595a, 596b. Research in Regional Geology (0-9-3 each semester). *Staff*

597a, 598b. Research in Marine Geology and Oceanography (0-9-3 each semester). *Staff*

700c. Summer Graduate Research.

800b. Degree Candidate Only.

Geography Courses

101a. The Earth (3-0-3).
Nature of the earth and the physical processes that control and change it: plate tectonics to the central core, from ocean deep to mountains. Also offered as Geology 101. *Mr. Clark*

102b. Heritage of the Earth (3-0-3).
Introduction to earth history, tracing the origin and development of earth, atmosphere, hydrosphere, and life and the movement of continents through time. Also offered as Geology 102. *Staff*

111a. Laboratory Study of the Earth (0-3-1).
Study of rocks and minerals, maps, and air photos. Also offered as Geology 111. *Staff*

112b. Laboratory for Heritage of the Earth (0-3-1).
Study of sedimentary rocks, fossils, and geologic maps with application toward unraveling earth history. Also offered as Geology 112. *Staff*

310b. World Ethnography (3-0-3).
Introduction to cultural geography through survey of geographical and cultural areas of the world. Emphasis on the interrelationships between human societies and their physical environments. Also offered as Anthropology 310. *Staff*

German and Russian

Associate Professor R.G. Jones, *Chairman*
Professors E.M. Thompson, Weissenberger, and Winkler
Associate Professors S.L. Clark, Copeland, Eifler, and J.B. Wilson
Visiting Assistant Professor Burago

Degrees Offered: B.A., M.A., Ph.D.

German

Undergraduate Program. Students majoring in German may pursue either of two options: German literature or German studies.

For an option in **German literature** the requirements are:

1. Completion of a program approved by the department
2. The equivalent of at least twenty-four semester hours (eight courses) numbered 300 or higher

The department recommends related courses in linguistics, history, philosophy, and other literatures.

For an option in **German studies** the requirements are:

1. Completion of a program which has been defined in close cooperation with the departmental undergraduate adviser
2. The equivalent of at least eighteen semester hours (six courses) in courses numbered 300 or higher
3. At least twelve semester hours (four courses) in courses relating to the field of German in other departments. Courses in translation offered by the Department of German pertaining to German culture and civilization count toward the fulfillment of the area requirement.

This option in German studies, which permits maximum flexibility within a frame of clearly defined objectives, allows an interdisciplinary approach to German affairs. The student can incorporate into the study of German language and literature subject-related courses in political science, history, musicology, art history, philosophy, and economics. The option in German studies is designed for students who are preparing for a career in international law, business, banking, or diplomacy and for graduate study in a variety of fields such as history, political science, library science, art history, etc.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 50-51.

Honors Program. The department offers a special program for outstanding students consisting of independent readings and research which must lead to a substantial honors essay under the supervision of a departmental faculty member. Admission is decided in the second semester of a student's sophomore year.

German Literature in Translation. Courses in German literature in translation (designated "Germanics" with course number) are open to undergraduate students from all disciplines. Readings and discussions are in English. These courses may be repeated for credit.

Requirements for the Degree of Master of Arts:

1. Completion with high standing of a program approved by the department: normally, this includes twenty-four semester hours at the graduate level
2. Satisfactory performance on a reading examination in one foreign language other

than German approved by the department
3. Completion of an acceptable thesis
4. Satisfactory performance on a final oral examination on the thesis and related topics

Requirements for the Degree of Doctor of Philosophy:

1. Completion with high standing of a program approved by the department: normally, this includes forty-five semester hours at the graduate level, including those required for the degree of Master of Arts
2. Satisfactory performance on a reading examination in two foreign languages other than German approved by the department
3. Satisfactory performance on a preliminary written and oral examination on the general field of German studies; this examination is based in part on a reading list provided by the department
4. Completion of a dissertation approved by the department; the dissertation is expected to represent an original contribution to knowledge
5. Satisfactory performance on a final oral examination on the dissertation and related fields

Note: Requirements 1 and 2 must be met at least a year before the submission of a dissertation.

As part of their training, graduate students, regardless of the type of appointment, will be required to perform some duties, such as assisting in classes, the language laboratory, research, and other activities suggested by the department.

German Language and Germanic Linguistics Courses

101a/b, 102a/b. Elementary German (3-1-4 each semester).
Introductory German with emphasis on speaking and reading. The course is supplemented by language laboratory work. *Ms. Clark, Mr. Copeland, Staff*

103a/b. Accelerated Beginning German (6-2-8).
The equivalent of German 101 and 102 in one semester. Prerequisite: permission of instructor. Not offered every year. *Mr. Copeland, Staff*

105a, 106b. Beginning Germanic Language (3-1-4).
Introductory study of one of the Germanic languages (Swedish, Norwegian, Danish, Dutch) with emphasis on speaking and reading. Not offered every year. *Mr. Wilson, Staff*

111a, 112b. German for Graduate Students (3-0-0 each semester).
Concise introduction to the reading of German for research purposes. A noncredit course restricted to graduate students. Not offered every year. *Staff*

201a/b. Intermediate German (3-0-3).
Grammar, conversation, and extensive reading supplemented by films and language laboratory work. *Ms. Eifler, Staff*

202a/b. Intermediate German (3-0-3).
Intermediate language skills with readings and discussion of literary texts and related materials. Prerequisite: German 201, 203, or equivalent. *Ms. Eifler, Staff*

203a, 204b. Intermediate German: Scientific (3-0-3 each semester).
Language skills based on readings from German scientific books and journals (including independent work of the student's own choice); supplemented by films. Prerequisite for 204: German 201, 203, or equivalent. Not offered every year. *Mr. Wilson*

206a/b. Accelerated Intermediate German (6-0-6).
Increases fluency in speaking and reading; introduces short works of German literature. Prerequisite: permission of instructor. Not offered every year. *Staff*

301a, 302b. Advanced Scientific German I, II (3-0-3 each semester).
Continuation of German 204. Open to all students with second-year competence. Not offered every year. *Mr. Wilson*

303a/b. Commercial German (3-0-3).
Introduction to general business practices and terminology useful in a subsequent business career. Prerequisite: second-year competence or permission of instructor. Not offered every year. *Ms. Eifler*

305a, 306b. Composition and Conversation I, II (3-0-3 each semester).
A variety of reading materials serves as the basis for discussions and compositions. Prerequisite: second-year competence. *Ms. Eifler, Mr. Weissenberger, Mr. Wilson, Mr. Winkler, Staff*

322a/b. Reading Dutch and Scandinavian (3-0-3).
A knowledge of German and English is applied toward a reading ability in Dutch and Swedish, Afrikaans, Danish, and Norwegian. Not offered every year. *Mr. Wilson*

403a/b. Linguistic Structure of German (3-0-3).
Synchronic study of Modern German syntax, phonology, and semantics, including discourse structure. Also offered as Linguistics 403. Not offered every year. *Mr. Copeland*

404a/b. History of the German Language (3-0-3).
Aspects of the history of German phonology, syntax, and semantics (with related systems) from its Proto-Indo-European origins to the present. Also offered as Linguistics 404. Not offered every year. *Mr. Copeland*

431a/b. Advanced Stylistics (3-0-3).
For advanced students to achieve oral and written proficiency in German, using tape recordings, films, and current newspaper articles. Prerequisite: German 305 or permission of instructor. Not offered every year. *Mr. Weissenberger*

432a/b. German Applied Linguistics and Teaching Methodology (3-0-3).
Contrastive study of German and English combined with problems in teaching methods and the development and evaluation of teaching materials. Not offered every year. *Mr. Copeland*

454a/b. A Linguistic Approach to Translation: German/English, English/German (3-0-3).
Not offered every year. *Mr. Copeland*

German Literature and Civilization Courses

311a, 312b. Survey of German Literature I, II (3-0-3 each semester).
German 311 is an introduction to the historical development of German literature: the description, interpretation, and analysis of literature and literary trends through the nineteenth century. German 312 is a continuation of German 311 and deals with German literature from the late nineteenth century to the present. Not offered every year. *Mr. Weissenberger, Mr. Winkler, Staff*

341a/b. The Age of Goethe (3-0-3).
German classical literature (1700-1820); emphasis changes from year to year. May be repeated for credit. Not offered every year. *Staff*

342a/b. Romanticism and Realism (3-0-3).
Nineteenth-century literary tendencies related to social and political context. May be repeated for credit. Not offered every year. *Staff*

371a/b. German Literature from 1900 to 1945 (3-0-3).
Concentrates on the Literature of German Expression and the Weimar Republic. Not offered every year. *Staff*

372a/b. German Literature since 1945. (3-0-3)
Authors who began their careers after 1945; for example, Böll, Grass, Dürrenmatt, Weiss. Not offered every year. *Staff*

375a/b. Germany Today: East and West (3-0-3).
Comparative study of the two German states. Readings include documentary and literary texts. Not offered every year. *Ms. Eifler*

381a/b. Major Authors of German Literature (3-0-3).
Topic changes from year to year. May be repeated for credit. Not offered every year. *Staff*

391a/b, 392a/b. Special Topics (3-0-3).
Topic changes from year to year. May be repeated for credit. Not offered every year.
Staff

401a/b, 402a/b. Independent Work in German Literature or Philology (3-0-3 each semester).
Qualified students work on projects of their choice under the supervision of individual instructors. May be repeated for credit. *Staff*

405a/b. Introduction to Gothic and Old High German (3-0-3).
Basic readings in language and literature. Open to graduate students for credit. Not offered every year. *Mr. Wilson*

411a/b. Introduction to Middle High German Language and Literature (3-0-3).
Middle High German language and representative works from literature of the courtly period (twelfth and thirteenth centuries). Open to graduate students for credit. Not offered every year. *Ms. Clark*

412a/b. Middle High German Lyric and Epic Poetry (3-0-3).
Literature of the first high point of German literary development. Texts read in the original. Prerequisite: German 411. Open to graduate students for credit. Not offered every year. *Ms. Clark*

421a/b. German Literature of the Renaissance and Reformation (3-0-3).
Major aspects of German literature from 1400 to 1600. Open to graduate students for credit. Not offered every year. *Ms. Clark*

422a/b. German Literature of the Baroque (3-0-3).
German literature of the seventeenth century. Open to graduate students for credit. Not offered every year. *Staff*

Graduate Courses

500a/b. Graduate Research.
Graduate research and thesis in partial fulfillment for the degree of Master of Arts.

511a, 512b. Independent Graduate Study in German Literature or Philology (3-0-3 each semester).

521a/b. Gothic (3-0-3).
The Gothic languages, its significance in the Germanic subfamily, readings from the *Bible* translation of Bishop Ulfilas (fourth century). Not offered every year. *Mr. Wilson*

522a/b. Old High German (3-0-3).
Language and literature of the Old High German period (eighth to eleventh centuries); texts from the pagan and the monastic traditions. Not offered every year. *Mr. Wilson*

523a/b. Old Saxon (3-0-3).
Early North German language and literature, chiefly the long epic poem *Heliand* in Germanic alliterative verse. Not offered every year. *Mr. Wilson*

524a/b. Old Icelandic (3-0-3).
The earliest Scandinavian language and literature: runic inscriptions, the prose sagas of the Viking era, the Eddic poetry of Germanic gods and heroes. Not offered every year.
Mr. Wilson

526a/b. Seminar in Medieval Literature (3-0-3).
Specific aspects and problems of medieval literature. The topics vary from year to year. May be repeated for credit. Not offered every year. *Ms. Clark*

531a/b. Linguistic Structure of German (3-0-3).
Synchronic study of Modern German syntax, phonology, and semantics, including discourse structure. Not offered every year. *Mr. Copeland*

532a/b. Special Topics in German Linguistics (3-0-3).
Topics change from year to year. Not offered every year. *Mr. Copeland*

561a/b. Seminar in Literary Criticism (3-0-3).
Introduction to the major modes of literary historiography, interpretation, and evaluation since Dilthey. Not offered every year. *Mr. Winkler*

562a/b. Seminar in Literary Theory (3-0-3).
Historical studies of poetic theories and literary aesthetics. Not offered every year.
Mr. Winkler

563a/b. Seminar in Literary Genres (3-0-3).
Topic for fall 1981: Bildungsroman. May be repeated for credit. Not offered every year.
Ms. Eifler

565a, 566b. Special Topics in German Literature (3-0-3 each semester).
Topic for fall 1981: German Literature 1890-1914. May be repeated for credit. Not offered every year. *Mr. Winkler*

571a/b. Seminar in the Eighteenth and Nineteenth Centuries (3-0-3).
Specific aspects, problems, and authors of the period. May be repeated for credit. Not offered every year. *Staff*

572a/b. Seminar in the Nineteenth and Twentieth Centuries (3-0-3).
Specific aspects, problems, and authors of the period. Topic for spring 1982: expressionism. May be repeated for credit. Not offered every year. *Mr. Weissenberger*

591a/b. Selected Problems in Modern Literature (3-0-3).
May be repeated for credit. Not offered every year. *Staff*

592a/b. Selected Problems in Modern Literature (3-0-3).
May be repeated for credit. Topic for spring 1982: exile literature. Not offered every year.
Mr. Winkler

600a/b. Graduate Research.
Graduate research and dissertation in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

700c. Graduate Summer Research.

800b. Degree Candidate Only.

Germanic Literature and Civilization in Translation

Germanic Courses

313a/b. Studies in German Culture (3-0-3).
Study of the significant aspects of the German cultural past that define its unique tradition in a European context. Not offered every year. *Ms. Clark*

321a/b. Viking Literature in Translation (3-0-3).
Literature of medieval Scandinavia: runic inscriptions, laws, sagas, Eddic poetry, and Skaldic poetry. Not offered every year. *Mr. Wilson*

351a, 352b. Great German Authors of the Twentieth Century in Translation (3-0-3 each semester).
Topic changes from year to year. Topic for fall 1981: Kafka. May be repeated for credit. Not offered every year. *Mr. Weissenberger*

361a, 362b. Special Topics in Modern German Literature in Translation (3-0-3 each semester).
Topic changes from year to year. May be repeated for credit. Not offered every year.
Staff

376a/b. Germany Today: East and West (3-0-3).
Comparative study of the two German states. Reading materials include documentary and literary texts. Not offered every year. *Ms. Eifler*

406a/b. Major Trends in German Literature from the Middle Ages through Enlightenment in Translation (3-0-3).
Topic changes from year to year. May be repeated for credit. Not offered every year.
Ms. Clark

407a/b. German Literature of the Middle Ages in Translation (3-0-3).
Topic changes from year to year. May be repeated for credit. Not offered every year.
Ms. Clark

Russian

Undergraduate Program. At least twenty-four semester hours (eight courses) offered in fulfillment of major requirements must be numbered 300 or higher. Double majors may be allowed to take eighteen semester hours (six courses numbered 300 or higher) with the approval of the department and should consult with the Russian staff to arrange a program compatible with the other major. Four of the courses may be language courses with the remainder literature, which may be chosen by the student with the adviser's consent. All departmental majors must have their programs approved by the representative of the department.

No knowledge of Russian is required for nonmajors who wish to take courses in Russian literature. Lectures and readings are in English. Majors are required to attend extra sessions in Russian as well as to read some of the works and to write assigned papers in Russian.

Russian Courses

101a, 102b. Elementary Russian I, II (3-2-4 each semester).
Fundamentals of Russian grammar. Pronunciation, reading, oral practice, and translation. *Staff*

105a, 106b. Beginning Slavic Language (3-1-4).
Introductory study of one of the Slavic languages (Polish, Czech, Ukrainian, Serbo-Croatian) with emphasis on speaking and reading. Not offered every year. *Staff*

110a/b. Russian for Graduate Students (3-0-3).
Not offered every year. *Staff*

201a, 202b. Intermediate Russian I, II (3-0-3 each semester).
Grammar review, reading of selected texts, conversation, and composition. *Staff*

301a, 302b. Reading, Composition, and Conversation (3-0-3 each semester).
Emphasis on composition and conversation with reading of relevant texts. *Staff*

305a, 306b. Advanced Conversation and Composition I, II (3-0-3 each semester).
Intensive practice in Russian conversation. Wide variety of topics drawn from everyday life, newspapers, contemporary short stories. Prerequisite: second-year competence or permission of instructor. Offered alternate years. *Mr. Jones*

311a/b. Survey of Russian Literature (3-0-3).
Comprehensive survey of the best-known Russian literature up to 1860 with emphasis on the classic works of the nineteenth century. No knowledge of Russian required. Not offered every year. *Staff*

312a/b. Survey of Russian Literature II (3-0-3).
Comprehensive survey of Russian literature from 1860 to the Soviet period (1917). No knowledge of Russian required. Not offered every year. *Staff*

320a/b. Slavic Civilization (3-0-3).
Development of Slavic cultures, with emphasis on literature, the arts, music, and folklore. No knowledge of Russian required. Not offered every year. *Ms. Thompson*

351a/b. Dostoevsky and Tolstoy (3-0-3).
Study of the major works of Dostoevsky and Tolstoy. No knowledge of Russian required. Not offered every year. *Ms. Thompson*

352a/b. From Chekhov to the Revolution (3-0-3).
Turn of the century Russian literature and art. No knowledge of Russian required. Not offered every year. *Ms. Thompson*

401a, 402b. Russian Stylistics I, II (3-0-3 each semester).
Designed to improve the spoken and written language with emphasis on syntactic and idiomatic structures. Offered alternate years. *Staff*

411a/b. Russian Literature of the Soviet Period (3-0-3).
Survey of the literary works of Russian writers — Soviet and emigré — published since 1917. No knowledge of Russian required. Not offered every year. *Staff*

412a/b. Solzhenitsyn and the Dissidents (3-0-3).
Study of the life and works of Solzhenitsyn and of the dissident movement in post-Stalin Russia. No knowledge of Russian required. Not offered every year. *Ms. Thompson*

420a/b. Women in Russian Literature (3-0-3).
The portrayal of women in major works of Russian literature. No knowledge of Russian required. Not offered every year. *Ms. Thompson*

441a, 442b. Special Topics in Russian Literature (3-0-3 each semester).
Topics change from year to year. May be repeated for credit. No knowledge of Russian required. Not offered every year. *Staff*

450a/b. Independent Study (3-0-3).
Qualified students may conduct research and write a paper on a topic of particular interest.

Health and Physical Education

Professor Poindexter, *Chairman*
Professors Bearden and Spence
Adjunct Professors Fred, Skaggs, and Weinberg
Associate Professors Barker, Bland, Disch, and E.J. Lee
Assistant Professors DeSensi, Hudson, and Iammarino
Lecturers Bordelon, Brown, and Eggert

Degrees Offered: B.A. with major in physical education; health education as teaching field only.

A minimum of 120 semester hours is required for the Bachelor of Arts with a major in physical education. The university distribution and skills requirements described on pages 50-51 must be satisfied. Students majoring in physical education must complete between thirty-six and forty-two semester hours of physical education courses and laboratories depending on the specific physical education track followed. Students planning physical education as a second teaching field must complete twenty-four semester hours in the physical education teaching track and six to eight corresponding laboratories. Physical Education 105, 120, and 319 are required courses. Physical Education 105 and 120 should be taken as early as possible.

Both physical education and health education are offered as fields for teacher certification. Students wishing to qualify for teacher certification by the Texas Education Agency must complete twelve semester hours of English, six semester hours of American history, six semester hours of federal and state government, eighteen semester hours of education, twenty-four semester hours in another teaching field, and twenty-four semester hours of health education courses or physical education courses, according to which is selected for the teaching field.

Health education courses cannot be used to fulfill the requirements for a major in physical education but may be taken as electives by all students.

Physical Education Courses

101a,b. Basic Health and Physical Education (0-2-0 each semester).
Skill development, knowledge of rules and strategy, concepts of conditioning and participation in two physical activities. Required for baccalaureate. *Staff*

105a. Foundations of Contemporary Sport (3-0-3).
Interactions of philosophy, economics, politics, education, and contemporary social issues in the evolution of sport. For first- and second-year students. *Ms. DeSensi*

120b. Scientific Foundations of Physical Education (3-0-3).
An introduction to the scientific areas of human movement: anatomy and physiology, physiology of exercise, motor learning, kinesiology, and tests and measurements.
Mr. Disch, Ms. Hudson

122b. Laboratory (0-3-1).
Instruction in basic aquatic activities, including mechanics of the various strokes and basic lifesaving. *Mr. Bearden*

126b. Laboratory (0-3-1).
Focus on skills, theory, teaching progressions and practice teaching of swimming, lifesaving, and beginning swimming. Completion of requirements leads to certification as Water Safety Instructor. *Mr. Bland*

128a,b. Laboratory (0-3-1 each semester).
Badminton, racquetball, squash, and tennis: history, educational value, court and field construction, skills and methods of teaching, coaching and officiating. Prerequisite: concurrent or previous enrollment in Physical Education 120 or previous enrollment in Physical Education 101 and 102. *Mr. Barker*

135a. Laboratory (0-3-1).
An introduction to gymnastics. Activities include tumbling, vaulting, and activities on trampoline, parallel bars, side horse, rings, high bar, and balance beam. Prerequisite: concurrent or previous enrollment in Physical Education 105 or previous enrollment in Physical Education 101 and 102. *Staff*

201a. Intramural Sports and Community Recreation Programs (3-0-3).
Study of the organization and administration of intramural sports programs and community recreation programs. *Mr. Barker*

204b. Psychological Foundations of Sport and Physical Activity (3-0-3).
Investigation of the theoretical and empirical psychological foundations of sport and physical activity. *Ms. Poindexter*

205a. Sport and Society (3-0-3).
A study of the development of contemporary sport and its interrelationships with existing social institutions. *Ms. Lee*

221a. Laboratory (0-3-1).
The Red Cross multimedia standard first aid course, including CPR. Also offered as Health Education 221. *Mr. Iammarino*

223a. Laboratory (0-3-1).
Archery, golf, fencing, and basic rhythms: educational values, teaching methods, and officiating. Prerequisite: concurrent or previous enrollment in Physical Education 105 or previous enrollment in Physical Education 101 and 102. *Mr. Bearden*

228b. Laboratory (0-3-1).
Advanced instruction in tennis for the prospective coach and/or highly skilled performer. Prerequisite: permission of instructor. *Staff*

250b. Anatomy and Physiology (3-0-3).
Introduction to human anatomy and physiology, with emphasis on gross structure and basic concepts of function. *Mr. Spence*

302b. Kinesiology (3-0-3).
A review of applied anatomy, mechanical analysis of selected physical activities, and physical principles of body mechanics. Prerequisite: Physical Education 120, 250, or permission of instructor. *Ms. Hudson*

304b. Laboratory (2-1-2).
The American Red Cross advanced first aid course for emergency care of illness and traumatic injuries. Prerequisite: Physical Education 221 or equivalent multimedia standard first aid course. Also offered as Health Education 308. *Mr. Iammarino*

305a. Physical Education for Exceptional Children (3-0-3).
Areas of exceptionality displayed by children within the school or institution relative to the physical educator's role. *Mr. Bearden*

308b. Teaching Competencies and Program Development in Physical Education (3-0-3).
Teaching methodology, program development, and implementation of teaching techniques and class management. For junior and senior students. *Ms. Lee*

311a. Motor Learning (3-0-3).
Physiological, neurological, and psychological factors affecting voluntary skill acquisition and development. *Ms. Poindexter*

314b. Laboratory — Physical Education Methods Practicum (0-3-1).
Practicum in the application of teaching methods in physical education activities. Prerequisite: Concurrent or previous enrollment in Physical Education 308. *Ms. Lee*

319a. Tests and Measurements (3-0-3).
Introduction to basic statistics, test construction and evaluation, and basic research design in physical education. *Mr. Disch*

321a. Physiology of Exercise (3-0-3).
Physiologic response of the circulatory, respiratory, and muscular systems to exercise stress. Prerequisite: Physical Education 250 or permission of instructor. *Mr. Spence*

323a. Laboratory (0-3-1).
Measuring physiologic response to exercise stress. Prerequisite: concurrent enrollment in Physical Education 321. *Mr. Spence*

324b. Laboratory (0-3-1).
Rules and mechanics of officiating basketball, volleyball, and softball. *Mr. Disch*

326a. Laboratory (0-3-1).
Field application in prevention, management, and rehabilitation of athletic injuries. *Mr. Eggert*

329a. Laboratory (0-3-1).
Rules and mechanics of officiating football and soccer. *Staff*

336b. Laboratory (0-3-1).
Advanced instruction in gymnastics, including tumbling, vaulting, and activities on trampoline, parallel bars, balance beam, and uneven parallel bars. Prerequisite: Physical Education 135 or permission of instructor. *Staff*

337a. Laboratory (0-3-1).
An introduction to modern dance techniques and improvisation. *Staff*

338b. Laboratory (0-3-1).
An advanced class in modern dance technique and improvisation. *Staff*

341a. Sports Medicine and Training (3-0-3).
The following areas are integrated: anatomy and physiology of sports, emphasizing orthopedic anatomy and circulorespiratory physiology; clinical medicine; prevention and management of athletic injuries. *Mr. Spence, Mr. Brown*

400b. Organization and Administration of Physical Education (including Athletics) (3-0-3).
Administrative policies and procedures: personnel, budgets, facilities, equipment, office management, schedules, public relations, and publicity. Prerequisite: advanced standing. *Mr. Bearden*

411a. Concepts and Techniques of Athletic Coaching (3-0-3).
Coaching techniques, concepts, and problems in major athletic sports. Prerequisite: permission of instructor. *Mr. Bland*

416b. Sports Management (3-0-3).
Administrative theory, personnel and fiscal management of sports programs. For junior and senior physical education majors. *Ms. DeSensi, Staff*

431-436. Athletic Coaching of Team Sports (2-0-2).
Study of coaching methods and strategies for developing high level athletic performance.

431a. Basketball (2-0-2). *Staff*

432b. Baseball (2-0-2). *Mr. Bland*

433a. Football (2-0-2). *Staff*

434b. Track and Field (2-0-2). *Mr. Spence*

435a. Soccer (2-0-2). *Staff*

436b. Volleyball (2-0-2). *Mr. Disch*

490b. Seminar in Sports Medicine (3-0-3).
Case study approach is used to present sports related injuries, management, and rehabilitation. Prerequisite: Physical Education 341.

495, 496. Independent Study (Credit variable).
For junior and senior students only.

Health Education Courses

101b. Nutrition (3-0-3).
Concepts underlying the science of nutrition: food composition, calories and needs for energy, special nutrients, and nutritional deficiencies. *Mr. Awapara*

107a. Concepts in Health Science (3-0-3).
Designed to acquaint prospective health educators with the structure and function of health in our society. *Mr. Iammarino*

201a. Environmental Systems (3-3-4).
The chemical, physical, and biological components of the environment as natural resources and the effect of pollution on their maintenance and utilization. Also offered as Environmental Science and Engineering 201. *Mr. Ward*

208b. Chemical Alterations of Behavior (3-0-3).
Investigates the use, abuse, and misuse of alcohol, tobacco, and psychoactive drugs. *Staff*

221a. Laboratory (0-3-1).
The Red Cross multimedia standard first aid course, including CPR. *Mr. Iammarino*

306b. Human Sexuality (3-0-3).
Designed to explore the physiological, psychological, and sociological parameters of human sexuality, to provide accurate sex information, and to develop healthy attitudes toward sexuality. *Mr. Iammarino*

308b. Emergency Care/Advanced First Aid Instructor (2-1-2).
Emergency care procedures for illness and traumatic injuries. Prerequisite: Health and Education 221. *Mr. Iammarino*

356b. Sociology of Health and Illness (3-0-3).
Social and cultural factors that influence physical and mental disorders, behaviors that underlie the course of illness, and delivery of health care in American society. *Staff*

370a. History of Medicine (3-0-3).
Changing concepts of diseases and public health developments and the emergence of the modern health care profession. *Mr. Van Helden*

407a. Diseases of the Human Organism (3-0-3).
Study of communicable, noncommunicable, and behavioral diseases with emphasis on the disease process and basic epidemiologic methods. *Mr. Iammarino*

410b. Program Development in Health Education (3-0-3).
Content and methods in teaching health education; program materials and curriculum construction in secondary school health education programs. Required for Teaching Certification in Health. *Mr. Iammarino*

495, 496. Independent Study (Credit variable).

History

Professor Stokes, *Chairman*
Professors Boles, Drew (on leave spring or fall 1982), **Garside** (on leave fall 1981), **Gruber** (on leave 1981-82), **Higginbotham, Hyman** (on leave 1982-83), **Loewenheim** (on leave fall 1982), **Matusow, and Wiener**
Associate Professors Haskell, R.J. Smith, and Van Helden
Assistant Professor Hyland (1981-82 only)
Adjunct Instructor Alphin

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. A student majoring in history must take a minimum of thirty semester hours (ten courses) in history, of which eighteen semester hours (six courses) must be on the advanced level (300 or 400). At least six semester hours (two courses) must be taken in American history and at least six semester hours (two courses) in fields other than American history. Students are advised to acquaint themselves with humanistic disciplines other than history (for example, literature, fine arts, and philosophy) and also with social sciences such as political science, sociology, economics, and anthropology, whose contributions to historical studies are of increasing importance. Some foreign language proficiency is recommended for the potential traveler, researcher, or graduate student (most graduate schools require a reading knowledge of French and German for the Ph.D. degree).

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 50-51.

Graduate Program. Graduate students in history are accepted for study leading to either the M.A. or Ph.D. Holders of the B.A. degree (or its equivalent) from an acceptable institution are eligible to apply. The graduate program is designed to train a limited number of carefully selected students. Both the M.A. and the Ph.D. degrees are offered in limited areas of American and European history. Further information about the fields may be obtained on request from the department.

Graduate fellowships as well as graduate scholarships within the limits of available funds are awarded to qualified students with demonstrated ability. Fellowships include a stipend and a waiver of tuition; scholarships provide a waiver of tuition only. As a part of their training, all graduate students are expected to render limited services to the department as tutorial instructors, as research assistants, or as assistants to the editors of the *Journal of Southern History* or *The Papers of Jefferson Davis,* both of which are sponsored by Rice University.

Requirements for the Degree of Master of Arts. Candidates for the M.A. are expected to complete a certain amount of formal class or seminar work, usually twenty-four semester hours (eight courses); pass a reading examination in one foreign language (usually French or German); and write a thesis under the direction of an advisory committee of the department headed by a professor having special competence in the subject area of the thesis. An oral defense of the thesis is also required. Completion of these requirements usually takes two years. Not more than three years may elapse between the time the student is admitted to graduate study and the completion of the degree, unless an extension is approved by the departmental graduate committee. An alternate M.A. degree is available to doctoral students who fulfill the special requirements set by the department.

Requirements for the Degree of Doctor of Philosophy. Candidates for the Ph.D. degree are expected to prepare themselves for a qualifying examination in four fields, at least two of which must be in the major area of concentration (either European or American history). If the major area is European history, one field must be in American history; if the major is in American history, one field must be in European history. The fourth field may be outside the department if approved by the departmental graduate committee. Preparation for this qualifying examination (the passing of which qualifies the student for formal admission to candidacy for the Ph.D. degree) normally includes course work, seminars, directed reading, and a substantial amount of independent reading. The examination usually is oral, though it may be written or both written and oral at the discretion of the department. It is given only after the student has completed all necessary course and seminar work and passed reading examinations in two foreign languages (usually French and German). Students should take the qualifying examination before the beginning of their sixth semester and must take it by the end of the sixth semester. In addition to the foreign language examinations and the qualifying examination, the Ph.D. candidate must present a dissertation embodying the results of original research and defend it in public oral examination. This dissertation must be completed within three calendar years after passing the qualifying examination, unless an extension is granted by the departmental graduate committee.

History Courses

101a, 102b. The Essentials of European History (3-0-3 each semester).
Why has the world been so thoroughly reshaped by the European experience? A comprehensive attempt to answer that question. *Mr. Stokes*

105a, 106b. Varieties of the American Experience (3-0-3 each semester).
Interpretive approaches to American history. *Mr. Gruber, Mr. Higginbotham, Mr. Matusow, Staff*

201a. Ancient History (3-0-3).
History of the Ancient Near East, Greece, the Roman Republic, and the Early Empire. *Mrs. Drew*

202b. Medieval History (3-0-3).
A study of the late Roman Empire and the Middle Ages. *Mrs. Drew*

211a, 212b. American Thought and Society (3-0-3 each semester).
A topical introductory survey of American history, primarily concerned with intellectual and social developments underlying surface events. *Mr. Haskell*

223a, 224b. History of Science (3-0-3 each semester).
A broad survey of the development of scientific ideas and methods from the ancient Greeks to the beginning of the twentieth century. Not offered 1982-83. *Mr. Van Helden*

250b. Traditional Chinese Culture (3-0-3).
An introduction to the language, philosophy, religion, literature, arts, and social customs of China. *Mr. Smith*

257a. Technology and World History (3-0-3).
An examination of the technological dimension of human culture from the Paleolithic era to about 1750; a comparative approach. Not offered 1981-82. *Mr. Van Helden*

258b. Technology and the Contemporary World (3-0-3).
An examination of how the Western world has been changed by science and technology since 1750 and how other societies have incorporated Western technology, or parts of it, into their cultures. Not offered 1981-82. *Mr. Van Helden*

261a. History of England: From the Reformation to the American Revolution (3-0-3).
The personalities and forces that changed England from a backwater of Europe to the leading nation in the world. *Mr. Wiener*

262b. History of England: From the American Revolution to the Present (3-0-3).
England's "take-off" into the industrial Revolution and how it has adapted to it. Novels, biographies, and other materials are used to examine the transformation of British society in the past two centuries. *Mr. Wiener*

265b. Contemporary History: The Age of Antidemocratic Revolution (3-0-3).
A survey of our times. *Mr. Loewenheim*

297a, 298b. Constitutional and Legal History of the United States (3-0-3).
Major questions in the historical development of American law and governing institutions. Not offered 1982-83. *Mr. Hyman*

299a. Civil War and Reconstruction (3-0-3).
Background of the war, the course of the war itself, and the economic and social consequences of the war. Not offered 1982-83. *Mr. Hyman*

303a, 304b. Undergraduate Independent Reading (3-0-3 each semester).
Independent reading under the supervision of a faculty member. Open to a limited number of advanced students with special permission. *Staff*

305a. Russian History (3-0-3).
A survey of Russian history from earliest times to the present. Not offered 1981-82. *Mr. Stokes*

308b. Texas History (3-0-3).
Lectures and readings in Texas history. *Mr. Higginbotham*

309a, 310b. American Thought and Society (3-0-3 each semester).
An enriched version of History 211, 212. Students may not receive credit for both 211, 212 and 309, 310. *Mr. Haskell*

314b. History of Religion in America (3-0-3).
A survey from pilgrim beginnings to urban revivalism on the eve of the Civil War. Not offered 1982-83. *Mr. Boles*

319a. America in the Sixties (3-0-3).
An examination of the major social, political, and economic developments of the sixties. Not offered 1981-82. *Mr. Matusow*

326b. Illusions of Independence: An Introduction to Modern Latin American History (3-0-3).
Explores the movement for independence from 1760 to our time in the larger context of Latin America's neocolonial incorporation into the world economic order. Not offered 1982-83. *Mr. Hyland*

327a. The Old World and the New: An Introduction to Colonial Latin American History (3-0-3).
Explores the process and latent contradictions of the Iberian discovery, conquest, evangelization, and colonization of the Americas, with emphasis on the intertwining of European, Amerindian, and African peoples and cultures over the course of three hundred years (1492-1810). Not offered 1982-83. *Mr. Hyland*

333a. Martin Luther and the Reformation in Germany (3-0-3).
An analysis of the Protestant Reformation as one of the decisive events in German history. Not offered 1981-82. *Mr. Garside*

334b. Calvin and Geneva (3-0-3).
The intellectual and religious development of Calvin and the Reformation in Geneva. Not offered 1981-82. *Mr. Garside*

335b. Calvin and Servetus (3-0-3).
An examination in depth of the major dimensions and implications of the most celebrated heresy trial of the sixteenth century. Not offered 1982-83. *Mr. Garside*

337a. History of Ancient and Medieval Law (3-0-3).
Ancient law focusing on imperial Roman law and the various forms of medieval law: vulgar Roman law, barbarian Germanic law, and English common law. Not offered 1982-83. *Mrs. Drew*

338b. English Legal History (3-0-3).
Major topics in English legal history since the Middle Ages. The law as a mirror of social and political developments. Not offered 1981-82. *Mr. Wiener*

339a. American Intellectuals (3-0-3).
Major nineteenth- and early twentieth-century thinkers who addressed perennial problems of human existence in a particular national and temporal context. *Mr. Haskell*

341a. History of China to 1800 (3-0-3).
Survey of Chinese history from antiquity to about 1800, highlighting salient aspects of China's heritage. *Mr. Smith*

342b. History of China since 1800 (3-0-3).
China's revolutionary transformation in the nineteenth and twentieth centuries — from Ch'ing dynasty to People's Republic. *Mr. Smith*

343a. Contemporary China (3-0-3).
An examination of the interplay between "tradition" and "modernity" in contemporary China. *Mr. Smith*

348b. The American Military Experience (3-0-3).
A study of war and society in the United States from the colonial period to the present. Not offered 1981-82. *Mr. Gruber*

349a. Nineteenth-Century Europe (3-0-3).
The history of Europe from the French Revolution and Napoleon to Bismarck, Gladstone, and the Spanish American War. Not offered 1982-83. *Mr. Loewenheim*

357a. Technology and World History (3-0-3).
An enriched version of History 257. Students may not receive credit for both 257 and 357. Not offered 1981-82. *Mr. Van Helden*

358b. Technology and the Contemporary World (3-0-3).
An enriched version of History 258. Students may not receive credit for both 258 and 358. Not offered 1981-82. *Mr. Van Helden*

359b. Roman Britain and Medieval England (3-0-3).
A survey of historical developments in Roman Britain and Medieval England with special attention to social, economic, and religious factors. Not offered 1981-82. *Mrs. Drew*

361a. History of England: From the Reformation to the American Revolution (3-0-3).
An enriched version of History 261. Students may not receive credit for both 261 and 361. *Mr. Wiener*

362b. History of England: From the American Revolution to the Present (3-0-3).
An enriched version of History 262. Students may not receive credit for both 262 and 362. *Mr. Wiener*

367b. History of British Cities (3-0-3).
The evolution of urban life in the world's first urban nation, especially during the past 200 years. Not offered 1982-83. *Mr. Wiener*

368b. History of Modern Mexico (3-0-3).
Explores violent transformation of Mexico from pearl of Spanish empire in 1760, through process of independence after 1810, to modern oil-rich nation struggling to reconcile contradictions of the Revolution of 1910. Not offered 1982-83. *Mr. Hyland*

370a. History of Medicine (3-0-3).
Changing concepts of health and disease from antiquity to the present and the rise of the modern health-care profession. Also listed as Health Education 370. *Mr. Van Helden*

373b. History of the Physical Sciences (3-0-3).
A one-semester survey of the history of astronomy, mechanics, and optics. Not offered 1981-82. *Mr. Van Helden*

395a. The Old South (3-0-3).
Economic, cultural, political, and social history of the South from 1607 to 1860. *Mr. Boles*

396b. The New South (3-0-3).
Continuation of History 395 to the present. *Mr. Boles*

397a, 398b. Constitutional and Legal History of the United States (3-0-3 each semester).
An enriched version of History 297, 397. Students may not receive credit for both 297, 298 and 397, 398. Not offered 1982-83. *Mr. Hyman*

399a. Civil War and Reconstruction (3-0-3).
An enriched version of History 299. Students may not receive credit for both 299 and 399. Not offered 1982-83. *Mr. Hyman*

403a, 404b. Senior Thesis (0-0-3 each semester).
Open to well-qualified students with special permission. Students must take both History 403 and 404 to gain credit. *Staff*

414b. Slavery in North America (3-0-3).
An interdisciplinary examination of all aspects of United States slavery, from the African background through emancipation. Not offered 1981-82. *Mr. Boles*

428b. The Role of the Expert in Modern Society (3-0-3).
An examination of the growing importance of professional experts in society, the sources of their authority, and the significance of recent criticism directed against them. Not offered 1982-83. *Mr. Haskell*

430b. Social Problems in Nineteenth-Century Britain and America (3-0-3).
How problems like crime, poverty, insanity, intemperance, and ignorance were discovered and defined and how solutions to these problems were invented and applied. Not offered 1982-83. *Mr. Wiener*

433b. Renaissance Humanism: From Petrarch to Machiavelli (3-0-3).
Studies in the transmission of the classical tradition in Italy in the fourteenth, fifteenth, and early sixteenth centuries. Not offered 1981-82. *Mr. Garside*

434b. Humanism in the Sixteenth Century (3-0-3).
The classical tradition in Northern Europe and its relationship to developments in the study of law, writing of history, Protestant Reformation, scientific revolution, and birth of opera. *Mr. Garside*

440b. Social and Economic History of Europe in the Middle Ages (3-0-3).
Seminar covering selected problems in the social and econmic history of medieval Europe. *Mrs. Drew*

442b. History of Astronomy and Cosmology (3-0-3).
History of astronomy and cosmology from antiquity to about 1850. Not offered 1982-83. *Mr. Van Helden*

450b. Traditional Chinese Culture (3-0-3).
An enriched version of History 250. Students may not receive credit for both 250 and 450. *Mr. Smith*

453a. Balkan History (3-0-3).
Rumania, Yugoslavia, Bulgaria, Albania, Greece, and Turkey from the Byzantine period to the present. Not offered 1982-83. *Mr. Stokes*

455b. Europe from Bismarck to the First World War (3-0-3).
Aspects of Europe, 1871-1914, with special attention to Mazzini, Gladstone, Bismarck, and Burckhardt. Not offered 1981-82. *Mr. Loewenheim*

456a. Europe and World Politics from Sarajevo to Pearl Harbor (3-0-3).
Europe from 1914 to 1945, with special attention to the historic role of the United States in world affairs. Not offered 1982-83. *Mr. Loewenheim*

460b. Europe and World Politics from Sarajevo to the Present (3-0-3).
The aftermath of World War II, the Cold War, the era of Vietnam, and after. Special attention to role of the United States in world affairs. Not offered 1982-83.
Mr. Loewenheim

465a. Colonial America to 1754 (3-0-3).
The growth of society, thought, and politics in the English colonies of North America. Lectures, discussions, and papers. Not offered 1981-82. *Mr. Gruber*

466b. American Revolution, 1754-89 (3-0-3).
The origins and implications of the American Revolution, emphasizing constitutional, social, and political developments. Not offered 1981-82. *Mr. Gruber*

467a, 468b. The Life and Times of Adolf Hitler: I and II (3-0-3 each semester).
How and why Hitler and National Socialism took over Germany, conquered most of Europe, and finally met defeat and destruction. Not offered 1981-82. *Mr. Loewenheim*

469a. Rural Life in Latin America, 1850-1960 (3-0-3).
Explores the multifaceted social and economic relationships that comprised life on haciendas [fazendas], as these evolved in societies moving from slavery to free labor; subsistence to commercial agriculture. *Mr. Hyland*

501a, 502b. Historical Research (Credit variable).
Master's thesis. Students must take both History 501 and 502 in order to gain credit. *Staff*

511a, 512b. Directed Reading in American History I (0-0-3 each semester).
For graduate students only. *Staff*

513a. 514b. Directed Reading in American History II (0-0-3 each semester).
For graduate students only. *Staff*

517a, 518b. Directed Reading in History of Science, Technology, and Medicine (0-0-3 each semester).
For graduate students only. *Staff*

521a, 522b. Directed Reading in Medieval History (0-0-3 each semester).
For graduate students only. *Staff*

527a, 528b. Directed Reading in Nonwestern History (0-0-3 each semester).
For graduate students only. *Staff*

529a, 530b. Directed Reading in Modern European History I (0-0-3 each semester).
For graduate students only. *Staff*

531a, 532b. Directed Reading in Modern European History II (0-0-3 each semester).
For graduate students only. *Staff*

545a. Historiography (3-0-3).
Seminar in historical method and issues. Undergraduates admitted with special permission. *Mr. Haskell*

585a, 586b. Seminar in United States Constitutional and Legal History (3-0-3 each semester).
Significant constitutional and legal questions stressing civil liberties, criminal law, civil-military relations, race relations, and urban problems. *Mr. Hyman*

601a, 602b. Historical Research (Credit variable).
Doctoral dissertation. May be repeated for credit.

700c. Summer Graduate Research.

701a, 702b. Historical Research (Credit variable).
Doctoral dissertation. For students not in residence. May be repeated for credit.

800b. Degree Candidate Only.

Italian (see French and Italian)

Legal Studies

Degree Offered: B.A.

Undergraduate Program. Students majoring in legal studies are required to take the following ten courses: Anthropology 326, Economics 438, History 297 or 397 and 298 or 398, Legal Studies 201 and 401, Philosophy 307 and 316, and Political Science 325 or 326 and 309 or 321. In addition, students must take two of the following electives: Economics 436, 461, 483; Environmental Engineering 406; History 337, 338; Philosophy 101, 314; Political Science *309, 310, 315, *321, *325, *326, 337, 410; Psychology 444; Sociology 321.

* If not taken as a required course.

Legal Studies Courses

201b. Introduction to Legal Studies I (3-0-3).
Introduction to the interdisciplinary study of the law as a fundamental social institution and of the values it embodies. *Mr. Brody*

401a. Senior Seminar I (3-0-3). *Staff*

Linguistics

Associate Professor Copeland, *Chairman*
Professors P.W. Davis, Grandy, Lamb, Morris, and Tyler
Associate Professors R.G. Jones and Urrutibeheity
Assistant Professor Kauffmann
Adjunct Associate Professor E.D. Mitchell

Degree Offered: B.A.

Undergraduate Program. Students majoring in linguistics are required to take a total of thirty semester hours (ten courses) in linguistics, of which twenty-four semester hours (eight courses) must be on the 300 level or above. All majors are required to take Linguistics 201, 202 or the equivalent. With the approval of the major adviser, related courses offered by other departments may be taken for credit toward fulfillment of the requirements in linguistics.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 50-51.

Linguistics Courses

201a. Introduction to General Linguistics (3-0-3).
Study of language including basic synchronic concepts and techniques: phonological, grammatical, and semantic systems. Also offered as Anthropology 207. *Staff*

202b. Introduction to General Linguistics (3-0-3).
Continuation of Linguistics 201 with an introduction to the diachronic study of language and the methods of linguistic prehistory. Also offered as Anthropology 208. *Staff*

300a/b. Language and Communication Codes (3-0-3).
Language and its relation to animal communication; human social codes; propaganda, politics, and exploitation; artistic expression; sex; pathological states; myth. Not offered every year. *Staff*

302a/b. Syntax of Language (3-0-3).
Study of semantic categories common to all languages and their formal expression in the grammars of specific languages. Also offered as Anthropology 302. Not offered every year. *Staff*

303a/b. Modern Linguistic Theory (3-0-3).
Survey of selected theories of language from de Saussure to the present. Also offered as Anthropology 303. Not offered every year. *Staff*

304a/b. Phonology of Language (3-0-3).
Study of the categories that serve as the framework for the perception of sounds in specific languages. Also offered as Anthropology 304. Not offered every year. *Staff*

305a/b. Historical Linguistics (3-0-3).
The nature of language change in its social and geographical contexts from the perspective of language acquisition. Also offered as Anthropology 305. Not offered every year. *Mr. Davis*

312a/b. Language, Thought, and Mind (3-0-3).
Introduction to cognitive linguistics, with an emphasis on semantic and conceptual structure and thought processes. Prerequisite: Linguistics 201 or permission of instructor. Not offered every year. *Mr. Lamb*

313a/b. Language and Culture (3-0-3).
Investigation of the systematic relations between linguistic form and expression and culture. Also offered as Anthropology 313. Not offered every year. *Mr. Tyler*

394a/b. The Linguistic Structure of English (3-0-3).
Introduction to modern English grammar, phonology, and phonetics, including study of English pragmatics, discourse, sociolinguistics, and dialectology. Also offered as English 394. Not offered every year. *Mr. Davis*

395a/b. History of the English Language (3-0-3).
Also offered as English 395. Not offered every year. *Mr. Mitchell*

396a/b. Language and Philosophy in Literature (3-0-3).
Readings and discussions of issues in the philosophy of language: representation, metaphor, structure, speech. Focus on: Lacan, Derrida, Heidegger, Cassirer, Saussure, Wittgenstein, Plato, Aristotle. Also offered as English 396. Not offered every year. *Mr. Morris*

401a, 402b. Independent Study in Linguistics (3-0-3 each semester).

403a/b. Linguistic Structure of German (3-0-3).
Synchronic study of modern German phonology, syntax, and semantics, including aspects of discourse structure. Also offered as German 403. Not offered every year. *Mr. Copeland*

404a/b. History of the German Language (3-0-3).
Aspects of the history of German phonology, syntax, and semantics (with related systems) from its Proto-Indo-European origins to the present. Not offered every year. *Mr. Copeland*

405a/b. Applied Linguistics (3-0-3).
Relation of structural linguistics to the teaching of modern languages. Prerequisite: Linguistics 201, 202 or permission of instructor. Not offered every year. *Mr. Urrutibeheity*

406a/b. Cognitive Anthropology (3-0-3).
Focus on the relations between thought, language, and culture. Special emphasis given to systems of folk classification and the logical principles underlying them. Also offered as Anthropology 406. Not offered every year. *Mr. Tyler*

407a/b. Field Techniques and the Analysis of Natural Language (4-0-4).
Techniques and practice in the observation, analysis, and recording of a human language. Also offered as Anthropology 403. Not offered every year. *Staff*

409a/b. Special Topics in Linguistics (3-0-3).
Topic changes from year to year. May be repeated for credit. Prerequisite: Linguistics 201, 202 or permission of instructor. Not offered every year. *Staff*

410a/b. A Critical Introduction to Structuralism (3-0-3).
Basic texts of European structuralism (de Saussure, Jakobsen, Levi-Strauss, Barthes), and several important critiques of it (Derrida, Foucault, Ricoeur). Emphasis on main elements of structuralist methodology in the analysis of texts. Also offered as Spanish 402. Not offered every year. *Mr. Kauffmann*

411a/b. Neurolinguistics: Language and the Brain (3-0-3).
Organization of the brain; localization of speech, language, and memory functions; hemispheric dominance; pathologies of speech and language associated with brain damage. Also offered as Anthropology 411. Not offered every year. *Staff*

415a/b. Mathematical and Computational Tools for Linguistics and Semiotics (3-0-3).
A study of various tools and techniques, including laws of form, digital logic networks, and computer programing, with applications to linguistics and semiotics. Prerequisite: Linguistics 201 or permission of instructor. Recommended: Linguistics 312, 410. Not offered every year. *Mr. Lamb*

416a/b. Automata and Formal Languages (3-0-3).
Finite automata, regular expressions, regular languages, pushdown automata, context-free languages. Turing machines, recursive languages, computability, and solvability. Prerequisite: Computer Science 316. Also offered as Computer Science 416. (Distribution category III, 5). Not offered every year. *Staff*

423a/b. The Linguistic Structure of Spanish (3-0-3).
Synchronic study of modern Spanish phonology and syntax, including peninsular and Hispanic American variants. Also offered as Spanish 423. Not offered every year. *Mr. Urrutibeheity*

424a/b. Studies in Hispanic Linguistics (3-0-3).
Topic changes from year to year. May be repeated for credit. Not offered every year. *Mr. Urrutibeheity*

466a/b. The Philosophy of Language (3-0-3).
Philosophical investigation of relations among language,thought, and reality. Specific topics include such notions as analyticity, meaning, reference, and speech act. Prerequisite: two courses in linguistics or philosophy. Also offered as Philosophy 403. Not offered every year. *Mr. Grandy*

491a/b. Seminar in Phonology and Morphology (3-0-3).
Not offered every year. *Mr. Lamb*

493a/b. Seminar in Syntax and Semantics (3-0-3).
Not offered every year. *Mr. Lamb*

495a/b. Seminar in Computational Linguistics (3-0-3).
Not offered every year. *Mr. Lamb*

497a/b. Seminar in Semiotics (3-0-3).
Not offered every year. *Mr. Lamb*

508a/b. Linguistic Anthropology (3-0-3).
Application of linguistic theory and method to the analysis of cultural materials. Also offered as Anthropology 508. Not offered every year. *Mr. Tyler*

Mathematical Sciences

Professor Tapia, *Chairman*
Professors Bowen, S.H. Davis, de Figueiredo, Dennis, Kennedy, Kilpatrick, Lutes, Miele, Pfeiffer, Rachford, Schum, Thrall, J.R. Thompson, Wang, Wheeler, and Young
Adjunct Professors B.W. Brown, Cardus, Downs, Frankowski, Gehan, Gorry, Hsi, Jansson, Middleton, Thames, and Zimmerman
Associate Professors Cartwright (on leave 1982-83) **and D.W. Scott**
Adjunct Associate Professors Ewing, Gentle, and Hacker
Assistant Professor Trosset
Adjunct Assistant Professors Johnston, Kendall, and R.A. White

Degrees Offered: B.A., M.A.Ma.Sc., M.A., Ph.D.

Undergraduate Program. The program allows students considerable freedom to plan a course of study consistent with their particular interests in mathematics and its applications. Available courses provide foundations for applications to many fields of engineering, physical sciences, life sciences, behavioral and social sciences, and computer science.

Within the flexible framework of university requirements, the program consists of three parts: (1) basic courses in mathematics and computer science, (2) introductory courses in appropriate areas of mathematical sciences, and (3) electives for which major credit is given.

1. Students normally take eight courses, as follows:
   Elementary analysis: Mathematics 101, 102 or honors equivalent
   Differential equations: Mathematics 211 or more advanced introduction
   Multivariable calculus: Mathematics 212
   Linear algebra: Mathematics 355 or Mathematical Sciences 310
   Algebraic structures: Mathematics 356 or 463 or Mathematical Sciences 316 or 411
   Computer science: Mathematical Sciences 220, 222, 223, or approved alternate
   Model building: Mathematical Sciences 300, 301, or approved alternate
2. Students also take one course in three of the following areas:
   Computer science: Mathematical Sciences 320 or 321
   Numerical analysis: Mathematical Sciences 353, 451, 452, or 454
   Operations research and optimization: Mathematical Sciences 460, 463, 464, 471, 472, or 476
   Physical mathematics: Mathematical Sciences 330, 340, or 343 or Mathematics 381, 382, or approved alternate
   Probability and statistics: Mathematical Sciences 380, 381, or 382
3. Students also take seven elective courses for credit toward the mathematical sciences major, as follows:
   Two additional courses in one of the areas selected above, but not limited to the courses listed above
   At least one additional course in mathematics or mathematical sciences
   At least four courses in fields where mathematics may be applied

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 50-51.

A student contemplating work in mathematical sciences is encouraged to contact any member of the department, particularly the members of its undergradu-

ate committee, who will help the student explore possible programs suited to individual needs and interests.

The Department of Mathematical Sciences participates in the interdisciplinary programs in computer science and managerial studies. More information may be obtained from the descriptions on pages 54-56.

Graduate Program. Admission to graduate study in mathematical sciences is open to qualified students holding bachelor's or master's degrees (or their equivalent) in engineering, mathematics, or physical, biological, mathematical, or behavioral sciences. The credentials of each applicant will receive individual evaluation by the faculty of the department. An applicant holding only a bachelor's degree should submit quantitative and verbal scores from the Graduate Record Examination when requesting application forms.

The graduate program is designed for students seeking the professional degree of Master in Applied Mathematical Sciences or the research degrees of Master of Arts or Doctor of Philosophy. It normally takes one or two years to obtain a master's and three or four years to obtain a doctorate. A master's degree is not a prerequisite for the doctoral degree.

The professional degree emphasizes the applied aspects of the mathematical sciences. This degree is intended for persons who plan careers as practitioners rather than primarily as researchers. Presently, this degree emphasizes the following areas, singly or in combination: (1) computer science, (2) statistics, (3) operations research, and (4) numerical analysis. Further information about this degree may be obtained from the department.

The granting of a research degree presupposes demonstrated ability to do advanced original research. Students are encouraged to initiate research activities at the earliest possible time in their graduate study. Presently, the research interests of the faculty are in the following five major areas: (1) computer science, (2) numerical analysis, (3) statistics and probability, (4) operations research, and (5) mathematical models in physical, biological, or behavioral sciences. Further information about these areas may be obtained from the department.

Graduate fellowships, research assistantships, and graduate scholarships are available and are awarded on the basis of merit to qualified students. Current practice in the department is for most doctoral students of good standing to receive some financial aid. As an integral part of their scholastic programs, all graduate students are expected to attain some proficiency in teaching by engaging in instructional assignments of the department.

The Master in Applied Mathematical Sciences requires satisfactory completion of at least thirty semester hours approved by the department.

Requirements for the Degree of Master of Arts:

1. Satisfactory completion of at least thirty semester hours (including thesis) at the graduate level. Normally five courses must be in mathematical sciences. Specific courses of study should be formulated in consultation with the student's adviser and must be approved by the department.
2. An original thesis acceptable to the department; note, however, that successful performance on the qualifying examination fulfills the master's thesis requirement for a student working toward the Ph.D. degree
3. Satisfactory performance on a public oral examination on the thesis; the procedure for the public oral examination is given in the general rules of the university.

Requirements for the Degree of Doctor of Philosophy:

1. Satisfactory completion of courses of study approved by the department. At least two courses outside the department are required
2. Satisfactory performance on preliminary and qualifying examinations and reviews
3. Satisfactory completion of two semester courses or a reading examination on an

approved foreign language
4. An original thesis acceptable to the department
5. Satisfactory performance on a final public oral examination on the thesis; the procedure is given in the general rules of the university

Mathematical Sciences Courses

Note: Only one of these courses may be taken for credit: Mathematical Sciences/Electrical Engineering/Computer Science 220, 221, 222, 223, Engineering 240.

220a,b. Introduction to Computer Science and Engineering (3-3-4).
A semi-self-paced introduction to programing for students in computer science and engineering. Also offered as Computer Science 220 and Electrical Engineering 220.

222a,b. Introduction to Business Data Processing (3-3-4).
A semi-self-paced introduction to programing in PL/1 with emphasis on business applications and problems. Also offered as Computer Science 222 and Electrical Engineering 222.

223a,b. Introduction to Computing (3-3-4).
A semi-self-paced introduction to the computer solution of equations using APL and FORTRAN. Also offered as Computer Science 223 and Electrical Engineering 223.

280a,b. Elementary Applied Statistics (3-0-3).
A noncalculus introduction to statistics for students with interests in the social sciences.

300b. Model Building (3-0-3).
Examples to illustrate mathematical formulation (modeling) of scientific problems, their solution and interpretation. Emphasis on physical science models.

301a. Model Building (3-0-3).
Same as Mathematical Sciences 300 with emphasis on behavioral science models.

310b. Linear Algebra (3-0-3).
Concepts and results of linear algebra useful in a variety of fields of application.

316a. Introduction to Discrete Structures (3-0-3).
Set theory, relations, mappings; algebraic systems such as semigroups, groups, rings, fields, graph theory, Boolean algebra, and propositional logic. Also offered as Computer Science 316 and Electrical Engineering 316.

320a,b. Computer Organization and Software (3-3-4).
Basic computer architecture and assembly language programing. System software, including loaders and assemblers. Input-output devices and programing. Prerequisite: Mathematical Sciences 220. Also offered as Computer Science 320 and Electrical Engineering 320.

321a,b. Advanced Programing (3-3-4).
Advanced programing methods, including structured programing, team programing, data structures, searching and sorting, data management, and information retrieval. Prerequisite: Mathematical Sciences 220. Also offered as Computer Science 321 and Electrical Engineering 321.

322a. Introduction to Management Information Systems (3-0-3).
Basic concepts for development and implementation of computer-based management systems. Field assignments in local industry. Prerequisite: Mathematical Sciences 222. Also offered as Computer Science 322 and Electrical Engineering 322.

330a,b. Complex Variables (3-0-3).
Discussion of the basic concepts of complex variables theory and applications to the solution of physical problems. Prerequisite: Mathematics 211.

340b. Partial Differential Equations for Engineers and Scientists (3-0-3).
Elementary methods for the solution of partial differential equations and boundary value problems in engineering and physical sciences. Prerequisite: Mathematics 211.

343a. Partial Differential Equations and Complex Variables for Engineers and Scientists (4-0-4).
Standard methods of solution for partial differential equations of mathematical physics. Introduction to functions of a complex variable and Laplace transform. Prerequisite: Mathematics 211.

353a,b. Topics in Computational Numerical Analysis with Computer Laboratory (3-1-3).
An introductory course in numerical analysis with computer applications. Prerequisite: Mathematics 211.

376a. Quantitative Analysis in Managerial Decisions (3-0-3).
Mathematical models in deterministic and stochastic situations, including linear programing, inventory theory, decision theory, waiting line theory. Prerequisite: one year of college mathematics and statistics course.

380a. Introduction to Probability (3-0-3).
For students in the behavioral, social, and biological sciences. Prerequisite: Mathematics 102 or 103.

381a,b. Introduction to Applied Probability (3-0-3).
Concepts, interpretations, elementary techniques, and applications of modern probability theory, including a brief introduction statistical inference. Prerequisite: Mathematics 102. Also offered as Electrical Engineering 331.

382a. Introduction to Probability and Statistics (3-0-3).
Probability theory and the central concepts and methods of statistics. Prerequisite: Mathematics 102.

400a,b. Advanced Model Building (3-0-3).
Continuation of Mathematical Sciences 300 or 301 with an increased emphasis on the mathematical solution phase. Prerequisite: permission of instructor. Not offered every year.

411a. Group Theory for Chemists and Physicists I (3-0-3).
Symmetries of physical laws and structures and associated transformation groups. Applications to problems in atomic, solid state, and molecular physics and chemistry. Prerequisite: linear algebra and elementary quantum mechanics.

412. Group Theory for Chemists and Physicists II (3-0-3).
Continuation of Mathematical Sciences 411. Not offered every year.

416b. Automata and Formal Languages (3-0-3).
Finite automata, regular expressions, regular languages, pushdown automata, context-free languages. Turing machines, recursive languages, computability, and solvability. Prerequisite: Mathematical Sciences 316. Also offered as Computer Science 416, Electrical Engineering 416, and Linguistics 416.

417. Combinational Analysis (3-0-3).
Solution of enumeration problems using the methods of inclusion and exclusion and generating functions, distributions, permutations, and graphical enumeration. Not offered every year.

420b. Algorithms and Data Structures (3-3-4).
The design and analysis of computer algorithms. Models of computation, data structures, and efficiency considerations. Prerequisite: Mathematical Sciences 316, 321. Also offered as Computer Science 420 and Electrical Engineering 420.

421a. Systems Programing (3-3-4).
Introduction to the design and construction of important software systems programs, including assemblers, compilers, and operating systems. Introduction to concurrent programing. Prerequisite: Mathematical Sciences 316, 320, 321. Also offered as Computer Science 421 and Electrical Engineering 421.

432b. Tensor Analysis (3-0-3).
Review of linear algebra. Tensor algebra. Tensor analysis on Euclidean spaces. Applications to particle mechanics, continuum mechanics, and electromagnetic theory. Prerequisite: linear algebra.

440a. Mathematical Methods in Physics and Engineering (3-0-3).
Application of linear operator theory and transform techniques in the solution of ordinary and partial differential equations of engineering and mathematical physics. Prerequisite: Mathematical Sciences 330.

451a. Computational Methods and Analysis in Numerical Linear Algebra (3-0-3).
A study of numerical methods in linear algebra.

452b. Computational Methods for Differential Equations with Computer Laboratory (3-3-4).
Finite difference, variational, and collocation methods for approximating numerically solutions of ordinary and partial differential equations. Computer implementation to verify convergence to the solution.

453. Methods and Analysis in Ordinary Differential Equations (3-0-3).
Several popular methods for solving systems of differential equations, including analysis of methods of quadrature and methods for integral equations. Prerequisite: Mathematics 211. Not offered every year.

454b. Computational Methods in Nonlinear Systems (3-0-3).
Analysis and computer applications of modern methods for solving nonlinear algebraic systems and nonlinear constrained optimization problems in R^n. Prerequisite: Mathematics 211, 212, linear algebra.

460a. Foundations of Optimization Theory (3-0-3).
Derivation and application of necessity conditions and sufficiency conditions for constrained optimization problems. Prerequisite: Mathematics 212.

463a. Minimization of Functions (3-0-3).
Theory of maxima and minima. Analytical methods. Numerical methods. Also offered as Mechanical Engineering 463.

464b. Minimization of Functionals (3-0-3).
Optimal control theory. Calculus of variations. Analytical methods. Numerical methods. Also offered as Mechanical Engineering 464.

471a. Linear Programing (3-0-3).
Formulation of managerial and technical problems; simplex method; revised simplex method; duality theory and applications; transportation problems; decomposition techniques. Also offered as Economics 471.

472b. Game Theory and Decision Analysis (3-0-3).
Matrix games; relation to linear programing; nonzero sum games; games against nature; decision trees; models for group decisions; utility theory; benefit-cost models.

475. Operations Research, Deterministic Models (3-0-3).
Optimization problems in a managerial and economic context. Familiarity with linear programing and microeconomic theory is strongly recommended. Also offered as Economics 475. Not offered every year.

476b. Operations Research, Stochastic Models (3-0-3).
Decision theory, waiting line theory. Markov chains, inventory models, replacement models, simulation. Prerequisite: Mathematical Sciences 380 or 381. Also offered as Economics 476.

477b. Mathematical Structure of Economic Theory I (3-0-3).
Exposition of the theory of competitive economies from a mathematical perspective, unifying calculus, matrix algebra, and set-theoretic approaches. Prerequisite: Economics 211, Mathematics 212, Mathematical Sciences 310. Also offered as Economics 477. Not offered every year.

478. Mathematical Structure of Economic Theory II (3-0-3).
Continuation of Economics/Mathematical Sciences 477, which is a prerequisite. Also offered as Economics 478. Not offered every year.

480b. Introduction to Statistical Method (3-0-3).
A survey of distribution theory, estimation theory, and hypothesis testing. Prerequisite: Mathematical Sciences 380 or 381.

481. Introduction to Mathematical Statistics: Estimation Theory (3-0-3).
Distributions related to the Gaussian; central limit theorem; Bayes's theorem; admissibility; minimaxity; maximum-likelihood estimation; Gauss-Markov theorem; Cramer-Rao inequality. Prerequisite: Mathematical Sciences 380, 381, or 382.

482a. Introduction to Mathematical Probability (3-0-3).
Measure-theoretic foundations of probability theory for students who need access to advanced mathematical literature in applied probability.

483a. Markov and Related Processes (3-0-3).
Conditional expectation and conditional independence; Poisson processes; Markov chains; continuous-parameter Markov processes; renewal processes. Prerequisite: Mathematical Sciences 380 or 381.

484. Second-Order Processes and Martingales (3-0-3).
Second-order processes: Hilbert space ideas, covariance analysis, spectral representation, mean-square calculus. Stopping times. Discrete-parameter submartingales. Prerequisite: introductory course in probability. Also offered as Electrical Engineering 533. Not offered every year.

485. Introduction to Mathematical Statistics: Hypothesis Testing (3-0-3).
Confidence intervals, Neyman-Pearson lemma, uniformly most powerful tests, rank tests, sign tests, Kolmogorov-Smirnov testing. Prerequisite: Mathematical Sciences 480 or 481.

The following three courses are offered occasionally by CAMS (Houston Council for Applied Mathematical Sciences).

486a. Linear Models 3-0-3).
Univariate distribution theory and inference. Multivariate normal distribution. Multiple and partial correlation. Wishart distribution. Prerequisite: linear algebra, one year of probability and statistics.

487b. Multivariate Analysis (3-0-3).
Continuation of Mathematical Sciences 486. Hotelling's T^2. Fisher's linear discriminant function. Principal component analysis. Multivariate analysis of variance. Multivariate nonformal distributions.

488. Bayesian Foundations of Statistical Inference (3-0-3).
Bayes's theorem; vague prior knowledge; inference for multivariate distributions; approximation methods; natural conjugate priors; likelihood principle.

490a, 491b. Independent Study in Mathematical Sciences (Credit variable).

492a/b, 493a/b. Computer Science Special Projects (1-6-3 each semester).
Independent and group work on large software systems. Complete implementations, including programing, debugging, verification, and documentation. Prerequisite: permission of instructor.

518b. Analysis Techniques for Combinatorial Algorithms (3-0-3).
Analysis of problem complexity; matrix multiplication, primality testing, string matching, NP-complete problems, approximation algorithms, lower bound techniques. Outside readings and term project. Prerequisite: Mathematical Sciences 416, 420. Also listed as Computer Science 518 and Electrical Engineering 518.

520a. Operating Systems (3-3-4).
Operating systems as a resource manager; memory management, including allocation, virtual memory, and sharing; scheduling; concurrent processes, including process synchronization and communication and deadlocks; protection and file systems. Prerequisite: Mathematical Sciences 420, 421, 425, 381. Also offered as Computer Science 520 and Electrical Engineering 520.

521b. Artificial Intelligence (3-3-4).
Techniques for simulating intelligent behavior by machine; problem solving, game playing, pattern perceiving, theorem proving, semantic information processing, and automatic programing. Prerequisite: Mathematical Sciences 381, 420. Also listed as Computer Science 521 and Electrical Engineering 521.

523b. Compiler Construction (3-3-4).
Advanced topics in the design of programing language compilers, including parsing, run-time storage management, code generation and optimization, and error recovery. Prerequisite: Mathematical Sciences 416, 421. Also listed as Computer Science 523 and Electrical Engineering 523.

533. Advanced Tensor Analysis (3-0-3).
Differential and integral calculus on manifolds. Riemannian geometry. Calculus of variations. Hamilton-Jacobi theory. Applications to analytical mechanics, relativity and continuum mechanics. Prerequisite: Mathematical Sciences 423. Offered occasionally.

535. Mathematical Theory of Nonlinear Elasticity (3-0-3).
Representation theory for the constitutive relations for elasticity; homogeneous and inhomogeneous bodies; wave propagation; second-order elasticity and approximations. Prerequisite: Mechanical Engineering 511, 512, or Mathematical Sciences 432. Offered occasionally.

540a. Applied Functional Analysis (3-0-3).
Applications of basic concepts and theorems in functional analysis to mechanics, quantum mechanics, and/or optimal control problems.

541. Partial Differential Equations I (3-0-3).
Selected topics from first-order partials; characteristics and classifications; initial value problems; boundary-value problems for elliptic equations; Riemann's, Green's, and Neumann's functions; and applications. Offered occasionally.

542b. Partial Differential Equations II (3-0-3).
Selected topics, arranged in such a way that Mathematical Sciences 541 is not a prerequisite. Offered occasionally.

544b. Mathematical Methods of Physics (3-0-3).
Selected mathematical techniques useful in the solution of problems in physics and space physics. Prerequisite: Physics 301, 302; Mathematical Sciences 440 is desirable. Also offered as Space Physics 544. Offered alternate years.

551a. Analysis of Numerical Methods for Partial Differential Equations (3-0-3).
Analysis of modern numerical methods, including finite-difference methods, finite-element methods, collocation methods, and associated algebraic problems. Also offered as Mathematics 438.

552b. Analysis of Numerical Methods for Optimization Problems (3-0-3).
Analysis of modern methods (including secant methods) for nonlinear algebraic equations and nonlinear optimization problems.

553, 554. Advanced Topics in Numerical Analysis I, II (3-0-3 each semester).
The content of the course varies from year to year at the discretion of the instructor. Neither course is a prerequisite for the other.

563a. Minimization of Functions (3-0-3).
Same as Mathematical Sciences 463 with emphasis on computer methods. Also offered as Mechanical Engineering 563.

564b. Minimization of Functionals (3-0-3).
Same as Mathematical Sciences 464 with emphasis on computer methods. Also offered as Mechanical Engineering 564.

571a. Topics in Linear Programing (3-0-3).
Continuation of Mathematical Sciences 471. Advanced topics in mathematical structure of linear programing. Special emphasis on applications in management and economics. Not offered every year.

572. Topics in Theory of Games (3-0-3).
Utility theory; theory of two-person general-sum games; bargaining and threats. Theory of n-person games; solution concepts and extensions. Optional topics. Not offered every year.

573. Nonlinear Programing (3-0-3).
Theory and computational methods for nonlinear programing, including: Kuhn-Tucker conditions, duality theory, methods for constrained optimization of convex and nonconvex problems. Also offered as Economics 573. Not offered every year.

574b. Integer Programing (3-0-3).
Applications theory and computational methods in pure and mixed integer programing. Special problem structures.

580a,b. Introduction to Statistical Inference (3-0-3).
A methods course for graduate students with limited mathematical background. Not open to mathematical sciences majors.

581. Estimation Theory (3-0-3).
Effects of linear and memoryless nonlinear filters, estimation techniques, Hilbert space concepts, Wiener and Kalman filtering. Prerequisite: introductory stochastic processes or Electrical Engineering 430. Also offered as Electrical Engineering 534. Not offered every year.

582. Advanced Stochastic Processes (3-0-3).
Measure-theoretic probability, separability and measurability, analytic properties of sample functions. Standard topics of second-order processes. Continuous-parameter martingales. Prerequisite: Mathematical Sciences 484 or 581. Also offered as Electrical Engineering 537. Not offered every year.

583. Pattern Recognition (3-0-3).
Topics such as statistical pattern classification, feature extraction, and unsupervised learning; perception theory and cluster analysis; syntactic pattern recognition. Prerequisite: Mathematical Sciences 480 or 481. Also offered as Electrical Engineering 538. Not offered every year.

585. Information and Coding Theory (3-0-3).
Information theory concepts, channel coding and source coding with fidelity criterion. Parity check codes, algebraic coding, convolutional codes. Variable-length source coding. Prerequisite: Mathematical Sciences 381 or 382. Also offered as Electrical Engineering 535. Not offered every year.

586a, 587b, 588a, 589b. Advanced Topics in Theoretical Statistics I, II, III, IV (3-0-3) each semester).
This two-year sequence varies from year to year. Subjects may include: Monte Carlo techniques, time series analysis, nonparametric statistics, hypothesis testing, regression theory. Prerequisite: Mathematical Sciences 480 or 481.

590a, 591b. Topics in Operations Research (3-0-3 each semester).

592a, 593b. Topics in Applied Mathematics (3-0-3 each semester).

596a, 597b. Special Topics in Mathematical Sciences (3-0-3 each semester).
Independent study.

600a, 601b. Thesis.

617. Continuum Mechanics I (3-0-3).
Advanced topics in continuum mechanics. Theory of constitutive equations. Theories of fading memory. Thermodynamics of materials with memory. Prerequisite: Mechanical Engineering 511, 512. Also offered as Mechanical Engineering 617. Not offered every year.

618. Continuum Mechanics II (3-0-3).
Recent developments in continuum mechanics. Typical topics; irreversible thermodynamics; electromagnetic interaction with general materials; theories of mixtures; continuum dislocation theories. Prerequisite: Mathematical Sciences 617. Also offered as Mechanical Engineering 618. Offered occasionally.

621. Principles of Programing Languages (3-0-3).
Logical design and efficient implementation of programing languages. Formal semantics, programing logics, logical models of computation, efficient representation of abstract data objects. Prerequisite: Computer Science 321, 416, and 420. Also offered as Computer Science 621 and Electrical Engineering 621.

623. Advanced Compiler Construction (3-0-3).
Advanced topics in construction of programing language translators. Prerequisite: Computer Science 523. Also offered as Electrical Engineering 623 and Computer Science 623.

641, 642. Topics in Experimental Design I, II (3-0-3 each semester).
Discussion and interpretation of current literature and research relevant to the environmental sciences. Also offered as Environmental Science and Engineering 641, 642. Not offered every year.

686a, 687b, 688a, 689b. Advanced Topics in Applied Statistics I, II, III, IV (3-0-3 each semester).
This two-year sequence varies from year to year. Topics may include bioassay, sampling theory, survival studies, experimental design, analysis of variance, data analysis. The courses are arranged so that none is a prerequisite to any other, unless noted otherwise.

700c. Summer Graduate Research (Credit variable).

800b. Degree Candidate Only.

Mathematics

Professor Polking, *Chairman*
Professors Bochner, Curtis, Harvey, Hempel, Jaco (on leave spring 1982), **B. F. Jones, Taylor, Veech, and Wells**
Associate Professors Bryant and Shalen (on leave 1981-82)
Instructors M. Andersen, Bivens, Culler, and Pool

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. It is possible to major in mathematics in either the science, engineering, or humanities program. There are two major programs.

1. *Regular major.* Mathematics 101, 102 or 121, 122 and 211, 212 or 221, 222 and at least twenty-four semester hours (eight courses) in courses numbered 300 or above in the Department of Mathematics. A student can receive advanced placement credit for Mathematics 101 by achieving a score of 4 or 5 on the AP AB level test or for Mathematics 101 and 102 by achieving a score of 4 or 5 on the BC level test. Students who have had calculus but have not taken the AP test may petition the Department of Mathematics for a waiver of the calculus requirements for a major in mathematics.

2. *Double major.* The requirements for the double major are the same as above with the exception that up to nine of the twenty-four semester hours numbered 300 or above can be replaced by approved mathematics-related courses.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 50-51.

Graduate Program. Admission to graduate study in mathematics will be granted to a limited number of students who have indicated ability for advanced and original work. Normally, one or two years are required after the bachelor's degree to obtain an M.A. degree and three or four years to obtain a Ph.D. An M.A. is not a prerequisite for the Ph.D.

A number of graduate scholarships and fellowships are available and will be awarded on the basis of merit. As part of the graduate education in mathematics, each graduate student is normally expected to engage in teaching or other instructional duties. Generally, less than six hours a week is devoted to such duties.

Qualifying Examinations. The qualifying examinations in mathematics consist of two parts: the general examination and the advanced examination.

1. *General examination.* It consists of three parts, covering algebra, analysis, and topology. The examination will be given twice a year, in mid-September and in

mid-January. A student should take this examination after the third semester of graduate study or sooner. A student who fails one or more parts of the general examination may, with the approval of the departmental graduate committee, be allowed to retake the appropriate part(s) at the next scheduled examination time. A student generally will not be allowed to take any part of the general examination more than two times.

2. *Advanced oral examination.* After completing the general examination, the student should prepare for an advanced oral examination by selecting some special field (e.g., homotopy theory, several complex variables, group theory, etc.) and submitting the topic to the departmental graduate committee for approval. The time of the advanced examination will be scheduled by the graduate committee and will normally be within six to nine months after the general examination. A student who fails the advanced examination may, with the approval of the graduate committee, be allowed to retake it (on the same or possibly a different topic) but will generally not be allowed to take the advanced examination more than two times.

Requirements for the Degree of Master of Arts:

1. Satisfactory completion (grade of "2" or better) of a course of study approved by the department and fulfillment of the general rules of the university (described on pages 90-92). Transfer of credits from another university will be allowed only when approved by both the department and the University Graduate Council.
2. Satisfactory performance on an examination in at least one approved foreign language (French, German, or Russian)

Other requirements for the master's degree may be satisfied in either of the following ways:

1. Completion of all the requirements for qualification as a candidate for the doctoral degree as given below
2. Presentation and oral defense of an original thesis acceptable to the department

Requirements for the Degree of Doctor of Philosophy:

1. Satisfactory completion (grade of "2" or better) of a course of study approved by the department. Transfer of credits from another university will be allowed only when approved by both the department and the University Graduate Council.
2. Satisfactory performance on both the general and advanced qualifying examinations described above
3. Satisfactory performance on examinations in two approved foreign languages (French, German, or Russian)

Remaining requirements for the doctoral degree.

1. The writing of an original thesis acceptable to the department
2. Satisfactory performance on a final oral examination on the thesis
3. Any other conditions required by the general rules of the university (described on pages 90-92).

Mathematics Courses

101a,b; 102a,b. Differential and Integral Calculus for Functions of One Variable (4-0-4 each semester).

Includes careful discussion of continuity, sequences, series, and power series. Mathematics 102 is open to entering students with advanced placement and departmental approval. Offered in both "self-paced" and "traditional" format.

103a, 106b. Introduction to Calculus and Its Applications (3-0-3 each semester).

Emphasis on problem solving and applications. Intended for non-science-engineering students. Not open to mathematics majors.

104b. Finite Mathematics (3-0-3).

Topics from elementary propositional calculus, partitions and counting, linear programing. Not open to mathematics majors.

121a, 122b. Honors Analysis (4-0-4 each semester).
Covers the material of 101, 102 with emphasis on theoretical aspects. Prerequisite: departmental permission.

211a, b. Linear Algebra and Ordinary Differential Equations (4-0-4).
Elements of vector spaces: linear dependence, linear transformations and matrices, first-order differential equations, second-order differential equations, power series solutions, systems.

212b. Differential and Integral Calculus for Functions of Several Variables (4-0-4).
Differentiation, vector-valued functions, Taylor's theorem and extrema, integration, integrals over paths and surfaces, Green's Theorem, Stokes's Theorem.

221a, 222b. Advanced Honors Analysis (3-0-3 each semester).
Elementary topology of R^n, differentiation of vector-valued functions, elementary theory of Lebesgue integration in R^n, changes of variable formula, exterior differential calculus, integration on submanifolds.

312b. Principles of Analysis (3-0-3).
A careful treatment of: the topology of R^n, convergence of sequences and series of functions, the implicit function theorem, existence theorems for ODEs, and related topics.

355a. Linear Algebra (3-0-3).
Linear transformations and matrices, solution of linear equations, the eigenvalue problem and quadratic forms.

356b. Abstract Algebra (3-0-3).
Groups: normal subgroups, factor groups, Abelian groups. Rings: ideals, Euclidean rings, unique factorization. Fields: algebraic extensions, finite fields. Students may not take this course and Mathematics 463.

365a. Elementary Number Theory (3-0-3).
Properties of numbers depending mainly on the notion of divisibility. Continued fractions. Offered alternate years. Not offered 1981-82.

366a. Projective Geometry (3-0-3).
Basic elements of classical projective geometry: projective spaces, subspaces, incidence relations, comparison with other geometries. Offered alternate years.

381a. Analysis and Applications (3-0-3).
Laplace transform: inverse transform, applications to constant coefficient differential equations. Boundary value problems: Fourier series, Bessel functions, Legendre polynomials.

382b. Complex Analysis and Applications (3-0-3).
Cauchy integral theorem, Taylor series, residues, evaluation of integrals by means of residues, conformal mapping, application to two-dimensional fluid flow. A student may not receive credit for this course and Mathematics 427.

401a, 402b. Differential Geometry (3-0-3 each semester).
Differential manifolds, Stokes's Theorem and deRham's Theorem, fundamental theorem of local Riemannian geometry, Lie groups, vector bundles, affine connections.

423a, 424b. Partial Differential Equations (3-0-3 each semester).
Cauchy-Kowalewski Theorem, first-order hyperbolic systems, harmonic functions and potential theory. Dirichlet and Neumann problems, integral equations, and parabolic and elliptic equations.

425a. Real Analysis (3-0-3).
Lebesgue theory of measure and integration.

426b. Topics in Real Analysis (3-0-3).
Topics vary. Past topics include: Fourier series, harmonic analysis, probability theory, advanced topics in measure theory, ergodic theory.

427a, 428b. Complex Analysis (3-0-3 each semester).
Cauchy-Riemann equations, power series, Cauchy's integral formula, residue calculus, conformal mappings, special topics such as the Riemann mapping theorem, Runge's Theorem, elliptic function theory.

438a. Computational Methods in Partial Differential Equations (3-0-3).
Methods of solution: finite-element methods, collocation methods, finite difference methods, and associated algebraic problems. Also offered as Mathematical Sciences 551.

443a. General Topology (3-0-3).
Basic point set topology. Includes set theory, well ordering. Metrization.

444b. Geometrical Topology (3-0-3).
Introduction to algebraic methods in topology and differential topology. Elementary homotopy theory. Covering spaces.

463a, 464b. Algebra (3-0-3 each semester).
Groups, rings, fields, vector spaces. Matrices, determinants, eigenvalues, canonical forms, multilinear algebra. Structure theorem for finitely generated abelian groups.

490. Supervised Reading in Mathematics (Credit variable).

501a, 502b. Special Topics in Differential Geometry (3-0-3 each semester).
Topics vary. Past topics include: relativity theory, geometric measure theory, Kähler manifolds.

521a. Special Topics in Complex Analysis (3-0-3).
Topics vary: Stein manifold theory, analytic spaces, compact complex manifolds.

523a. Functional Analysis (3-0-3).
Locally convex spaces, theory of distributions. Banach spaces. Hilbert spaces.

525a, 526b. Advanced Topics in Analysis (3-0-3 each semester).
Topics vary. Past topics include: nonlinear partial differential equations, exterior differential systems, gauge theories of mathematical physics.

537a. Algebraic Topology (3-0-3).
Singular homology and cohomology.

538b. Algebraic Topology (3-0-3).
Homotopy theory, Serre spectral sequence and applications.

541a,b. Special Topics in Topology (3-0-3 each semester).
Topics vary. Past topics include: geometric topology, 3-manifold topology, differential topology, topological dynamics.

601a, 602b. Thesis (Credit variable).

700c. Summer Research.

800b. Degree Candidate Only.

Military Science

Professor Sawyer, *Chairman*
Assistant Professors Bailey and Bush

The Department of Military Science is chaired by a United States Army officer, assisted by officers and noncommissioned officers of the U.S. Army. Training in military leadership and management is emphasized with instruction given in subjects common to all branches of the U.S. Army. Eligible students have the option of completing Reserve Officer Training Corps courses in either a four-year or a two-year program.

Four-Year Program. The four-year program consists of the Basic Course (Military Science I and II), taken during the first and second years, and the Advanced Course (Military Science III and IV), taken during the third and fourth years.

Two-Year Program. Students with two years of study remaining who have not participated in the Basic Course are eligible for the two-year program. Students must successfully complete the six-week Basic Camp during the summer to qualify for the Advanced Course. The Basic Camp substitutes for Military Science I and II.

Advanced Camp. All students in the Advanced Course must attend a six-week Advanced Camp between their junior and senior years.

Leadership Laboratory. All students in the Reserve Officer Training Corps (ROTC) program must participate in a weekly, two-hour leadership laboratory. A lab fee of $12.50 per semester is required.

Scholarships. Two- and three-year scholarships are available on a competitive basis to students who participate in the Army ROTC program. Special two- and three-year scholarships are available for nonenrolled students. Each scholarship student receives $100 per month with all tuition, fees, books, and equipment paid for by the Army for the period of the scholarship.

Nonscholarship Students. Nonscholarship students receive $100 per month during the Advanced Course.

Graduates of the Army ROTC program are commissioned in the various branches of the U.S. Army based on the needs of the Army, academic discipline, personal preference, recommendation of the professor of military science, demonstrated ability, and prior military training or experience.

Military Science Courses

101a,b. The Defense Establishment and National Security (1-2-1).
An introduction to the customs, courtesies, and organization of the U.S. Army. A study of the national security structure and the Department of Defense. *Staff*

201a. Management of the Military Team (2-2-1).
A study of training management, techniques of counseling, professional writing, and oral communication skills. *Maj. Bailey*

202b. Basic Tactics and Military Operations (3-2-1).
An introduction to small unit tactics, war gaming, and map and aerial photograph reading. *Captain Bush*

301a. Advanced Tactics and Military Operations (3-2-1).
Military planning, operations, advanced tactics and war gaming. *Captain Bush*

302b. Leadership Development (3-2-2).
The study of individual and group behavior and the principles and techniques of applied leadership. *Maj. Bailey*

401a. Professional Ethics and Military Justice (3-2-2).
A study of the military justice system, aspects of military law, the Geneva Convention, and military professionalism/ethics. *Lt. Col. Sawyer*

402b. Theory, Management, and Dynamics of the Military Team (2-2-1).
A study of the combined arms team, command and staff relationships, and army support organizations. *Lt. Col. Sawyer*

The Shepherd School of Music

Professor Holloway, *Acting Dean*
Professors Cooper, Gonzalez, S. Jones, Schnoebelen, and Tipton
Associate Professors Bible, Citron, Crouse, Fliegel, Kurtzman, Milburn, Norris, Pickar, and Trepel
Assistant Professors Bacon, R. Brown, Ellison, Ettelson, Gottschalk, Hanson, and Rosenberg
Visiting Instructor Richards
Lecturers Arbiter, Guderian, Holibaugh, Rose, and Waters
Adjunct Lecturers Barnard and Visser

Degrees Offered: B.Mus., B.A., B.Mus./M.Mus. (simultaneously); M.Mus.

The Shepherd School of Music is committed to the highest quality education of musicians and offers both professional training and a broad liberal arts curriculum at the undergraduate level. At the graduate level, it offers professional music training for qualified students in programs of performance, creativity, and scholarship.

Degrees Offered. The Shepherd School of Music offers three degrees: Bachelor of Music and Master of Music in composition, conducting, music history, performance, and theory and the Bachelor of Arts degree in music. Normally, four years are required for the bachelor's degrees and two years for the master's. It is also possible to elect a program that leads to the simultaneous awarding of the Bachelor of Music and Master of Music degrees after five years of study.

Admission. An audition, a theory evaluation, and a personal interview are required of each undergraduate applicant. Admission is determined jointly by the Shepherd School faculty and by the Admissions Committee of Rice University, which bases its evaluation upon successful academic achievement and standard college admission indices.

Transfer students from other colleges, conservatories, and universities are evaluated in terms of prior preparation, which may reduce the required period of study at Rice.

An audition or personal interview, placement exams in music history and music theory, and the Graduate Record Examination, including the advanced music tests, are required of graduate applicants.

Curriculum Design. Undergraduate curricula consist of courses in core music subjects, individual musicianship, other required music areas, chamber music and large ensembles, nonmusic courses as specified by the university, and electives. Core music courses are:

Music Theory: 211, 212, 311, 312, 411
Music History: 221, 222, 321, 322, 421
Aural Skills: 231, 232, 331, 332, 431

Requirements in other music areas vary with the degree program:

	Core Music	Individual M'ship	Required Music	Chamber Music and Ensemble	Total Degree
B.Mus., Performance	40	24	0	14	120
B.Mus., Composition	40	16	27	5	130
B.Mus., History	40	12	10	5	130
B.Mus., Theory	40	16	16	5	130
B.A., Music	34	8-12	0	4	120

The thirty-six course hours required by the university appear under the title "University Distribution Requirements" elsewhere in this catalog. For music

majors, six hours of music history may be counted as humanities (Group I, 2) and three hours of Music 414 may count as physical science (Group III, 5).

The B.Mus./M.Mus. program includes the core curriculum and an advanced curriculum. The first five semesters parallel the core curriculum of the four-year degrees. The sixth semester is a transitional semester in which the student must qualify for formal admission to candidacy for the master's degree as well as begin work in the advanced curriculum. If qualifying does not take place by the end of the sixth semester, the student is not allowed to register for the advanced curriculum without special permission. At least five distribution courses (preferably six) must be completed by the end of the sixth semester before the student is considered for formal admission to candidacy for the master's degree.

The final two years are devoted to the advanced curriculum, in which the student concentrates on creativity, performance, or research supported by laboratory or performing ensembles, theory and history seminars, and professional apprenticeships. Apprenticeships may involve a diversity of professional activities as appropriate for the individual. These may include participation with major or civic orchestras, choirs, or opera theaters; off-campus solo and small ensemble performances; conducting apprenticeships with professional orchestras, operas, or ballet companies; composition for films, television, public schools, and for ensembles in residence; and research in major national and international libraries. It is the responsibility of students to arrange their apprenticeships. Whenever possible, faculty members assist students in making arrangements for apprenticeships. These and any other specialized studies must be engaged by the individual student with the approval of the faculty.

Courses for Nonmajors. Nonmajors will find the following courses designed for the general student: Music 117, 118; 307, 308; 317, 318; 335, 337, 338; 414; 327, 328; individual instruction in all instruments. In addition, other music courses may be taken by the nonmajor with the permission of the instructor and approval of the dean of the Shepherd School.

Musical Opportunities. Musical and educational opportunities are afforded the student both on campus and in the greater Houston area. A visiting lecturer series, a professional concert series, and numerous visiting distinguished musicians contribute to the Shepherd School environment. The Houston Symphony Orchestra, Symphony Chorale, Houston Grand Opera, Texas Opera Theater, Houston Ballet, as well as the activities of other institutions of higher learning in the area provide exceptional opportunities for musical experiences.

Special Examinations:

1. At the end of each semester, a jury examination is given in individual musicianship over the material studied during the semester.
2. Keyboard proficiency is required of all degree candidates and may be satisfied by examination or enrollment in secondary piano until proficiency requirements are met.
3. Students on four-year undergraduate degree programs take, at the end of the fourth semester, an examination to determine continuance on their degree program.
4. Students on the five-year program must take a qualifying examination no later than the sixth semester to determine admissibility to the student's preferred major area in the advanced curriculum. For performance majors, this examination consists of the qualifying recital and an oral examination in music history and music theory based on the compositions to be performed on the qualifying recital. The Graduate Record Examination is required by the conclusion of the sixth semester.

Performance. Students are expected to perform frequently during their residence at Rice. Performance majors must present at least two full recitals. Frequent performance is expected of all students during the core curriculum. Composition and

conducting students are expected to present recitals as specified by their degree programs. Students are expected to attend both faculty and student recitals.

Thesis. The master's degree for composition, conducting, music history, and theory majors assumes a high level of scholarship. A thesis is required of music history and theory majors. An original work of extended scope is required of composition majors. Conducting majors must present either an extended composition or project.

Large Ensembles. All students are required to participate in one of the school's conducted ensembles as specified by their degree program. Students may be exempt from this requirement at the request of their major teacher and with the approval of the dean.

Warning, Music School Probation, Discontinuation. A student performing unsatisfactorily in one or more courses at the midterm period may be placed on warning. If at the end of the semester significant improvement has not been shown, the student may be placed on music probation. A student may be placed directly on probation without warning. Probation is a more serious status than warning, and it signifies that the student's work has been sufficiently unsatisfactory to preclude graduation unless significant improvement is achieved promptly. A student on music probation may be absent from class only for extraordinary reasons and may not represent the school in any public function not directly a part of a degree program.

If at the conclusion of the probationary period the student has not shown marked improvement, the student may be discontinued from the school as a music major. Any student discontinued as a music major but not on academic suspension may elect a major elsewhere in the university, subject to the requirements of the major department or school.

Composition

Music Courses

201a. Composition I (3-0-3).
Creative composition employing midcentury vocabularies supported by extensive performance, listening, and analysis of related scores. Prerequisite: permission of instructor.
Mr. Cooper, Mr. Milburn, Mr. Gottschalk

202b. Composition II (3-0-3).
Creative composition employing current musical vocabularies, supported by appropriate performance, listening, and analysis. *Mr. Cooper, Mr. Milburn, Mr. Gottschalk*

301a. Composition III (3-0-3).
Composition for solo instruments and small ensembles. *Staff*

302b. Composition IV (3-0-3).
Composition for four to six instruments and/or voices. *Staff*

303a, 304b. Undergraduate Composition Seminar I, II (Credit variable).
Mr. Gottschalk

307a, 308b. Composition for Nonmajors (3-0-3 each semester). *Staff*

401a, 402b. Composition V, VI (3-0-3 each semester). *Staff*

501a, 502b. Advanced Composition I, II (3-0-3 each semester).
Composition for large ensembles. *Mr. Cooper, Mr. Jones, Mr. Milburn*

503a,b; 504a,b. Electronic Music Composition (1-6-3 each semester).
Mr. Gottschalk

505. Composition for Media (1-6-3).
Not offered every year. *Mr. Milburn*

601a, 602b. Advanced Composition III, IV (3-0-3 each semester).
Mr. Cooper, Mr. Jones, Mr. Milburn

603a,604b.Graduate Composition Seminar (Credit variable).
Mr. Cooper, Mr. Milburn

Theory

Music Courses

117a,b. Fundamentals of Music I (3-0-3).
For nonmusic majors with minimal music preparation. Rudiments of pitch and duration. Study of scales, chord structure tonality, and forms. *Staff*

118b. Fundamentals of Music II (3-0-3).
Application of Music 117 materials. Creative work utilizing twentieth-century art and popular vocabulary. *Staff*

211a. Theoretical Studies I (3-0-3).
For music majors. Theory evaluation survey is required prior to admission to class. Study of music aesthetics, physical properties of sound, melody, rhythm, counterpoint, instrumentation, and form. Study of and creative work in music of the late Medieval period and the Renaissance. *Mr. Cooper*

212b. Theoretical Studies II (3-0-3).
For music majors. Discussion, analysis, and creative application of theoretical concepts and vocabulary from 1700 to 1950. *Mr. Cooper*

311a. Theoretical Studies III (3-0-3).
For music majors. Baroque and Early Classical music. Study of species counterpoint and of two-three-four voice tonal counterpoint. Analysis of representative compositions of diverse genre and medium. *Mr. Gottschalk*

312b. Theoretical Studies IV (3-0-3).
For music majors. Late Classical and Romantic music. Continued study of tonal counterpoint. Instrumentation and orchestration. Analysis of selected major works.
Mr. Gottschalk

317a. Theory for Nonmajors I (3-0-3).
For nonmusic majors with appreciable instrumental and/or high school theory background. Discussion, analysis, and application of the parameters of music: melody, rhythm, harmony, counterpoint, instrumentation, and form. Application to literature to 1700.
Ms. Citron

318b. Theory for Nonmajors II (3-0-3).
For nonmusic majors with appreciable instrumental and/or high school theory background. Prerequisite: 317 or permission of instructor. Stylistic harmony, melody, and form from 1700 to the present. *Ms. Citron*

411a. Theoretical Studies V (3-0-3).
Music of the twentieth century. Counterpoint and orchestration, employing twentieth-century vocabulary and techniques. Analysis of selected major works. *Mr. Milburn*

412b. Theoretical Studies VI (3-0-3).
Advanced analytical techniques. Practical applications of principal analytical systems from the Middle Ages to the present. *Mr. Milburn*

414b. Acoustics (3-0-3). *Mr. Gottschalk*

513a. Modal Counterpoint (2-0-2). *Mr. Gottschalk*

515a, 516b. Advanced Orchestration I, II (2-0-1 each semester).
Mr. Cooper, Mr. Milburn

611a, 612b. Pedagogy of Theory I, II (3-0-3 each semester).
Principal learning theories and philosophies of learning and teaching. Examination and critique of college-level materials. *Mr. Cooper*

613b. Canon and Fugue (2-0-2).
Specialized study of imitative counterpoint. Examples from the fifteenth to twentieth centuries. Emphasis on the Baroque fugue. *Mr. Milburn*

History and Literature

Music Courses

221a, 222b. Historical Studies I, II (3-0-3 each semester).
Historical study of musical style. The Middle Ages to 1700, first semester; 1700 to the present, second semester. *Ms. Hanson*

321a, 322b. Historical Studies III, IV (3-0-3 each semester).
Advanced historical studies in music of the seventeenth, eighteenth, and nineteenth centuries. Baroque and Early Classical, first semester; Classical and Romantic, second semester. Correlated with Music 311, 312 and 331, 332. *Ms. Schnoebelen, Ms. Citron*

327a, 328b. Music Literature for Nonmajors I, II (3-0-3 each semester).
Historical survey of music from the Middle Ages to 1700, first semester; from 1700 to the present, second semester. *Mr. Kurtzman*

421a. Historical Studies V (3-0-3).
Twentieth century and contemporary. Advanced historical studies in music of the twentieth century. Correlated with Music 411 and 431. *Mr. Kurtzman*

422. Renaissance Music (3-0-3).
Not offered every year. *Ms. Schnoebelen*

424a, 425b. Organ Literature I, II (3-0-3 each semester).
Not offered every year. *Mr. Holloway*

426. Piano Literature (3-0-3).
Not offered every year. *Ms. Norris*

429. Music of the Middle Ages (3-0-3).
Not offered every year. *Ms. Hanson*

523a. Bibliography and Research Methods I (3-0-3).
Techniques in research methodology, studies in bibliography. Not offered every year. *Mr. Holibaugh*

524b. Bibliography and Research Methods II (3-0-3).
Prerequisite: Music 523 or permission of instructor. Not offered every year. *Ms. Hanson*

525. Performance Practices Seminar (3-0-3).
Study of performance practices from treatises and music, problems in editing music. Not offered every year. *Ms. Schnoebelen*

621. Selected Studies in Music History (3-0-3).
Seminar on individual topics in music history to be announced each year. Prerequisite: Music 411, 421. *Staff*

624. Seminar on a Selected Composer (3-0-3).
Advanced study of the music of a single composer. Topic for spring 1982: Beethoven. *Ms. Schnoebelen*

723. Aesthetics in Music (3-0-3).
Studies in contemporary aesthetic philosophy, with emphasis on the writings of Suzanne Langer and Leonard Meyer. Not offered every year. *Mr. Kurtzman*

725, 726. History of Notation I, II (3-0-3 each semester).
Prerequisite: permission of instructor. Not offered every year. *Ms. Hanson*

Aural Skills, Ensembles, Conducting

Music Courses

231a. Aural Skills and Performance Techniques I (3-0-2).
Ear-training and sight-singing: solfege, rhythmic studies, intervals, chords. Literature through about 1700. *Ms. Citron*

232b. Aural Skills and Performance Techniques II (3-0-2).
Continuation of Music 231. Literature from about 1700 to the present. *Ms. Citron*

331a, 332b. Aural Skills and Performance Techniques III, IV (3-0-2 each semester).
Continuation of Music 232. Also studies in performance techniques: intonation, phrasing, improvisation, performance practice. First semester: baroque. Second semester: classic/romantic. *Mr. Tipton*

335a,b. Undergraduate Chorus (0-3-1 each semester). *Staff*

337a,b. Undergraduate Orchestra (0-9-1 each semester). *Mr. Ellison*

338a,b. Undergraduate Chamber Music (0-6-1 each semester). *Staff*

339a,b. Collegium (Credit variable each semester).
Prerequisite: permission of instructor. Not offered every year. *Mr. Holibaugh*

431a. Aural Skills and Performance Techniques V (3-0-2).
Continuation of performance techniques. Literature of the twentieth century. *Mr. Tipton*

433a. Score Reading (2-2-2). *Staff*

434b. Elements of Conducting (2-9-2). *Mr. Jones*

435a,b. Contemporary Ensemble (1-4-3 each semester). *Mr. Milburn*

437a, 438b. Graduate Ear Training Review I, II (3-0-2 each semester). *Staff*

531a,b. Orchestral Repertoire (1-3-1 each semester).
May be repeated. *Staff*

532a,b. Interpretation (3-0-1 each semester).
Class performances and discussions on required listening. Not offered every year. *Mr. Rosenberg*

537a. Advanced Conducting I (3-9-3). *Staff*

538b. Advanced Conducting II (3-9-3). *Mr. Jones*

539a. Psychology of Conducting (1-0-1).
Not offered every year. *Mr. Jones*

635a,b. Advanced Orchestra (0-9-1 each semester). *Mr. Ellison*

636a,b. Advanced Chamber Music (0-6-1 each semester). *Staff*

637a, 638b. Advanced Conducting III, IV (3-9-3 each semester). *Mr. Jones*

639b. Orchestra Administration (1-0-1).
Not offered every year. *Mr. Jones*

640a,b. Advanced Chorus (0-3-1 each semester). *Staff*

Individual Instruction

Course numbers for individual instruction are constituted as follows:

1. The first digit indicates function within the student's curriculum: 1 = nonmusic major; 2 = secondary, i.e., study by a music major on an instrument other than her or his principal instrument; 3 = concentration, i.e., the principal instrument of students majoring in composition, music history, theory, or conducting; 4 = music performance major for four-year undergraduates and five-year students prior to qualifying exams; 6 = music performance major for two-year graduate students and five-year students after qualifying exams.
2. The second digit indicates the instrumental "family."
3. The third digit indicates the particular instrument within the family.

Course numbers for flute are printed in complete format below. The remainder is printed in summary form.

Woodwind Instruction

Flute Courses

151a,b. Flute for Nonmajors (1-5-2). *Staff*

251a,b. Secondary Flute (1-5-2). *Staff*

351a,b. Concentration Flute (1-5-2). *Staff*

352a,b. Concentration Flute-Intensive (1-25-3). *Mr. Tipton*

451a,b. Flute for Majors (1-25-3). *Mr. Tipton*

651a,b. Flute for Majors, Advanced, and Graduates (1-25-3). *Mr. Tipton*

Oboe Courses

153a,b. (1-5-2); **253a,b** (1-5-2); **353a,b** (1-5-2); **354a,b** (1-25-3); **453a,b** (1-25-3); **653a,b** (1-25-3)

Clarinet Courses

155a,b (1-5-2); **255a,b** (1-5-2); **355a,b** (1-5-2); **356a,b** (1-25-3); **455a,b** (1-25-3); **655a,b** (1-25-3)

Bassoon Courses

157a,b (1-5-2); **257a,b** (1-5-2); **357a,b** (1-5-2); **358a,b** (1-25-3); **457a,b** (1-25-3); **657a,b** (1-25-3)

459. Theory of Woodwind Performance Techniques (1-3-1 each semester).
Not offered every year. *Mr. Rosenberg*

559a,b. Woodwind Pedagogy (1-3-2 each semester).
Not offered every year. *Staff*

Brass Instruction

Horn Courses

161a,b (1-5-2); **261a,b** (1-5-2); **361a,b** (1-5-2); **362a,b** (1-25-3); **461a,b** (1-25-3); **661a,b** (1-25-3) *Mr. Bacon*

Trumpet Courses

163a,b (1-5-2); **263a,b** (1-5-2); **363a,b** (1-5-2); **364a,b** (1-25-3); **463a,b** (1-25-3); **663a,b** (1-25-3) *Mr. Guderian*

Trombone Courses

165a,b (1-5-2); **265a,b** (1-5-2); **365a,b** (1-5-2); **366a,b** (1-25-3); **465a,b** (1-25-3); **665a,b** (1-25-3) *Mr. Waters*

Tuba Courses

167a,b (1-5-2); **267a,b** (1-5-2); **367a,b** (1-5-2); **368a,b** (**1-25-3**); **467a,b** (1-25-3); **667a,b** (1-25-3) *Staff*

469. Theory of Brass Performance Techniques (1-3-1 each semester).
Not offered every year. *Mr. Bacon*

569a,b. Brass Pedagogy (1-3-2).
Not offered every year. *Staff*

Percussion Instruction

Percussion Courses

171a,b (1-5-2); **271a,b** (1-5-2); **371a,b** (1-5-2); **372a,b** (1-25-3); **471a,b** (1-25-3); **671a,b** (1-25-3) *Mr. Brown*

479. Theory of Percussion Performance Techniques (1-3-1 each semester).
Not offered every year. *Mr. Brown*

579a,b. Percussion Pedagogy (1-3-2 each semester).
Not offered every year. *Mr. Brown*

Voice Instruction

Voice Courses

173a,b. (1-5-2); **273a,b** (1-5-2); **373a,b** (1-5-2); **374a,b** (1-25-3); **473a,b** (1-25-3); **673a,b** (1-25-3) *Ms. Bible*

549a,b. Voice Pedagogy (1-3-2 each semester).
Not offered every year. *Staff*

575a, 576b. Voice Repertoire I, II (1-3-2 each semester). *Staff*

577a, 578b. Diction I, II (1-3-1 each semester). *Staff*

Keyboard and Harp Instruction

Piano Courses

181a,b (1-5-2); **281a,b** (1-5-2); **381a,b** (1-5-2); **382a,b** (1-25-3); **481a,b** (1-25-3); **681a,b** (1-25-3) *Ms. Norris, Ms. Ettelson*

Organ Courses

183a,b (1-5-2); **283a,b** (1-5-2); **383a,b** (1-5-2); **384a,b** (1-25-3); **483a,b** (1-25-3); **683a,b** (1-25-3) *Mr. Holloway*

Harpsichord Courses

185a,b (1-5-2); **285a,b** (1-5-2); **385a,b** (1-5-2); **386a,b** (1-25-3); **485a,b** (1-25-3); **685a,b** (1-25-3) *Mr. Holloway*

Harp Courses

187a,b (1-5-2); **287a,b** (1-5-2); **387a,b** (1-5-2); **388a,b** (1-25-3); **487a,b** (1-25-3); **687a,b** (1-25-3) *Ms. Rose*

445a, 446b; 545a, 546b. Keyboard Proficiency I, II, III, IV (Credit variable each semester).
Not offered every year. *Mr. Holloway*

547a. Organ Pedagogy (1-3-2). *Staff*

589a,b. Piano Pedagogy (1-3-2).
Not offered every year. *Staff*

645a,b. Organ Construction (Credit variable).
Not offered every year. *Staff*

String Instruction

Violin Courses

191a,b (1-5-2); **291a,b** (1-5-2); **391a,b** (1-5-2); **392a,b** (1-25-3); **491a,b** (1-25-3); **691a,b** (1-25-3) *Mr. Fliegel, Mr. Gonzalez*

Viola Courses

193a,b (1-5-2); **293a,b** (1-5-2); **393a,b** (1-5-2); **394a,b** (1-25-3); **493a,b** (1-25-3); **693a,b** (1-25-3) *Mr. Crouse*

Violoncello Courses

195a,b (1-5-2); **295a,b** (1-5-2); **395a,b** (1-5-2); **396a,b** (1-25-3); **495a,b** (1-25-3); **695a,b** (1-25-3) *Ms. Trepel*

Double Bass Courses

197a,b (1-5-2); **297a,b** (1-5-2); **397a,b** (1-5-2); **398a,b** (1-25-3); **497a,b** (1-25-3); **697a,b** (1-25-3) *Mr. Ellison*

499. Theory of String Performance Techniques (1-3-1).
Primarily for conductors and composers. Not offered every year. *Staff*

599a,b. String Pedagogy (1-3-2 each semester).
Not offered every year. *Staff*

Courses Applicable to All Specializations

441a,b. Qualifying Recital (0-0-0 each semester).

442a,b. Recital Accompanying (0-2-1 each semester).
Accompanying a single student recital, including the preview, dress rehearsal, performance, three lessons with the soloist's teacher, and practice times mutually agreeable to soloist and accompanist. May be repeated for additional credit.

443a,b. Studio Accompanying (0-4-1 each semester).
Accompanying private lessons in studios as assigned for a total of four hours per week. May be repeated for additional credit.

449a,b. Undergraduate Independent Study (Credit variable).
Not offered every year.

641a,b. Advanced Recital (0-0-0 each semester).

642a,b. Accompanying for Ensemble Credit (0-4-1 each semester).
Requires permission of student's major teacher and conductor of ensemble in which student would normally perform. Taken in lieu of Music 635 or 640. Student to fulfill requirements of Music 442 or 443.

647a,b. Master's Thesis in Composition, Theory, History and Literature, or Conducting (1-0-3).

649a,b. Graduate Independent Study (Credit variable).

741a,b. Graduate Recital (0-0-0 each semester).

749a,b. Apprenticeship (Credit variable).

Band

Band Courses

340a,b. Concert Band (0-4-1).

342a,b. Jazz Ensemble (0-3-1).

415b. Band Arranging (2-1-1).
Creative band arranging for marching, jazz, and concert bands. Study of contemporary harmony, musical style, and scoring supported by practical performance and analysis of student projects.

Naval Science

Professor G. Bell, *Chairman*
Associate Professor Lodge
Assistant Professors Frazier, Peeler, and Tomaski

The Department of Naval Science is administered by a senior U.S. naval officer, assisted by officers and men of the U.S. Navy and Marine Corps. The purpose of the Naval Reserve Officers' Training Corps is to train highly select young men and women for naval service as commissioned officers of the Navy and Marine Corps.

Students taking five-year courses are considered eligible for enrollment at the beginning of their first or second year. In view of the heavy academic loads for fifth-year engineering students and scheduling difficulties, all students are encouraged to enroll in the regular manner during first-year matriculation. Students may voluntarily disenroll any time during the first two years of the program, without incurring further service obligation.

There are two categories of NROTC students: (1) scholarship, (2) nonscholarship.

Scholarship Students. A scholarship NROTC student is appointed a midshipman, U.S. Naval Reserve, on a nationwide competitive basis and receives retainer pay at the rate of $100 per month for a maximum of four academic years, with all tuition, fees, books, and equipment paid for by the government. He is required to complete prescribed naval science courses, participate in drills and three summer cruises, and, upon graduation with a baccalaureate or advanced degree, to accept a regular commission as ensign in the U.S. Navy or second lieutenant in the U.S. Marine Corps.

Nonscholarship Students. Nonscholarship students are civilian college students who enter into a mutual contract with the secretary of the navy in which they take naval science courses and participate in drills and one summer training cruise. In return, the Navy pays the student $100 per month during the junior and senior years and offers a reserve commission in the Navy or Marine Corps upon graduation. Nonscholarship students may, on a local, competitive basis, be recommended for scholarship status by the professor of naval science.

Two-Year Program Students. Interested students may, in their sophomore year (junior year for five-year students at Rice), apply for the two-year NROTC program. A nationwide competition will initially determine their scholarship or nonscholarship status (see above). Following selection, applicants attend a six-week Naval Science Institute (NSI) at Newport, Rhode Island, during July and August, which is designed to "make up" the first two years of the regular NROTC program. Successful completion of NSI qualifies the student for enrollment in the advanced NROTC on an equal footing with the four-year students. About 15 percent of the nonscholarship students finishing NSI may be offered a two-year NROTC scholarship at that time. Additional scholarships may be awarded to the others from time to time upon the recommendation of the professor of naval science at Rice.

U.S. Marine Corps. NROTC students, either scholarship or nonscholarship, may apply for the Marine Corps program. Such selectees are referred to as Marine Corps option students and attend separate classes under a marine officer instructor during their junior and senior years.

Naval Science Courses

101a. Naval Orientation (2-2-0).
An introduction to naval traditions and customs, seamanship, naval organization and missions, and the fundamental concepts of seapower. *Staff*

102b. Naval Ships Systems I — Naval Engineering (3-2-3).
A study of ship design, stability, compartmentation, propulsion, auxiliary power, refrigeration, electrical systems, and damage and casualty control measures. *Mr. Tomaski*

201a. Naval Ships Systems II — Naval Weapons (3-2-2).
An introduction to naval weapons systems with emphasis on linear analysis of ballistics and control system dynamics. *Mr. Tomaski*

202b. Sea Power and Maritime Affairs (3-2-2).
Readings, discussions, and research on selected topics related to the history, importance, and impact of sea power on modern civilization. *Staff*

301a. Navigation (3-2-3).
A comprehensive study of coastal piloting, celestial and electronic ship navigation; involves nautical astronomy, navigational aids, satellite and inertial systems. *Mr. Frazier*

302b. Naval Operations (3-2-3).
An analysis of ship movements, formations, and fleet operations; includes Rules of the Road, maneuvering board, tactical publications and communications. *Mr. Frazier*

401a, 402b. Principles of Leadership and Management (3-2-2; 3-2-1).
An introduction to the principles and concepts of management, organization, leadership, military law and discipline, information systems, and decision making. *Mr. Lodge*

NROTC students who desire to be commissioned as second lieutenants in the U.S. Marine Corps or Marine Corps Reserve and whose applications for transfer are accepted substitute the following courses during the final two years.

Naval Science Courses

303b. Evolution of Warfare (3-2-2).
Historical survey of the evolution of the conduct of warfare. Strategy, tactics, weapons, organization, and military leaders/thinkers are studied. *Mr. Peeler*

403b. Amphibious Warfare (3-2-1).
Study of the history of amphibious warfare. Case studies examine doctrine, tactics, and the factors necessary for successful operations. *Mr. Peeler*

In addition to the courses listed above, NROTC students may be required to complete certain other courses that are offered by the university.

Philosophy

Professor Brody, *Chairman*
Professors Grandy and Kolenda (on leave 1981-82)
Associate Professors Kulstad, and Mattern
Modrak (on leave 1981-82), **and Temkin**
Instructors Deveraux and Smith

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. The philosophy major requires thirty semester hours (ten courses); at least eighteen semester hours (six courses) must be in the 300 level or above. Majors must take Philosophy 201, 202, 306, one course in logic (either 106 or 305), and two further courses in the history of philosophy (301, 302, 308, 501, or

502). If the student wishes, metaphysics (Philosophy 304) or epistemology (Philosophy 303) may be substituted for one of these additional history courses.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 50-51.

Requirements for the Degree of Master of Arts:

1. Completion with high standing of at least twenty-four semester hours in advanced courses approved by the department
2. Satisfactory performance on a reading examination in one foreign language
3. Completion of a written thesis on a subject approved by the department
4. Satisfactory performance on a final oral examination not limited to the student's special field of study

Requirements for the Degree of Doctor of Philosophy:

1. Completion with high standing of courses approved by the department and of work in the area of logic
2. Satisfactory performance on a reading examination in one foreign language. Students whose research interests require a substantial knowledge of another discipline can petition to substitute for the language exam an examination in that other discipline.
3. Satisfactory performance on examinations in history of philosophy, metaphysics and epistemology, value theory, and philosophy of science and language
4. Completion of a written thesis on a subject approved by the department; at least one year of thesis research must be spent in residence
5. Satisfactory performance in limited teaching duties assigned by the department
6. Satisfactory performance on a final oral examination, not limited to the student's special field of study

Philosophy Courses

101a. Philosophical Perspectives on Contemporary Moral and Legal Issues (3-0-3).

Examination of the moral and legal issues surrounding such topics as abortion, euthanasia, war, capital punishment, and equality of opportunity. *Mr. Temkin*

102b. Four Perspectives on the Meaning of Life: Existentialism, Marxism, Mysticism, Humanism (3-0-3).

Examination of contrasting orientations toward human life that emerge from the contemporary intellectual, social, and political situation. *Mr. Kolenda*

103a. Philosophy and Psychology: The Critical Interaction (3-0-3).

Examination of the interrelationship between philosophical and psychological thought. *Mr. Smith*

104b. Philosophical Perspectives on Science (3-0-3).

Philosophical issues that arise in and about science; specific theories in both natural and social science analyzed to understand the nature and impact of scientific knowledge. *Mr. Grandy*

106b. Logic (3-0-3).

A system of natural deduction is used to establish the validity of arguments, the validity of which turns on their truth functional or quantificational form. *Staff*

201a. History of Philosophy I (3-0-3).

Survey of major philosophers of the ancient and medieval world from Thales to Ockham. *Ms. Mattern or Ms. Modrak*

202b. History of Philosophy II (3-0-3).

A survey of modern philosophy beginning with Descartes, including logical positivism, philosophical analysis, and existentialism. *Mr. Kulstad*

203b. Problems of Philosophy: Knowledge and Reality (3-0-3).
Survey of traditional and contemporary authors on such topics as the nature of scientific knowledge, the theory of justice, and the conflict between determinism and freedom.
Ms. Deveraux

301a. Ancient and Medieval Philosophy (3-0-3).
Survey of major philosophical writings from the fourth century through the fourteenth. Content varies from year to year. *Mr. Brody or Ms. Modrak*

302b. Modern Philosophy (3-0-3).
Examination of themes or authors in modern philosophy. Content varies from year to year. Prerequisite: one course in philosophy. *Mr. Kulstad or Ms. Mattern*

303a. Epistemology (3-0-3).
Topics: knowledge, truth, perception, memory, etc. Prerequisite: one course in philosophy.
Mr. Kulstad

304b. Metaphysics (3-0-3).
Examination of some classical and contemporary metaphysical systems. Particular attention is paid to the very possibility of metaphysical analysis. Prerequisite: one course in philosophy. *Mr. Brody*

305a. Mathematical Logic (3-0-3).
Natural deduction, axiomatic, and semantical treatment of first order logic. Also, Godel's Incompleteness Theorem for arithmetic. *Mr. Grandy*

306b. Ethics (3-0-3).
Philosophical analysis of traditional and contemporary theories of ethics. *Mr. Temkin*

307a. Social and Political Philosophy (3-0-3).
What makes a society just? On what grounds may the liberty of individuals be legitimately limited? What social ends may a state legitimately pursue? *Mr. Temkin*

308a. Continental Philosophy from Kant to Heidegger (3-0-3).
Selected readings from Kant, Hegel, Nietzsche, and Heidegger. Offered alternate years.
Staff

309b. Aesthetics (3-0-3).
Contemporary critiques of traditional theories of art. Examples from films, paintings, and a variety of recent movements in the arts. Offered alternate years. *Ms. Deveraux*

311a. Philosophy of Religion (3-0-3).
Examination of God's existence, the problem of evil, the relation between faith and reason, and the varieties of religious experience. Offered alternate years. *Mr. Kolenda*

312b. Philosophy of Mind (3-0-3).
Inquiry into the nature of mind with emphasis on the mind/body problem. Prerequisite: one course in philosophy. Offered alternate years. *Ms. Modrak or Mr. Smith*

313a. Philosophy of Science (3-0-3).
Study of the relationship between scientific theories, experiment, observation, and reality. Prerequisite: one course in philosophy. Offered alternate years. *Staff*

314b. Philosophy of Medicine (3-0-3).
Examination of ethical, epistemological, and ontological questions arising in the practice of medicine. *Ms. Mattern*

316b. Philosophy of Law (3-0-3).
Examination of social control of private property, compensation in the law of torts, the right to privacy and bodily integrity, and justice through compensatory discrimination, etc.
Mr. Brody

318a. Philosophy in Literature (3-0-3).
Study of philosophical themes in selected works in English, French, German, and Russian literature. Offered alternate years. *Mr. Kolenda or Ms. Deveraux*

320a. Space and Time (3-0-3).
Impact of recent theories on our views of the nature and structure of space and time. Offered alternate years. *Staff*

322b. American Philosophy (3-0-3).
Offered alternate years. *Mr. Kolenda*

401a, 402b. Independent Reading I, II (3-0-3 each semester).
Prerequisite: permission of the department. *Staff*

403a. Philosophy of Language (3-0-3).
Philosophical investigation of relations among language, thought, and reality. Theories of reference are emphasized. Prerequisite: two courses in linguistics or philosophy. Also offered as Linguistics 466. Offered alternate years. *Mr. Grandy*

404b. Action Theory (3-0-3).
Philosophical problems embedded in our conception of human action — topics include the problem of individuation of actions and the relation between actions and reasons. Offered alternate years. *Ms. Modrak*

407a. Philosophy of Logic and Mathematics (3-0-3).
Offered alternate years. *Mr. Grandy*

501a. Seminar in Modern Philosophy (3-0-3).
Offered alternate years. *Mr. Kulstad or Ms. Mattern*

502b. Seminar in Ancient Philosophy (3-0-3).
Offered alternate years. *Ms. Modrak*

503a. Seminar in Epistemology (3-0-3).
Offered alternate years. *Mr. Kulstad*

505b. Seminar in Metaphysics (3-0-3).
Offered alternate years. *Mr. Brody*

506b. Seminar in Philosophy of Physics (3-0-3).
Offered alternate years. *Staff*

507a. Seminar in Ethics (3-0-3).
Offered alternate years. *Mr. Temkin*

508b. Seminar in Social and Political Philosophy (3-0-3).
Offered alternate years. *Mr. Temkin*

509b. Seminar in Philosophy of Science (3-0-3).
Offered alternate years. *Mr. Grandy or Ms. Mattern*

510a. Seminar in Philosophy of Language (3-0-3).
Offered alternate years. *Mr. Grandy*

511a. Seminar in Philosophy of Logic (3-0-3).
Offered alternate years. *Mr. Grandy*

512b. Seminar in Philosophy of Mind (3-0-3).
Offered alternate years. *Mr. Smith*

513a. Pragmatism (3-0-3).
Offered alternate years. *Mr. Kolenda*

514b. Kant and Hegel (3-0-3).
Offered alternate years. *Staff*

515a. Wittgenstein and Austin (3-0-3).
Offered alternate years. *Mr. Kolenda*

516a. Frege to Logical Positivism (3-0-3).
Offered alternate years. *Mr. Brody*

518b. Husserl and Heidegger (3-0-3).
Offered alternate years. *Staff*

601a, 602b. Advanced Independent Reading I, II (3-0-3 each semester).

701a, 702b. Research and Thesis (3-0-3 each semester).

800b. Degree Candidate Only.

Physics

Professor N.F. Lane, *Chairman*
Professors S.D. Baker, Class, Clayton, Duck, Estle, Hannon, Michel, Phillips, Rorschach, Stebbings, Trammell, Walters, and Wolf
Adjunct Professors Hazlewood and Valkovic
Associate Professors Dunning, Huang, Mutchler, and J. B. Roberts
Assistant Professors Dodds and Miettinen
Adjunct Assistant Professor Chang

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. During the first two years, all physics majors, including those electing one of the five physics options listed below, are required to take the following courses:

Mathematics 101, 102 (or equivalent honors courses), 211, 212
Physics 101, 102, 132, 201, 202, 231 (or equivalent self-paced courses)
Chemistry 101, 102, 107

Each student will be assigned a faculty adviser at the end of the sophomore year who will be responsible for course registration for the junior and senior years. Unless students elect one of the special options given below, seven physics lecture courses and four physics laboratory courses at or above the 300 level are required during the junior and senior years. These are:

Physics 301, 302, 311, 312
Physics 331, 332 (Advanced Laboratory)
Physics 411, 412, 425
Physics 431, 432 or 433, 434 (Senior Research)

Students will select courses in mathematics or mathematical sciences in consultation with their advisers so that they will complete three semesters beyond the two-year introductory sequence.

In addition to the departmental requirements for the major, all students, including those who select one of the options below, must satisfy the distribution requirements (see pp. 50-51) and complete at least 60 semester hours outside the departmental requirements. Regular physics majors must complete a total program of at least 138 semester hours.

Physics majors with a special interest in astrophysics, biophysics, geophysics, or nuclear energy may wish to elect one of the special options described below.

Option in Space Physics and Astronomy. During the first two years, the requirements coincide with those for a standard physics major (described above). In addition, Space Physics and Astronomy 251, 252, 261, and 262 should ordinarily be elected in the sophomore year. The following upper level courses are required:

Physics 301, 302, 311, 312
Physics 331, 332 (Advanced Laboratory)
Physics 425
Space Physics and Astronomy 472
Space Physics and Astronomy 431, 432 (Senior Research)
Upper level mathematics or mathematical sciences (two semesters)

Students selecting this option must complete a total program of at least 140 semester hours. A faculty adviser who is jointly appointed by the physics and the space physics and astronomy departments will be assigned to each student.

Option in Biophysics. During the first two years, the student should satisfy the physics, chemistry, and mathematics requirements listed above for a standard physics major. The following additional courses are also required for graduation:

Chemistry 211, 212, 213, 214 (should be taken second year)
Biology 201, 202, 203
Biochemistry 361
Physics 301, 302, 311, 312

Students selecting the biophysics option must complete a total program of at least 134 semester hours.

Option in Geophysics. During the first two years, the student should satisfy the physics, chemistry, and mathematics requirements listed for a standard physics major. The following additional courses are also required for graduation:

Geology 101, 102, 111, 112, 441, 442
Electrical Engineering 220 or equivalent
Physics 301, 302, 311
Mathematical Sciences 340 (or equivalent)
Physics 431, 432, or 433, 434 (Senior Research)
Upper level mathematics or mathematical sciences (three semester hours)

Students selecting the geophysics option must complete a total program of at least 139 semester hours.

Option in Nuclear Energy. During the first two years, the student should satisfy the physics, chemistry, and mathematics requirements listed above for a standard physics major. The following additional courses are also required for graduation:

Engineering 200
Physics 301, 302, 311, 312, 331, 332, 411
Materials Science 395
Mechanical Engineering 481
Chemical Engineering 631, 632
Physics 431, 432, or 433, 434 (Senior Research)

Students selecting the nuclear energy option must complete a total program of at least 139 semester hours.

Chemical Physics Major. An interdepartmental major in chemical physics is offered in conjunction with the Department of Chemistry. Students wishing to elect this major must obtain approval from both departments and should consult the department chairman for further details.

Graduate Program. The Department of Physics offers studies and research programs leading to the degrees of Master of Arts and Doctor of Philosophy. The Department of Physics offers research facilities and thesis supervision in the fields of astrophysics, atomic and molecular physics and quantum electronics, biophysics, nuclear and particle physics, condensed matter physics, and theoretical physics.

To be eligible for the Master of Arts degree, a graduate student must complete thirty semester hours of approved graduate level studies, including a research thesis performed under the direction of a physics faculty member. A minimum of one year of graduate study is required for the M.A.

To be eligible for the Doctor of Philosophy degree, a graduate student must first demonstrate to the department the ability to engage in advanced research. This is normally done by successfully completing the work for the Master of Arts in physics. The student must also complete in residence sixty semester hours of approved graduate level study, including fifteen semester hours in required courses and a research thesis completed under the direction of a physics faculty member. A minimum of two years of graduate study is required for the Ph.D. Further details of research programs in physics and departmental degree requirements are contained

in a pamphlet *Graduate Study in Physics and in Space Physics and Astronomy* available from the Department of Physics on request.

Physics Courses

101a. Mechanics (3-0-3).
The first semester of the sequence in physics for science and engineering students.

102b. Electricity and Magnetism (3-0-3).
The second semester of the sequence in physics for science and engineering students. See Physics 132b.

111a. Mechanics (3-0-3).
A self-paced version of Physics 101. Limited enrollment.

112b. Electricity and Magnetism (3-0-3).
A self-paced version of Physics 102. Limited enrollment. See Physics 132b.

121a. Technical Physics I (3-0-3).
A noncalculus survey of mechanics, sound, and optics, primarily intended for architecture and premedical students, with emphasis on problem solving. See Physics 123a.

122b. Technical Physics II (3-0-3).
Continuation of Physics 121. Electricity and magnetism, physical optics, heat and thermodynamics. See Physics 124b.

123a, 124b. Introductory Physics Laboratory (0-3-1 each semester).
Recommended for all students enrolled in Physics 121, 122 and 141, 142

132b. Elementary Physics Laboratory (0-3-1).
Recommended for students enrolled in Physics 102 or 112.

141a, 142b. Concepts in Physics I, II (3-0-3 each semester).
Emphasis on the nature of physical phenomena, the conceptual development of physics, and related cultural influences. See Physics 123a, 124b.

201a. Electromagnetic Waves and Relativity (3-0-3).
The third semester of the four-semester sequence in physics for science and engineering students. See Physics 231.

202b. Modern Physics (3-0-3).
The final semester of the four-semester sequence in physics for science and engineering students.

211a. Electromagnetic Waves and Relativity (3-0-3).
A self-paced version of Physics 201. Limited enrollment. See Physics 231.

212b. Modern Physics (3-0-3).
A self-paced version of Physics 202. Limited enrollment.

231a. Elementary Physics Laboratory (0-3-1).
Recommended for students enrolled in Physics 201 or 211.

301a. Intermediate Mechanics (4-0-4).
Classical mechanics and appropriate mathematical methods. Emphasis on problem solving.

302b. Intermediate Electrodynamics (4-0-4).
Classical electrodynamics and appropriate mathematical methods. Emphasis on problem solving.

311a, 312b. Introduction to Quantum Physics I, II (3-0-3 each semester).
Wave mechanics is developed and applied to the harmonic oscillator, free particle, and atomic structure.

331a, 332b. Junior Physics Laboratory I, II (1-3-2 each semester).

411a. Modern Physics I: Nuclear and Particle Physics (3-0-3).
Continuation of quantum mechanics and modern physics begun in Physics 311, 312. Foundation course in nuclear and elementary particle physics and solid-state physics.

412b. Modern Physics II: Solid-State Physics (3-0-3).
Continuation of Physics 411.

425a. Statistical and Thermal Physics I (3-0-3).

426. Frontiers in Physics (3-0-3).
Content varies from year to year. Examines topic or topics of current research interest in physics or related fields. Not offered every year.

431a, 432b. Senior Physics Research I, II (0-6-2 each semester).

433a, 434b. Honors Research I, II (0-12-3 each semester).
The student pursues a research project in a similar way to Physics 431, 432 but in considerably greater depth. Prerequisite: permission of the department.

461a, 462b. Independent Research in Physics I, II (Credit variable).
A reading course in special topics.

482b. Introduction to Biophysics (3-0-3).
Senior/graduate level course in the application of physics to biological problems involving structure, statistical mechanics, transport processes, and electrophysiology. Not offered every year.

495a, 496b. Physics Teaching I, II (Credit variable).
A combination of in-service teaching and a weekly seminar. Prerequisite: permission of the department.

515a. Advanced Classical Mechanics (3-0-3).
Lagrangian and Hamiltonian dynamics, normal vibrations, rigid body motion, and the transformation theory of dynamics. Also offered as Space Physics and Astronomy 515.

521a, 522b. Quantum Mechanics I, II (3-0-3 each semester).
Also offered as Space Physics and Astronomy 521, 522.

526b. Statistical and Thermal Physics II (3-0-3).
A continuation of Physics 425 intended primarily for first-year graduate students and qualified undergraduates.

531a, 532b. Electromagnetic Theory I, II (3-0-3 each semester).

541a. Experimental Nuclear Physics (3-0-3).
Nuclear structure and reaction mechanisms. Study of accelerators, detectors, and systematics.

542b. Elementary Particle Physics (3-0-3).
Theory of elementary particles and characteristic features of experimental data.

551. Stellar Evolution and Nuclear Astrophysics I (3-0-3).
Physical principles governing structure and evolution of stars. Not offered 1982-83.

552. Stellar and Galactic Evolution (3-0-3).
Application of Space Physics and Astronomy 551 to stellar and galactic evolution. Not offered 1982-83.

563a. Introduction to Solid-State Physics I (3-0-3).
Fundamental concepts of crystalline solids, including crystal structure, band theory of electrons, and lattice vibration theory. Also listed as Electrical Engineering 563 and Materials Science 563.

564b. Introduction to Solid-State Physics II (3-0-3).
Continuation of Physics 563, including scattering of waves by crystals, transport theory, and magnetic phenomena. Also listed as Electrical Engineering 564 and Materials Science 564.

565, 566. Special Topics in Solids I, II (3-0-3 each semester).
Not offered every year. Also listed as Electrical Engineering 565, 566 and Materials Science 565, 566.

571a. Atomic and Molecular Spectra and Structure (3-0-3).
Not offered every year.

572b. Theory of Electronic and Atomic Collisions (3-0-3).
Not offered every year.

573. Quantum Optics (3-0-3).
Laser physics and the use of lasers in physical research. Not offered every year.

574. Theory of Atomic and Molecular Structure (3-0-3).
Not offered every year.

575. Experimental Atomic Physics (3-0-3).
Not offered every year.

591a, 592b. Graduate Research (Credit variable).

595a, 596b. Physics Teaching.

621a. Advanced Quantum Mechanics I (3-0-3).

622. Advanced Quantum Mechanics II (3-0-3).
Not offered every year.

645, 646. Special Topics in Nuclear Physics I, II (3-0-3 each semester).
Not offered every year.

660. Gravitation and Relativity (3-0-3).
Not offered every year.

661, 662. Special Topics in Solid-State Physics I, II (3-0-3 each semester).
Not offered every year.

671, 672. Special Topics in Atomic and Molecular Physics I, II (3-0-3).
Not offered every year.

700c. Summer Graduate Research.

800b. Degree Candidate Only.

Policy Studies

Degree Offered: B.A.

Undergraduate Program. Students are required to take twelve courses.

Three introductory social science courses, including Economics 211 or 212, selected from: Anthropology 320, Economics 211, 212, Political Science 210, 211, 212, Psychology 201, Sociology 204, 230

One course in statistical methods selected from: Economics 350, Mathematical Sciences 280, 382, or a more advanced course, Political Science 495, Psychology 339

One course in analytical approaches: Social Science 300

Three courses in advanced analysis selected from: Anthropology 333, Economics 370, 372, 375, 420, 455, 483, History 319, Mathematical Sciences 301, Political Science 337, 339, 315, Psychology 303, 462, Sociology 300, 311

Three courses in an applied area selected from one of the following groups:

1. Natural Resources/Regulation: Anthropology 383, Economics 436, 480, Sociology 396
2. Human Resources: Anthropology 381, Economics 415, History 370, Philosophy 314, Psychology 337
3. International Relations: Economics 420, 430, 450, History 456, Political Science 372, 375, 472

4. Law and Justice: Anthropology 326, Economics 438, History 297, 298, 397, 398, 338, Political Science 325, 410, Philosophy 316
5. Quantitative Analysis: Economics 400, Mathematical Sciences 222, 380, 381, 472, 480, 481, Mathematical Sciences/Economics 471, 475, 476, Psychology 340, Sociology 421
6. Urban Studies: Anthropology 371, Economics 461, History 367, 382, Sociology 446

One approved special topics seminar or one semester of independent work in a participating department

In addition to the requirements for the major, students must also satisfy the university's distribution and graduation requirements. The policy studies major can be taken only as a second major. See Degree Requirements and Majors, pages 50-51.

Policy Studies Courses

300b. Social Sciences and Public Policy (3-0-3).
The course will survey how disciplines in the social sciences study public policy. Specific policy questions will be examined as a means of highlighting each discipline's approach to the study of public policy. *Mr. Stein, Mr. Gordon*

Political Science

Professor Ambler, *Chairman*
Professors D.W. Brady, J. Cooper, Cuthbertson, Dix, and von der Mehden
Adjunct Professor Tarrance
Assistant Professors Sanders, Stein, and Stoll
Lecturers Godfrey and Hudspeth

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. Students majoring in political science are required to complete thirty semester hours (ten courses) in the field. All majors must also complete six semester hours (two courses) of advanced work, selected with the advice of the department, in any of the following fields: anthropology, behavioral sciences, economics, history, philosophy, psychology, or sociology.

Double majors in one of the above fields may automatically substitute six semester hours (two courses) in upper level courses in their second field for six of the required thirty semester hours in political science courses. Double majors whose second major is legal studies, managerial studies, or public policy may automatically substitute three hours (one course). Double majors whose second field is not listed above normally are required to take thirty semester hours (ten courses) in political science. They may petition for substitution of courses in other fields, but such substitutions are permitted only when the course to be substituted has a close and significant relationship to political science.

Within the major, each student is encouraged to take a program of courses that provides both a broad understanding of the field and a specialized knowledge of some portion of it. Specific distribution requirements are minimal. However, students are required to take at least one course in any four of the six areas listed below:

1. American politics
2. Comparative government
3. Law
4. International relations
5. Normative political theory
6. Empirical theory and methodology

Political Science 209, 210, 211, and 212 constitute the introductory courses in normative theory, American politics, international relations, and comparative government, respectively. Prospective majors are encouraged to take one or more of these courses, preferably in their first or second year. However, none is required of majors, except that Political Science 209 and 210 together remain the courses that meet the Texas state licensing requirements in political science for teachers. It should also be noted that no more than three of the above introductory courses may be counted toward the major.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 50-51.

Honors Program. Political science majors who qualify may enter an honors program. The program consists of (1) a one-semester reading course in the junior year (taken either term) which will serve as the basis for drawing up a prospectus for the senior essay, plus (2) the writing of the essay, normally in the senior year. The nine semester hours completed count toward the thirty semester hours required for the major and are counted for purposes of distribution in the appropriate area within the major. Alternatively, instead of writing the essay, a student may take six semester hours in graduate level courses.

Admission to the honors program occurs, as a rule, in the spring of the sophomore year at the time majors are selected. Others may be admitted during the junior year. Double majors are eligible for the program. Admission requires the approval of the departmental director of undergraduate studies, Mr. Cuthbertson.

Interdisciplinary Programs. The Department of Political Science participates in the inderdepartmental programs in legal studies, managerial studies, and public policy. See description of these programs on pages 55-57.

Graduate Program. The Department of Political Science offers a graduate program leading to the M.A. and the Ph.D. The Ph.D. student is expected to complete forty-eight semester hours in advanced courses or seminars prior to candidacy and to present a dissertation displaying original research. Normally, the student takes the core courses in the three general fields of American government, comparative government, and international relations. The student takes additional course work and comprehensive examinations in two of these three fields. Before taking the comprehensive examinations, the student is expected to complete a course in statistical analysis, demonstrate some familiarity with traditional political theory, satisfy the language or skill requirement in his or her major field, and complete all course requirements, including a two-semester sequence in scope and methods. Specific courses are chosen in consultation with the faculty advisor. A limited master's program also is offered by the department, consisting of three semesters of full-time study. The course work for the master's degree focuses primarily upon the student's major field. The third semester is devoted largely to the preparation of a thesis.

Political Science Courses

209a. Introduction to Constitutionalism and Modern Political Thought (3-0-3).
Constitutionalism and authoritarianism from Machiavelli to Marx; introduction to contemporary ideologies. Together with Political Science 210, meets state professional requirements for teachers. *Mr. Cuthbertson, Staff*

210b. Introduction to American Government and Politics (3-0-3).
Major topics in American politics: public opinion, group politics, political parties, elections, congressional-presidential-bureaucraticpolitics, and judicial politics. Together with Political Science 209, meets state professional requirements for teachers. *Mr. Brady, Staff*

211b. Introduction to International Relations (3-0-3).
Analysis of basic factors in world politics from the balance of power to multipolarity. Discusses new meaning of peace. *Mr. Stoll*

212a. Introduction to Comparative Politics (3-0-3).
An examination of political institutions and behavior in selected democratic, communist, and "third world" countries. *Mr. Dix*

305a, 306b. Directed Reading I, II (0-0-3 each semester).
Independent reading under the supervision of a member of the department. Open to junior majors in the honors program and to others in special cases with the permission of the department. *Staff*

309a, 310b. Law and Society (3-0-3 each semester).
An examination of the nature of law and of justice; employment of the casebook method to study specific aspects of the law. *Mr. Godfrey*

317a. Congress (3-0-3).
Examines the role of Congress in the American political system. Attention is given to the historical development of Congress, the current status of the Congress, and the functions of Congress in the American political system. *Mr. Brady*

318a. The Presidency (3-0-3).
Presidential powers and behavior are analyzed in the context of the legal, electoral, personal, and other forces that shape and limit the actions of the president. *Ms. Sanders*

321a. American Constitutional Law (3-0-3).
Interpretation of the Constitution by the Supreme Court. *Mr. Cuthbertson*

325a. Criminal Justice (3-0-3).
The cause of crime and response to crime, including the organization and activities of the police, lawyers, courts, and prisons. *Mr. Gow*

326b. Politics of the Judicial System (3-0-3).
How does politics influence the judiciary, and how does the judiciary influence politics? The federal courts, both trial and appellate, are the focus. *Mr. Gow*

331b. American Political Parties and Electoral Behavior (3-0-3).
The nature and functions of contemporary American political parties, including characteristics of party systems, party organization, elite recruitment, political socialization, and voting behavior. *Ms. Sanders*

333. Southern Politics (3-0-3).
An historical and contemporary overview of Southern politics. Not offered 1981-82. *Ms. Sanders*

336b. Politics of Regulation (3-0-3).
Focus is principally on government regulation of business and the political factors that shape its content. *Ms. Sanders*

337a. Bureaucracy and Public Policy (3-0-3).
The role public bureaucracy plays in national policy-making process. Sources of agency power are examined and then linked to different policy outcomes. *Mr. Stein*

339. Public Policy (3-0-3).
Examines American public policy at the national level and concerns both the contents of public policy and the politics involved. Not offered 1981-82. *Mr. Stein*

340b. Ancient and Medieval Political Theory (3-0-3).
The sources of ancient and medieval political thought. Special emphasis on historical analysis of political philosophy and methodology and the influence of Plato and Aristotle. *Mr. Cuthbertson*

344. Contemporary Political Ideology (3-0-3).
Elements of major ideologies including nationalism, fascism, democracy, socialism, and revolution and their spokespeople in Afro-Asia and the West. Not offered 1981-82. *Mr. von der Mehden*

351. The Politics of Southeast Asia (3-0-3).
Political processes, institutions, and attitudes in selected Southeast Asian states. Emphasis on the postwar period, but traditional forces influencing contemporary political behavior also considered. Not offered 1981-82. *Mr. von der Mehden*

353. Politics of China and Japan (3-0-3).
Political processes, institutions, and attitudes of China and Japan; emphasis on postwar developments in relation to traditional patterns, political ideology, and international politics. Not offered 1981-82. *Mr. von der Mehden*

354b. Latin American Politics (3-0-3).
A study of the political process in contemporary Latin America, with particular attention to selected major countries. *Mr. Dix*

360a. Western European Democracies (3-0-3).
A survey of government and politics in Western European democracies, with primary emphasis on Great Britain, France, and Germany. *Mr. Ambler*

361b. Comparative Communist Systems (3-0-3).
A survey of government and politics in selected communist systems, including the USSR and Communist China. *Mr. Ambler*

371. Comparative Foreign Policy (3-0-3).
A survey and comparative analysis of the foreign policies and policy-making systems of selected countries, including China, Japan, and the Soviet Union. Not offered 1981-82. *Staff*

372b. The Conduct and Control of American Foreign Policy (3-0-3).
Examines the internal and external aspects of foreign policy leadership, presidential initiative, congressional control, press, public opinion, and crisis management. *Mr. Stoll*

375. International Organizations (3-0-3).
Survey of political processes in regional and global intergovernmental organizations and policy problems created by conditions of global interdependence. Not offered 1981-82. *Staff*

378. Politics of American National Security (3-0-3).
Major issues of national security policy, including strategic doctrines, policy-making processes on defense issues, arms control, and nuclear proliferation. Not offered 1981-82. *Mr. Stoll*

379. Problems in International Relations (3-0-3).
Examines a major issue in international relations and the contributions of the social sciences to an understanding and/or solution to that question. Not offered 1981-82. *Staff*

380a. Political Behavior (3-0-3).
Examines basic concepts in political behavior and includes politicization, public opinion, political participation, and voting behavior. Students will learn basic data analysis techniques. *Mr. Brady*

405a, 406b. Senior Thesis (0-0-3 each semester).
Open to senior honors majors with the permission of the department. Students must complete both Political Science 405 and 406 to obtain credit. *Staff*

410a. Seminar in Adjudication of Current Social Issues (3-0-3).
The current state of law and court delay, family planning, abortion, euthanasia, drugs, consumerism, privacy, environment, the poor, etc. Prerequisite: permission of the instructor. *Mr. Hudspeth*

430b. Seminar in Texas Politics (3-0-3).
Research seminar in the history of Texas politics. Enrollment limited. Prerequisite: permission of instructor. *Mr. Cuthbertson*

431a. The Politics and Administration of Electoral Campaigns (3-0-3).
Examines the role of campaigns in determining the outcome of political races. *Mr. van Lohuizen*

454. Revolutions and Revolutionary Movements (3-0-3).
Causes and outcomes of revolutions, both past and contemporary, and their relationships to the societies in which they occur. Not offered 1981-82. *Mr. Dix*

457b. The Conditions of Democracy (3-0-3).
This seminar explores the factors that make some countries democratic and others not, as well as the factors that may cause the breakdown of democratic regimes. *Mr. Dix*

460. Seminar in Comparative Government (3-0-3).
Selected topics in comparative government. Not offered 1981-82. *Staff*

470. Research Seminar in International Relations (3-0-3).
Conflict modeling and quantitative analysis of alliance formation, foreign aid, regime structures, ideologies, and arms races as they affect the probability of war. Not offered 1981-82. *Staff*

472a. Seminar in American Foreign Policy (3-0-3).
The content of American foreign policy, its sources, and the process of policy formulation. Prerequisite: permission of the instructor. *Mr. Stoll*

486. Topics in American Politics (3-0-3).
Not offered 1981-82. *Staff*

490. Research Seminar in Modern Political Theory and Interdisciplinary Fields (3-0-3).
The development of political fiction, the political novel as political theory, and the relevance of the political novel to contemporary problems. Not offered 1981-82. *Mr. Cuthbertson*

495a. Introduction to Statistics (3-0-3).
Investigation of basic concepts of statistics and their application to substantive problems in the social sciences. Prerequisite: permission of the instructor. *Mr. Stoll*

503. Special Topics in Research Methods and Data Analysis (3-0-3).
Applications of least squares and general linear model. Not offered 1981-82. *Mr. Gow*

510. Scope and Methods (3-0-3).
Introduction to research in political science, problems of the discipline, and basic political concepts. History of political science as a discipline. Not offered 1981-82.

511b. Measurement and Research Design (3-0-3).
Research design. Measurement theory. Data collection and modes of analysis. Use of the computer in political research. Theory building. *Mr. Gow*

520b. Approaches to Comparative Government (3-0-3).
Core graduate course analyzing basic approaches to the study of comparative government. Open to qualified undergraduates with permission of instructor. *Mr. von der Mehden*

527a. Organization Theory (3-0-3).
Examination of applications of organization theory to the study of American political institutions. *Mr. Cooper*

530a. Approaches to American Government (3-0-3).
Core graduate course analyzing basic approaches to the study of American politics. *Ms. Sanders*

537. Public Administration: The Intergovernmental System (3-0-3).
The administration and implementation of public policies across federal, state, and substate governments. Not offered 1981-82. *Mr. Stein*

538b. Management of Bureaucracy (3-0-3).
The management of public sector organizations: communications, management styles, organizational design, budgeting, motivation, planning, organizational change, staffing, and recruitment. Emphasis on public sector problems. *Mr. Stein*

540. Approaches to International Relations (3-0-3).
Core graduate course analyzing basic approaches to the study of international relations. Open to qualified undergraduates with permission of instructor. Not offered 1981-82. *Staff*

571a. International Relations and Business (3-0-3).
Emphasizes through comparative political analysis the societal conditions in the advanced industrial and developing countries and their impact on business. Also offered as Administration 571. *Mr. von der Mehden*

580. Seminar in American Politics (3-0-3).
Not offered 1981-82. *Staff*

581b. Seminar in Congress (3-0-3).
Examines the linkages between the United States Congress, its environment, and its policy outputs. *Mr. Brady*

591a, 592b. Directed Reading in Methodology and Research Design (0-0-3 each semester). *Staff*

593a, 594b. Directed Reading in American Politics (0-0-3 each semester). *Staff*

595a, 596b. Directed Reading in International Relations (0-0-3 each semester). *Staff*

597a, 598b. Directed Reading in Comparative Politics (0-0-3 each semester). *Staff*

600a,b. Topics in Political Science.
Research and thesis for resident students.

700c. Summer Study and Research.

800b. Degree Candidate Only.

Psychology

Professor Howell, *Chairman*
Professors Brelsford, Schum, and Tuggle
Adjunct Professor Singh
Associate Professors Burnett, Dipboye, and Watkins
Adjunct Associate Professor Wright
Assistant Professors C.A. Anderson, D.M. Lane, and Schuberth
Adjunct Assistant Professors Kahn and Rathjen

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. Twenty-seven semester hours are required for a major in psychology. For anyone declaring a major after fall 1981, the following courses are required for the major in psychology: Psychology 201, 339, and 340. Any 300 level or higher course in statistics may be substituted for Psychology 339. In addition to the three required listed above, the student must take at least two courses from each of the following blocks of courses:

Block 1: Psychology 307, 308, 329, 351, 362
Block 2: Psychology 303, 305, 312, 330, 332

Double majors may count one course (three semester hours) from the other major toward the psychology major.

Seven specific programs are now available: (1) standard, (2) business and management emphasis, (3) health-related career emphasis, (4) law and politics, (5) high school teaching emphasis, (6) psychology career emphasis, and (7) honors. Most courses, however, are also open to nonmajors, subject to the instructor's approval.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 50-51.

Graduate Program. Graduate programs are offered at both the M.A. and Ph.D. levels. The emphasis, however, is upon doctoral training, and only applicants of Ph.D. caliber are admitted.

A research thesis with public oral defense is required for both M.A. and Ph.D. degrees. In addition, sixty semester hours must be accumulated for the Ph.D. and thirty for the M.A. Included in this total are required courses in the areas of learning, physiology, social psychology, and methodology, plus whatever offerings are available in the student's specialty area. The two specialty areas currently offered are cognitive-experimental and industrial-organizational/ social.

Competence in a foreign language is not required. The student must, however, pass an admission-to-candidacy procedure designed to establish his or her expertise in the chosen specialty area.

Psychology Courses

201a,b. Introduction to Psychology (3-0-3).
Overview of current research and theory in a variety of subareas of psychology.
Mr. Schuberth, Mr. Anderson

303a. Industrial and Organizational Psychology (3-0-3).
An overview of the principles, techniques, and theories of psychology applied in the industrial setting. *Staff*

305a. Introductory Social Psychology (3-0-3).
Theories and research in social psychology with emphasis given to the implications for societal problems and interpersonal dynamics. Prerequisite: Psychology 201. *Mr. Anderson*

307a. Learning (3-0-3).
Introductory survey of issues, theories, research, and applications in learning. Prerequisite: Psychology 201. *Mr. Brelsford*

308b. Human Learning and Memory (3-0-3).
Critical review of traditional and contemporary approaches to the study of remembering and forgetting. Prerequisite: Psychology 201 and 307 or permission of instructor.
Mr. Watkins

312b. Developmental Psychology (3-0-3).
Focus on behavioral changes with age and general laws of development in both human and nonhuman species. Prerequisite: Psychology 201 or permission of instructor. *Mr. Schuberth*

329b. Tests and Measurements (3-0-3).
Techniques for measuring individual differences and critical review of theories of individual differences in intelligence and personality. Prerequisite: Psychology 201. *Staff*

330a. Personality Theory (3-0-3).
Consideration of those aspects of personality emphasized by the major theorists past and present. *Mr. Dipboye*

332b. Psychology of Abnormal Behavior (3-0-3).
Various aspects of human behavior, including personality functions and abnormal behavior. May be repeated with instructor's permission. Prerequisite: Psychology 201.
Ms. Burnett

339a. Statistical Methods in Psychology (3-3-4).
Introduction to quantitative and computer methods applicable to the analysis of experimental data. *Mr. Lane*

340b. Research Methods in Psychology (3-3-4).
A continuation of Psychology 339 with a strong emphasis on individual student experiments and the writing of research reports. Prerequisite: Psychology 339 or equivalent.
Mr. Brelsford

351. The Psychology of Perception (3-0-3).
Critical evaluation of data, theories, and methods in the area of human perception. Prerequisite: Psychology 201. Not offered every year. *Mr. Schuberth, Staff*

362b. Physiological Psychology — A Keller Method Course (3-0-3).
An overview of the neurophysiological correlates of behavior. *Mr. Howell*

370b. Engineering Psychology (3-0-3).
Principles of psychology and human performance applied to the design of modern systems. Prerequisite: Psychology 201. *Staff*

421a. Senior Seminar in Psychology (3-0-3).
A seminar on special topics of interest to particular staff members. Topics announced each semester. May be repeated. Not offered every year. *Staff*

431a,b. Advanced Topics in Social Psychology (3-0-3).
Prerequisite: permission of instructor. May be repeated for credit with instructor's approval. *Staff*

433a,b. Advanced Topics in Cognitive Psychology (3-0-3).
Prerequisite: permission of instructor. May be repeated for credit with instructor's approval. *Staff*

435a, 436b. Advanced Topics in Industrial Organization (3-0-3 each semester).
Prerequisite: permission of instructor. May be repeated for credit with instructor's approval. *Staff*

437a, 438b. Advanced Topics in General Psychology (3-0-3 each semester).
Prerequsite: permission of instructor. May be repeated for credit with instructor's approval. *Staff*

440b. Sensory Psychology (3-0-3).
A study of phenomena, methods, and theory in contemporary research on visual and auditory processes. Not offered every year. *Mr. Schum*

442b. Computer Applications in Psychology (3-3-4).
Use of small computers in psychological research. Prerequisite: statistics, programing, permission of the instructor. *Mr. Lane*

491a, 492b. Independent Study and Research (3-0-3 each semester).
May be repeated for credit. *Staff*

509a, 510b. Advanced Psychological Statistics (3-0-3 each semester).
Descriptive and inferential statistics for beginning graduate students in psychology. Prerequisite: permission of instructor. *Mr. Lane*

511. Research Strategies in Social Psychology (3-0-3).
Not offered every year. *Staff*

512b. Advanced Social Psychology (3-0-3). *Mr. Anderson*

514a. Topics in Quantitative Methods and Research Design (3-0-3). *Mr. Schum*

515a. Topics in Cognitive Psychology (3-0-3). *Mr. Brelsford*

516b. Topics in Cognitive Psychology (3-0-3). *Mr. Schuberth*

520a,b. Topics in Engineering Psychology (3-0-3). *Staff*

521a. Advanced Learning and Memory (3-0-3). *Mr. Watkins*

522b. Topics in Learning and Memory (3-0-3). *Mr. Watkins*

531b. Survey of Industrial-Organizational Psychology (3-0-3). *Mr. Dipboye*

532a. Topics in Industrial-Organizational Psychology (3-0-3). *Mr. Dipboye*

533b. Topics in Personal Psychology (3-0-3). *Staff*

551a, 552b. Graduate Research in Psychology (3-0-3 each semester). *Staff*

553a, 554b. Graduate Teaching in Psychology (3-0-3 each semester). *Staff*

700c. Summer Graduate Research in Psychology (3-0-3).

800b. Degree Candidate Only.

Religious Studies

Professor Nielsen, *Chairman*
Professors Kelber and Sellers
Adjunct Professor S.E. Karff
Visiting Assistant Professor R.A. Adams
Lecturers Benjamin, Borbridge, Dunne, T.F. Freeman, Sanborn, and Sherman

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. All undergraduates majoring in religious studies are expected to enroll in one of the introductory courses offered at the first- or second-year level. A total of twenty-four semester hours (eight courses) in advanced courses are required for completion of the major. At least six semester hours (two courses) are to be elected in each of the following areas represented in the department:

1. Historic and Biblical studies
2. Interpretation, theology, comparative religions
3. Religion in the modern world

Qualified upperclass students are given an opportunity to engage in independent work. Related courses offered by other departments may be taken for credit in religious studies with the approval of the major adviser.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 50-51.

Graduate Program. The Department of Religious Studies offers graduate work in a variety of fields: ethics, Judeo-Christian origins, philosophy of religion, and theology. In keeping with the traditions of Rice University, study and research are not confessionally oriented. The awarding of advanced degrees is not based solely on the accumulation of credits or compliance with formal requirements. Course plans are determined according to the preparation, needs, and interests of the candidate. A capacity for independent work is considered essential to study in the department.

Fellowship in Religious Studies for Study Abroad. A fellowship has been established to encourage advanced students to spend a year in another university, in most cases after they have completed their comprehensive qualifying examinations for the Ph.D. degree. It is available equally to persons in any field of study offered in the department. The recipient is chosen by faculty members responsible for graduate work. The cost of air travel is paid in addition to a monthly stipend. Additional costs such as tuition for study at particular institutes are considered on a case-to-case basis. Award is made annually, subject to availability of funds.

Requirements for the Degree of Master of Arts:

1. Completion with high standing of a program approved by the department; normally, this includes twenty-four semester hours in advanced courses plus thesis work
2. Satisfactory performance on a reading examination in French or German
3. Satisfactory performance on preliminary written and oral examinations in the field of religious studies; normally, these include Biblical studies, philosophy of religion, and ethics, with detailed attention to the area of thesis specialization

4. Completion of an acceptable thesis
5. Satisfactory performance on a final oral examination

Requirements for the Degree of Doctor of Philosophy:

1. Completion with high standing of a program approved by the department; normally, this includes fifty-four semester hours, counting those given for the degree of Master of Arts. Six of these semester hours may be waived upon petition to the graduate faculty after the first year. Normal minimum residence is at least two years, even for candidates already holding advanced degrees.
2. Satisfactory performance on a reading examination in both French and German
3. Satisfactory performance on preliminary written and oral examinations in religious studies. Candidates for the doctoral degree are expected to prepare themselves for four qualifying examinations (Biblical studies, philosophy of religion, ethics, etc.), at least two of which must be in their major area of concentration.
4. Completion of a dissertation approved by the department
5. Satisfactory performance on a final oral examination on the dissertation and related fields

Religious Studies Courses

111a. Religion and Culture (3-0-3).
The Religion Game-1. Examination of major traditions of the East and West. Religion in human experience: personal, historical, cultural, and theological dimensions. *Mr. Nielsen, Staff*

112b. Religion and Culture (3-0-3).
The Religion Game-2. Religious alternatives. The secular versus the sacred. Competing world views, East and West. *Ms. Dunne*

202b. Atheism (3-0-3).
Readings in Marx, Feuerbach, Nietzsche, Sartre, Ernest, Bloch, as well as classical theistic arguments. *Staff*

203a. The Radical Revolutionaries of Thought (3-0-3).
Study of the founders of the great religions as well as contemporary thinkers. *Staff*

204b. Diety, Mysticism, and the Occult (3-0-3).
Critical, phenomenological study of the psychology of religion and the occult. Comparative use of the categories of the Western and Eastern traditions. *Mr. Nielsen*

301a. Mysticism and Existentialism (3-0-3).
Examination of these two approaches to life in Christian and non-Christian literature, ancient and modern. Not offered 1982-83. *Ms. Dunne*

304b. Modern Jewish Thought (3-0-3).
Readings in contemporary Jewish thought with attention to Borowitz, Buber, Kaplan, and Rosenzweig. Not offered 1982-83. *Mr. Sherman*

305a. Introduction to Judaism (3-0-3).
Study of Biblical monotheism, Talmud, Jewish philosophy, mysticism, and contemporary reinterpretation. *Mr. Sherman*

306b. The Modern Jew: Despair versus Happiness (3-0-3).
Examination of the meaning of the Holocaust for Jews and Christians through literature, art, poetry, and other memoirs. Prerequisite: Religious Studies 111, 112, or other approved course. Not offered 1981-82. *Mr. Sherman*

307a. Jesus in History (3-0-3).
The life of Jesus viewed against the background of the political, social, cultural, economic, and religious history of his time. *Mr. Kelber*

308b. Synoptic Gospels (3-0-3).
Introduction to the religious world views of Mark, Matthew, and Luke in the light of redaction criticism. Not offered 1981-82. *Mr. Kelber*

310b. Pauline Theology (3-0-3).
Introduction to the theological controversies between Paul and anti-Pauline Christians. Not offered 1982-83. *Mr. Kelber*

311a. History of Religion: The Far Eastern Tradition (3-0-3).
Readings in the holy books of India, China, and Japan. Study of Hinduism, Buddhism, Confucianism, Taoism, and Shinto. *Mr. Nielsen*

312b. History of Religion: The Western Tradition (3-0-3).
Study of Judaism, Christianity, and Islam in their historical development. Attention to the basic themes of Western theism. *Ms. Dunne*

314a. Introduction to Islam (3-0-3).
Study of the history and traditions of the religion founded by Mohammed, Koran, Sufi mysticism and contemporary reinterpretation. *Mr. Adams*

315a. Hebrew Bible: From Myth to Monarchy (3-0-3).
Israel's beginnings and growth to nationhood: ancestors, Torah, deity, study of the Pentateuch and historical books. *Mr. Benjamin*

316b. Hebrew Bible: Cult and Crisis (3-0-3).
Israel's struggle with the myth, mysteries, and magic of the ancient Near East. The prophetic revolution and poetic traditions. *Mr. Benjamin*

321a. Seminar on a Contemporary Theologian: C.S. Lewis (3-0-3).
Study and critical evaluation of the writings of a contemporary religious thinker. Lewis' outlook compared with that of Thomas Merton and Dietrich Bonhoeffer. *Staff*

331a. Psychology of Religion (3-3-0).
Study of the primary developments in the field, with particular emphasis on changing issues and methods. *Ms. Dunne*

334b. Problems in Psychology of Religion (3-0-3).
Significant contemporary problems examined from a clinical standpoint, e.g., ideas of God, evil, anxiety, guilt, and therapeutic process. *Mr. Sanborn*

341a. Human Rights and Human Dignity I (3-0-3).
An exploration of questions raised by contemporary phenomena such as terrorism, torture, and totalitarianism. Not offered 1981-82. *Ms. Dunne*

342b. Human Rights and Human Dignity II (3-0-3).
A study of specific violations of human rights in contemporary society. Students may choose area of special interest. Not offered 1981-82. *Ms. Dunne*

343a. Science, Religion, and Value I (3-0-3).
Interdisciplinary consideration. Methodology and diverse physical and spiritual understandings of life. Mind-body problems, immortality. *Staff*

344b. Science, Religion, and Value II (3-0-3).
Quality of life, evolution and creation, the will-to-truth and the will-to-believe, the sacred, and the existence of God. *Staff*

345a. Ethics and the Life Cycle I (3-0-3).
The "stages on life's way" and the meaning of life and death from religious and secular points of view. Readings in Erikson, Malamud, Kierkegaard, Buber, Skinner, and sociobiology. *Mr. Sellers*

346b. Ethics and the Life Cycle II (3-0-3).
Concrete problems over the life cycle, including abortion, identity, birth control, sex ethics, ethics and mental health, medical ethics, aging, death, and dying. *Mr. Sellers*

347a. Varieties of Contemporary Religion (3-0-3).
Varying religious life styles, traditional and nontraditional, in the Indian, Black, Mexican-American, Islamic, and Jewish communities. Consideration of worship, sacred literature, ethics, community involvement, evangelical efforts. Field trips, guests, discussion. *Mr. Freeman*

348b. Community Ethical Dilemmas (3-0-3).
Current community problems and their ethical and religious implications: drugs, race, inequities, poverty, law enforcement, religious intolerance. Guest speakers, visitations. *Mr. Freeman*

375a. Man in the Cosmos (3-0-3).
Fundamental questions on the nature of humanity and its place in the universe. Not offered 1981-82. *Mr. Borbridge*

376b. Origin and Destiny of the Universe (3-0-3).
Major cosmological theories and their effect on both religious and secular thinking. *Mr. Borbridge*

401a, 402b. Independent Study (3-0-3 each semester). *Staff*

415a. Contemporary Moral Problems (3-0-3).
Study of such controversial moral issues as capital punishment, racism, euthanasia, abortion, and famine, with an ethical analysis based on pluralistic American ethics. Not offered 1981-82. *Mr. Sellers*

443b. Moral Conflicts in America (3-0-3).
Discussion of controversial moral issues with ethical analysis from the point of view of Judaism and Christianity. Subject for this semester: love and death, sexuality and dying in America. *Mr. Karff, Mr. Sellers*

444a. American Manners and Morals (3-0-3).
An inquiry into the basic themes of "American ethics," with analysis of comic strips, mass media, folklore, politics, and religion. Not offered 1982-83. *Mr. Sellers*

453a, 454b. History of Christianity I, II (3-0-3 each semester).
Study of representative thinkers of the Reformation and Enlightenment periods, together with contemporary history. *Staff*

462a. Recent Christian Theology and Ethics (3-0-3).
Which is more crucial to the Christian faith: love or justice? Examination of the thought of Christian thinkers including Rauschenbsuch, Niebuhr, Tillich, and Gutierrez. Prerequisite: permission of instructor. *Mr. Sellers*

463b. Recent Christian Theology and Ethics (3-0-3).
Faith and ethics: Is "faith" in the Christian sense essential to ethical action? This basic question will be explored through the thought of Luther, Edwards, Brunner, and Catholic thinkers. Prerequisite: permission of instructor. *Mr. Sellers*

501a, 502b. Research and Thesis (3-0-3 each semester). *Staff*

506a. Seminar in the Synoptic Gospels (3-0-3).
Not offered 1981-82. *Mr. Kelber*

507a. Pauline Theology (3-0-3).
Not offered 1982-83. *Mr. Kelber*

508b. The Gospel of John (3-0-3).
Not offered 1981-82. *Mr. Kelber*

509b. New Testament and Culture (3-0-3).
Not offered 1982-83. *Mr. Kelber*

511a, 512b. Seminar in Hebrew Religion I, II (3-0-3 each semester). *Mr. Benjamin*

521a. Readings in Non-Christian Religious Philosophy (3-0-3).
Critical examination of major traditions of Indian and Chinese philosophy; historical development and modern expressions of Hindu and Buddhist thought. Not offered 1982-83. *Mr. Nielsen*

522a. Seminar in Philosophical Theology (3-0-3).
Not offered 1982-83. *Mr. Vincent*

523a, 524b. Independent Study (3-0-3 each semester). *Staff*

525a. Seminar in the Problem of Religious Knowledge (3-0-3).
Not offered 1982-83. *Staff*

526a. Seminar in Contemporary Theology (3-0-3).
Not offered 1981-82. *Mr. Nielsen*

528b. Ecumenical Theology Seminar (3-0-3). *Mr. Nielsen*

529b. Religious Knowledge in Historical Perspective (3-0-3).
Not offered 1981-82. *Staff*

530b. Seminar in Historical Theology (3-0-3).
Not offered 1981-82. *Staff*

533a. Methodology in Historical Theology (3-0-3).
Not offered 1981-82. *Staff*

541a. Seminar in Ethics (3-0-3).
Not offered 1981-82. *Mr. Sellers*

542b. Seminar in Ethics and Society (3-0-3).
Not offered 1981-82. *Mr. Sellers*

543a. Seminar in Social Ethics (3-0-3).
Not offered 1982-83. *Mr. Sellers*

544b. Seminar in Theology and Ethics (3-0-3).
Not offered 1982-83. *Mr. Sellers*

552b. Seminar in History of Religion (3-0-3). *Mr. Nielsen*

553a, 554b. Department Colloquim (3-0-3). *Staff*

700c. Summer Graduate Research (3-0-3).

800b. Degree Candidate Only.

Sociology

Associate Professor Davidson, *Chairman*
Professors C. Gordon and W.C. Martin
Associate Professor Klineberg
Assistant Professor Long

Degree Offered: B.A.

Undergraduate Program. The major is designed to enable students to gain greater understanding of the nature of human societies as an important part of a liberal education, as a foundation for a variety of occupations, and as preparation for graduate study. The program provides students with considerable latitude in pursuing substantive interests, while ensuring a basic familiarity with theoretical approaches and issues of methodology. Majors in sociology are not required to take a foreign language; those planning graduate study, however, should be aware that many graduate departments of sociology require demonstrated competence in at least one foreign language. A minimum of twenty-four semester hours (eight courses) in sociology must be passed, of which at least eighteen semester hours (six courses) must be at the advanced level. In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete at least 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 50-51.

Requirements for the major in sociology are: (1) Sociology 203; (2) at least one of the two courses emphasizing theoretical approaches, i.e., Sociology 317 or 353; (3) Sociology 421; and (4) at least fifteen semester hours (five courses) in the substantive areas of sociological specialization. A statistics course such as Mathematical

Sciences 221, 280, 301, 380, 480, or 481 or an independent study course (Sociology 403, 404, 492, 493) may be used as one of these.

All sociology courses listed are regularly offered by the present faculty, although not necessarily every year. Additional courses may be offered with the addition of new faculty or variations in present course assignments; similarly, some courses may be discontinued from the regular offerings. It is the responsibility of the student to consult the listing of university distribution requirements before registering in order to satisfy all the requirements for his or her degree. The registration of every sociology major must be signed by a departmental adviser.

Honors Program. The honors program is designed to (1) provide undergraduates whose primary concentration is in the field of sociology with the opportunity to deepen their understanding of the sociological perspective through a two-semester program of directed independent research and writing and (2) provide an opportunity for the recognition of undergraduates who have demonstrated unusual competence in sociology and capacity for sustained independent research.

To be eligible for the program, a student must have maintained a "2" average in at least four sociology courses beyond the introductory level. During the first semester of the junior year, students who meet this requirement are invited to submit, no later than two weeks prior to registration for the spring semester, a description of their proposed research project to the Undergraduate Honors Committee (Professor Elizabeth Long, chairman). This committee, in consultation with the candidate, evaluates the proposal in terms of both its feasibility and its sociological significance. Upon acceptance into the program, the student is assigned a faculty adviser to supervise the student's independent research and the selection of further courses relevant to the project. It is expected that all honors candidates will have completed Sociology 421 before beginning their second semester of honors research.

Honor students register for two successive semesters of directed honors research (Sociology 492, 493). The first semester is normally devoted to a review of the relevant literature and the preparation of a detailed outline of the planned research. The research itself is normally carried out during the second semester and written up as a completed honors thesis by the end of that period.

The thesis is read and evaluated by two other faculty members in addition to the student's primary adviser and followed by an oral examination open to the public. These three faculty members share responsibility for determining departmental honors based on the student's performance in the program as a whole.

Sociology Courses

203a. Introduction to Sociology (3-0-3).
Introduction to the principal concepts, theories, and methods of sociology. *Mr. Martin*

204b. Contemporary Social Institutions (3-0-3).
Exploration of American social institutions — family, education, religion, work, culture — and of the problems and future prospects engendered by the rapid pace of social change.
Ms. Long

231a. Race and Nationality (3-0-3).
The role of race and nationality in society, ethnic cultures, prejudice, political institutions, patterns of conflict and cooperation; discrimination and its remedies. Not offered 1981-82.
Mr. Davidson

301a. Social Inequality (3-0-3).
A study of the extent of social inequality, its causes, costs, and benefits. Can (and should) it be abolished? Is inequality compatible with democracy? Not offered 1982-83.
Mr. Davidson

306b. Sociology of Sex Roles (3-0-3).
Relationship between gender and social role. Development of the contemporary sexual division of labor and process of socialization with reference to family, education, media, and occupations. Not offered 1982-83. *Ms. Long*

308b. Houston: The Sociology of a City (3-0-3).
An approach to urban sociology, using metropolitan Houston as a case study. Neighborhoods, politics, transportation, land use, ethnic groups, housing, cultural institutions. Field trips required. Not offered 1982-83. *Mr. Davidson*

311a. Collective Behavior (3-0-3).
Consideration of relatively noninstitutionalized conduct: crowds, mobs, publics, social movement; conditions and consequences of social unrest, excitement, panic, and protest. Not offered 1982-83. *Mr. Gordon*

321a. Criminology (3-0-3).
Types of criminal behavior, theories of crime and juvenile delinquency, with attention to the role of police, courts, correction agencies, and other social structures. Not offered 1981-82. *Mr. Martin*

325a. Bureaucratic Organizations and Their Management (3-0-3).
The rise and social impact of complex bureaucracies in business, government, and education; managerial techniques and legitimating ideologies. Not offered 1981-82. *Ms. Long*

331a. Politics and Society in Texas (3-0-3).
Texas as an emerging industrialized state with deep roots in a Southern rural past. Populism; "folk conservatism"; cosmopolites and yahoos; theories of how Texas politics works. Not offered 1981-82. *Mr. Davidson*

337a. Mass Communications (3-0-3).
Analysis of the structure, social context, and effects of large scale impersonal communication to dispersed and heterogeneous audiences through both print and electronic media. Not offered 1981-82. *Mr. Gordon*

340b. Marx and Freud: Humanism and Terror (3-0-3).
Exploration of two revolutionary modern thinkers, focusing on the tension between freedom and determinism in their thought and the theory and practice of their heirs. Not offered 1981-82. *Mr. Davidson, Ms. Long*

353a. Conceptions of Human Nature (3-0-3).
The perspectives of sociobiology, psychoanalysis, behaviorism, Piaget, and symbolic interactionism; the "paradigm shift" toward viewing human beings as actively engaged in the construction of reality. *Mr. Klineberg*

354b. Personality and Social Systems (3-0-3).
An attempted integration of the perspectives of psychology and sociology in relation to the determinants of individual behavior and to the processes of social change. *Mr. Klineberg*

356b. Sociology of Health and Illness (3-0-3).
Social and cultural factors that influence the development of physical and mental disorders and the delivery of health care in American society. *Staff*

368b. Environmental Sociology (3-0-3).
An exploration of the growing belief in the reality of ecological constraints and its implications both for sociological theory and for human societies. Not offered 1981-82. *Mr. Klineberg*

395a, 396b. Energy and Society (3-0-3).
The political conflicts and sociological forces that are shaping local and national responses to the energy dilemmas of the 1980s. *Mr. Gordon, Mr. Klineberg*

403a, 404b. Independent Study (0-0-3 each semester).
Directed reading and written papers on subjects not regularly offered; advanced study of subjects on which courses are offered. Prerequisite: permission of the department. *Staff*

411a. Social Change (3-0-3).
Processes of transition in family structures, work roles, economic and political systems; individual and collective responses to the "new realities" of the 1980s. Not offered 1982-83. *Mr. Klineberg*

421a. Introduction to Research Methods (3-0-3).
The methods of social science research and their theoretical, ethical, and policy implications. Discussion of sociological studies — classic and controversial — supplemented by practical field exercises. *Mr. Gordon, Staff*

425a. Political Sociology (3-0-3).
Examination of social phenomena that impinge on political systems: mass society, informal power structures, ideology, intergroup conflict, insurgent social movements. Not offered 1982-83. *Mr. Davidson*

430b. Sociology of Religion (3-0-3).
Religious beliefs, symbols, actions, organizations, roles, and various interrelationships between religion and society, including new religious movements, secularization, and functional alternatives to religion. Field work. *Mr. Martin*

432b. Sociology of Adulthood and Aging (3-0-3).
Seminar analyzing identity transformations, adult socialization, occupation, family, role losses, and death from young adulthood through old age. Effects of sex role, social class, and ethnicity. Not offered 1981-82. *Mr. Gordon*

470b. Popular Culture (3-0-3).
Analysis of social origins, significance, and implications of various types of media, arts, and popular entertainment. Enrollment limited. *Mr. Martin*

481a. Sociological Perspectives on the Future (3-0-3).
Processes underlying the transformation of advanced industrial societies, technology and resource scarcities, social movements and individual aspirations as they are interacting to shape the future. Not offered 1981-82. *Mr. Klineberg*

492b, 493a. Directed Honors Research (3-0-3 each semester).
Sociological research under faculty supervision. First semester: review of relevant literature and preparation of outline for planned research. Second semester: research carried out and honors thesis completed. Open only to students in sociology honors program. *Staff*

495a, 496b. Topics in Sociological Research (3-0-3).
Practical research seminar on a selected topic, providing an opportunity for advanced independent work with close faculty supervision. *Staff*

Space Physics and Astronomy

Professor Dessler, *Chairman*
Professors H.R. Anderson, Chamberlain, Clayton, Cloutier, J.W. Freeman, W.E. Gordon, Haymes, Heymann, N.F. Lane, Michel, Stebbings, Walters, and Wolf
Associate Professors Dunning, Few, and Talbot
Assistant Professor Dufour
Adjunct Assistant Professor Jost
Senior Research Scientist Bernstein
Associate Research Scientists Hill and Reiff
Assistant Research Scientist Voigt

Degrees Offered: B.A. in physics with space physics and astronomy option, M.S., Ph.D.

Undergraduate Program. There is no undergraduate major in the department; however, the Department of Physics offers a space physics and astronomy option leading to a B.A. with a major in physics for students with an interest in studies directed toward space physics and astronomy. The course requirements for this option can be satisfied in any order consistent with prerequisites. The following is a typical program (laboratory courses in parentheses):

First Year: Physics 101, 102, or 111, 112 (132)
Mathematics 101, 102
Chemistry 101, 102 (107)
Second Year: Space Physics and Astronomy 251, 252 (261, 262)

	Physics 201, 202 or 211, 212 (231)
	Mathematics 211, 212
Third Year:	Physics 301, 302 (331, 332)
	Physics 311, 312
	Mathematics or Mathematical Sciences elective (300 or above)
Fourth Year:	Space Physics and Astronomy 472 (431, 432)
	Physics 425
	Math elective

Additional courses in space physics, electrical engineering, mathematics, computer science, geology, and other subjects may be of use to undergraduate majors. The department has prepared a list of such courses and should be consulted prior to registration. In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 140 semester hours. See Degree Requirements and Majors, pages 50-51.

Graduate Program. Research opportunities exist for graduate studies leading to degrees of Master of Science and Doctor of Philosophy in the Department of Space Physics and Astronomy. To gain such a degree, a student must be knowledgeable in many areas of space physics and astronomy and expert in at least one.

Because of the interdisciplinary nature of the department's activities, holders of bachelor's degrees in astronomy, chemistry, electrical engineering, geophysics, physics, or any of several other scientific and engineering disciplines may apply for admission to graduate work in the department. Research programs in the Department of Space Physics and Astronomy include astrophysics, atmospheric electricity, atomic physics, fields and particles, meteoritics, planetary structure, and planetary atmospheres.

The requirements for M.S. and Ph.D. degrees are outlined below. A booklet giving more detailed and specific information is available from the departmental office.

Requirements for the Degree of Master of Science. Candidates for the master's degree must complete successfully at least thirty semester hours of approved graduate level studies and must demonstrate an understanding of physics and astronomy in an oral examination by their faculty committee. They must prepare a written thesis on an original research topic and defend the thesis orally.

Requirements for the Degree of Doctor of Philosophy. The basic requirement for a doctorate is demonstration of the capacity for independent, original research. Additional formal requirements are indicated below.

A student is normally admitted to candidacy for the Ph.D. degree by satisfying the requirements for the M.S. degree in space physics and astronomy as outlined above. A student who already holds a recognized M.S. degree or who does not desire to receive a master's degree may become a candidate for the Ph.D. through procedures described in the booklet available from the departmental office.

Candidates who hold a master's degree could possibly complete requirements for the doctorate in two years; however, a minimum of three years' graduate study is normally required. Students must complete at least sixty semester hours of approved graduate level studies, prepare a thesis on an original research topic, and defend the thesis orally. The thesis must be of a quality acceptable for publication in a reputable scientific journal. Further details of research programs in space physics and astronomy and departmental degree requirements are contained in a pamphlet available on request from the Department of Space Physics and Astronomy.

Space Physics and Astronomy Courses

235a. Space Colonies (3-0-3).
Physics of the planetary and space environment, calculation of spacecraft orbits, design and construction of large space structures, economic justification (power generation, specialized manufacturing), and evolution of social and political framework. *Mr. Freeman*

241a,b. Astronomy: Exploring the Universe (3-0-3).
An introductory course intended for students in academic programs. An overview of the solar system, plus stars: their classification, distances, birth, and death. *Mr. Chamberlain*

244b. Astronomical Horizons (3-0-3).
Recent discoveries about matter and the structure and evolution of the universe. Prerequisite: Space Physics and Astronomy 241 or equivalent. *Mr. Dufour*

251a, 252b. Introduction to Space Physics and Astronomy (3-0-3 each semester).
Recommended for science-engineering majors. Concurrent registration in Space Physics and Astronomy 261, 262 required. *Mr. Talbot*

261a, 262b. Observational Astronomy Laboratory (0-3-1 each semester).
Astronomical coordinates, telescopes, astrophotography, photometry, and spectroscopy. Corequisite: Space Physics and Astronomy 251, 252. *Mr. Dufour*

431a, 432b. Senior Research (0-6-2 each semester).
For majors in the space physics and astronomy option. *Staff*

433a, 434b. Honors Research I, II (0-9-3 each semester).
Student pursues a research project similar to Space Physics and Astronomy 431, 432 in considerably greater depth. Prerequisite: permission of department. *Staff*

443a. Introduction to Atmospheric Science (3-0-3).
Fundamentals of meteorology and climatology: radiation and energy balance, measurements, thermodynamics, clouds, weather systems and motions on small and global scales. Also offered as Environmental Science and Engineering 443 and Mechanical Engineering 477. Not offered 1982-83. *Mr. Few*

444b. Atmospheric Dynamics (3-0-3).
Hydrodynamic equations of motion on a rotating planet solved for static, stable, perturbed, and unstable flows for mesoscale and macroscale weather systems on the earth and other planets. Also offered as Environmental Science and Engineering 444 and Mechanical Engineering 478. Not offered 1982-83. *Mr. Few*

471b. Modern Astronomy and Astrophysics (3-0-3).
Observational and theoretical aspects of the generation of corpuscular, electromagnetic, and gravitational radiation in astronomical objects. Prerequisite: Space Physics and Astronomy 251, 252, 262; Physics 301, 302, 311, 312 or equivalent. *Mr. Haymes*

472a. Solar System Physics (3-0-3).
Solar-terrestrial relationships, planetary atmospheres, ionospheres, and magnetospheres. Prerequisite: Space Physics and Astronomy 251, 252, 262; Physics 301, 302, 311, 312 or equivalent. *Mr. Haymes*

488b. Topics in Space Utilization and Industrialization (3-0-3).
The utilization of space for industrial and advanced scientific purposes. Science/Engineering majors only; other majors should enroll in Space Physics and Astronomy 235. Not offered 1981-82. *Mr. Freeman*

495a, 496b. Science Teaching (3-0-3 each semester).
Supervised teaching experience in the science classroom or laboratory. For undergraduates. *Staff*

503a, 504b. Introduction to Plasma Astrophysics (3-0-3 each semester).
Magnetohydrodynamics, particle drifts, electrical conductivities, waves, and instabilities. Emphasis on applications. *Mr. Cloutier*

507a, 508b. Research Topics in Space Physics, Astronomy, and Atmospheric Physics (2-0-2 each semester).
A presentation of current research programs in the department. *Mr. Dessler*

511a. Planetary Atmospheres: Radiative Equilibrium (3-0-3).
Physics and chemistry of the lower atmospheres of planets. Not offered 1981-82.
Mr. Chamberlain

512b. Planetary Atmospheres: Aeromony (3-0-3).
Physics and chemistry of planetary atmospheres. Not offered 1981-82.
Mr. Chamberlain

515a. Advanced Classical Mechanics (3-0-3).
Lagrangian and Hamiltonian dynamics, normal vibrations, rigid body motion, the transformation theory of dynamics, and the covariant formulation. Also offered as Physics 515.
Staff

521a, 522b. Quantum Mechanics (3-0-3 each semester).
Also offered as Physics 521, 522. *Staff*

531a, 532b. Electromagnetic Theory (3-0-3 each semester).
Also offered as Physics 531, 532. *Staff*

535a. The Solar System (3-0-3).
Basic physical features of the solar system and the current theories that attempt to explain its origin and evolution. Not offered 1981-82. *Mr. Clayton*

537b. Cosmochemistry II (3-0-3).
Chemistry of interstellar media. Not offered 1981-82. *Mr. Heymann*

538b. Cosmochemistry I (3-0-3).
Chemical evolution of the solar system. Not offered 1981-82. *Mr. Heymann*

545a, 546b. Cosmology (3-0-3 each semester).
Structure and evolution of the universe. Not offered 1981-82. *Mr. Clayton*

551. Stellar Evolution and Nuclear Astrophysics (3-0-3).
Physical principles governing structure and evolution of stars. Not offered 1982-83.
Mr. Clayton

552. Stellar and Galactic Evolution (3-0-3).
Application of Space Physics and Astronomy 551 to stellar and galactic evolution. Not offered 1982-83. *Mr. Clayton*

591a, 592b. Graduate Research (Credit variable). *Staff*

595a, 596b. Teaching Space Physics and Astronomy (Credit variable).
For graduate students. *Staff*

603a, 604b. Special Topics in Space Physics and Astronomy
(3-0-3 each semester).
Current topics including modern developments in space physics and astronomy. Emphasis may vary from year to year. *Staff*

611a, 612b. Special Topics in Ionospheric Physics (3-0-3 each semester).
Current research in ionospheric physics with emphasis on experimental studies.
Mr. Gordon

660. Gravitation and Relativity (3-0-3).
Theories of gravitation with emphasis on the general theory of relativity and cosmological applications. Prerequisite: Physics 415 or equivalent. Also offered as Physics 660. Not offered 1982-83. *Mr. Michel*

700c. Summer Graduate Research (0-0-6).

800b. Degree Candidate Only.

Spanish, Portuguese, and Classics

Professor Leal, *Chairman*
Professors Castañeda and Levin
Associate Professors Boorman, Urrutibeheity, Valdivieso, and Wallace
Assistant Professor Kauffmann
Instructor Perez
Lecturers Daichman, Eaker, and Kiperman

Degrees Offered: B.A. and M.A. in Spanish; B.A. in classics

Study is offered in classics, Greek, Latin, Portuguese, and Spanish. A fully equipped language laboratory is in operation. Laboratory work is required of students in the beginning classes of all modern languages.

Qualified upperclass students may engage in independent work at the discretion of the department.

Spanish

Undergraduate Program. A student majoring in Spanish may pursue the following options: (1) language, (2) literature, or (3) Latin American studies. For an option in language or literature, thirty semester hours (ten courses) offered in fulfillment of major requirements must be Spanish courses numbered 300 or higher. For an option in Latin American studies, a minimum of eighteen semester hours (six courses) in Spanish courses numbered 300 or higher must be taken, plus six semester hours (two courses) of Portuguese, and at least twelve semester hours (four courses) related to the Latin American field in other departments. Qualified upperclass students are offered an opportunity to earn up to six semester hours in independent work. For specific requirements as to courses and the sequence to be followed, see the departmental advisers. All majors must have their programs approved by the department.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours outside the departmental requirements for a total program of at least 120 semester hours. See Degree Requirements and Majors, pages 50-51.

Requirements for the Degree of Master of Arts:

1. Completion with high standing of a program approved by the department; normally, this includes twenty-four semester hours in advanced courses plus six semester hours of thesis work
2. Satisfactory performance on a reading examination in one foreign language other than Spanish approved by the department
3. Satisfactory performance on a written comprehensive examination in Spanish, which tests the student's mastery of the chosen area of specialization and general competence in the remaining areas of Hispanic literature and linguistics
4. One semester of college Latin or equivalent
5. Completion of an acceptable thesis
6. Satisfactory performance on a final oral examination on the thesis

Summer Graduate and Undergraduate Program. Each summer since 1973, the Department of Spanish has offered programs designed to prepare students to study the Spanish language and do research on Spanish and Latin American study projects. These programs have been held in Argentina, Spain, and Mexico. The program has now been permanently established in Seville, Spain.

Translator Certification Program. The Spanish department and Office of Continuing Studies, Special Programs, offer a seven-course technical and legal program in translation and interpretation leading to professional certification. The program covers Hispanic-American dialectology, translation, simultaneous and consecutive interpretation, political science, and intercultural communication. A final juried examination is required of all students before the certification is awarded.

Spanish Courses

101a, 102b. First-Year Spanish (3-1-4 each semester).
Introduction to the study of the Spanish language with emphasis on the development of audiolingual skills. Language laboratory work required. *Mr. Perez, Staff*

103a. Accelerated Beginning Spanish (6-2-8).
Double course comparable to Spanish 101, 102 designed to achieve in one semester maximum proficiency in spoken language. Five classes a week, language lab twice a week.
Mr. Urrutibeheity, Staff

201a, 202b. Second-Year Spanish (3-1-4 each semester).
Contemporary short stories provide current linguistic models and serve as the point of departure for class conversation and discussion. *Mr. Perez, Staff*

204b. Accelerated Intermediate Spanish (6-2-8).
Continuation of Spanish 103 comparable to Spanish 201, 202. Contemporary short stories provide current linguistic models and serve as the point of departure for class conversation and discussion. *Staff*

280c. Spanish Conversation (3-0-3).
Intensive practice in the oral use of the language. Newspaper and magazine articles as well as interviews with native speakers are used as a basis for discussions. Grammar is reviewed incidentally. Emphasis on vocabulary acquisition and development of oral fluency. Offered in summer programs abroad only. *Staff*

291a. Intermediate Spanish: Legal and Commercial (3-0-3).
Introduction to general business and legal practices and terminology useful in subsequent business or legal career. Prerequisite: second-year competence or permission of instructor.
Ms. Kiperman

292b. Intermediate Spanish: Medical (3-0-3).
Introduction to general medical terminology and the reading of medical texts and journals. Useful in a subsequent medical career. Prerequisite: second-year proficiency or permission of instructor. *Ms. Kiperman*

303a. Spanish Literature in Translation (3-0-3).
Selected works of outstanding Spanish writers. Readings and class discussion in English. Open to all students. Does not count toward a major in Spanish. Offered occasionally.
Mr. Castañeda

304b. Spanish-American Literature in Translation (3-0-3).
Selected works of outstanding contemporary Latin American writers. Readings and class discussion in English. Open to all students. Does not count toward a major in Spanish. Offered alternate years. Offered 1982-83. *Ms. Boorman*

311a, 312b. Advanced Spanish (3-0-3 each semester).
Third-year course designed primarily to improve spoken language. Emphasis is on new vocabulary and idioms, morphology, syntax, and mechanisms of interference. *Staff*

318c. Spanish Conversation: Advanced Level (3-0-3).
Intensive practice in the oral use of the language. Movies, essays, and short stories are used as a basis for conversation. Offered in summer programs abroad only. *Staff*

319a, 320b. Survey of Spanish Literature (3-0-3 each semester).
The history of Spanish literature through representative readings from the medieval period to the present. Emphasis on stylistic analysis. *Mr. Perez*

321a, 322b. Survey of Spanish-American Literature (3-0-3 each semester).
The main literary trends and outstanding writers in Spanish America. Offered alternate years. Offered 1982-83. *Ms. Boorman, Ms. Valdivieso*

323a. Hispanic Culture and Civilization (3-0-3).
Topics relating to the development of social, political, and economic institutions of Spain form the basis for extensive conversation, discussion, and composition. *Mr. Kauffmann*

324b. Culture and Civilization of Latin America (3-0-3).
The development of social, political, and economic institutions of Latin America forms the basis for extensive conversation, discussion, and composition. *Ms. Valdivieso*

341a, 342b. Spanish Literature from 1800 to the Present (3-0-3 each semester).
Offered alternate years. Offered 1982-83. *Staff*

352b. Advanced Rhetoric and Composition (3-0-3).
Designed to strengthen oral and written rhetorical skills by using such materials as films, literary texts, and current periodicals. Offered alternate years. Offered 1982-83. *Staff*

361a, 362b. Golden Age Drama (3-0-3 each semester).
Development of the "comedia," illustrated by selected works of Lope de Vega, Tirso de Molina, Ruiz de Alarcón, Calderón de la Barca, and other seventeenth-century playwrights. Offered alternate years. Offered 1982-83. *Mr. Castañeda*

381a, 382b. Prose and Lyric Poetry of the Golden Age (3-0-3 each semester).
Analysis of poetry and prose emphasizing mysticism, the development of lyric poetry from Garcilaso to Góngora, the picaresque novel, and Cervantes. Offered alternate years. Offered 1981-82. *Mr. Castañeda*

402b. A Critical Introduction to Structuralism (3-0-3).
Basic texts of European structuralism (de Saussure, Jakobsen, Lévi-Strauss, Barthes) and several important critiques of it (Derrida, Foucault, Ricoeur). Emphasis on main elements of structuralist methodology in the analysis of texts. Also listed as Linguistics 410. Offered 1981-82. *Mr. Kauffmann*

405a, 406b. Spanish-American Literature (3-0-3 each semester).
Topic for 1981-82: contemporary Spanish-American theatre. Offered alternate years. *Ms. Boorman*

411a, 412b. Medieval and Renaissance Spanish Literature (3-0-3 each semester).
Not offered 1981-82. *Ms. Leal*

415a, 416b. The Art and Mechanics of Translation (3-0-3 each semester).
Designed to give intensive practice in Spanish-English, English-Spanish translation. Prerequisite: Spanish 311 or equivalent. *Staff*

421a, 422b. Independent Work: Special Topics (0-0-3 each semester).
Hispanic literature, Hispanic linguistics, and Hispanic culture and civilization. Reserved for qualified juniors and seniors who are particularly interested in a topic not covered in other courses. Prerequisite: permission of the department. *Staff*

423a. Linguistic Structure of Spanish (3-0-3).
A synchronic study of modern Spanish phonology, morphology, and syntax. Special attention given to Hispanic-American variants. Also offered as Linguistics 423.
Mr. Urrutibeheity

435a. Practicum in Consecutive Interpretation (3-0-3).
Intensive practice in Spanish-English interpretation for native speakers of English. The emphasis for native speakers of Spanish is on English to Spanish interpretation.
Ms. Daichman

436b. Practicum in Simultaneous Interpretation (3-0-3).
Intensive practice in Spanish-English interpretation for native speakers of English. The emphasis for native speakers of Spanish is on English to Spanish interpretation.
Ms. Daichman

501a, 502b. Research and Thesis. (0-0-3 each semester). *Staff*

507a. Teaching College Spanish (1-0-1).
Teaching methods and techniques, test preparation, and evaluation. One hour per week of discussion. Students observe language class one week, teach three weeks. Required for graduate students. *Mr. Urrutibeheity*

511a, 512b. Methods of Research in Hispanic Literature (3-0-3).
Theoretical and practical course for beginning graduate students. Emphasis on techniques of stylistic and linguistic analysis and on the bibliographical resources in the field. *Staff*

516b. Studies in Hispanic Linguistics (3-0-3).
Topics of 1981-82: history of the Spanish language. Old Spanish, applied Spanish linguistics, and Spanish-American dialectology. May be repeated for credit when topics vary. *Mr. Urrutibeheity*

518b. Studies in Medieval Spanish Literature (3-0-3 each semester).
Topic for spring 1982: epic poetry. Topic for spring 1983: narrative. *Ms. Leal*

523a, 524b. Studies in Spanish Golden Age Theater (3-0-3 each semester).
The cycles of Lope de Vega and Calderon de la Barca. Given alternate years. Offered 1982-83. *Mr. Castañeda*

525a, 526b. Studies in Spanish Golden Age Prose and Lyric Poetry (3-0-3 each semester).
Given alternate years. Offered 1981-82. *Mr. Castañeda*

535a/536b. Studies in the Spanish Literature of the Nineteenth Century (3-0-3 each semester).
Not offered every year. *Staff*

541a/542b. Studies in the Spanish Literature of the Twentieth Century (3-0-3 each semester).
Offered 1982-83. *Mr. Kauffmann*

555a. Studies in Spanish-American Literature from the Colonial Period to the Present Day (3-0-3).
Topic for 1981-82: contemporary narrative. Topic for 1982-83: contemporary poetry. *Ms. Valdivieso*

556b. Studies in Spanish-American Literature from the Colonial Period to the Present Day (3-0-3).
Topic for 1981-82: contemporary theatre. Topic for 1982-83: contemporary Mexican literature. *Ms. Boorman*

566b. Studies in the Culture and Civilization of Spain and Latin America (3-0-3).
Not offered every year.

575a/576b. Romance Linguistics (3-0-3 each semester).
Not offered every year.

591a, 592b. Independent Study: Special Topics in Hispanic Literature, Hispanic Linguistics, and Hispanic Culture and Civilization (3-0-3 each semester).

700c. Summer Graduate Research (0-0-3).

800b. Degree Candidate Only.

Portuguese

Portuguese Courses

101a, 102b. First-Year Portuguese (3-1-4 each semester).
Introduction to the study of the Portuguese language with emphasis on development of audiolingual skills. Language laboratory work required. *Ms. Boorman, Ms. Leal*

201a, 202b. Second-Year Portuguese (3-0-3 each semester).

311a, 312b. Advanced Portuguese (3-0-3 each semester).

400b. Independent Study: Special Topics in Luso-Brazilian Literature and Linguistics (0-0-3).
Reserved for qualified students particularly on a topic not covered in other courses. Prerequisite: permission of the department. *Ms. Leal*

Classics

Requirements for the Undergraduate Major in Classics. A student majoring in classics must take thirty semester hours (ten courses) in classics, Greek, and Latin, of which twenty-four semester hours (eight courses) must be at the 300 level or above. A double major requires thirty semester hours (ten courses), with at least eighteen hours (six courses) at the 300 level or above. All prospective programs for individuals majoring in classics are to be drawn up in consultation with members of the classics staff.

Classics Courses

211a. Classical Civilization: Greece (3-0-3).
Introductory survey of the various aspects of ancient Greek culture, including political and social history, art . and architecture, religion, philosophy, and literature. *Ms. Wallace*

212b. Classical Civilization: Rome (3-0-3).
Introductory survey of the various aspects of Roman civilization, including the rise of Christianity, political and social history, art and architecture, religion, philosophy, and literature. *Ms. Wallace*

214b. Greek and Latin Elements in English (3-0-3).
The relationship of English to the classical languages; a systematic guide to understanding vocabulary and an example of historical and cultural development. Does not count toward a major in classics. *Ms. Eaker*

335a, 336b. Classical Mythology (3-0-3 each semester).
Survey of Greek myths and their extension to Rome and modern European literature. All works are read in English translation. *Mr. Levin*

491a, 492b. Special Topics in Classics (3-0-3).
Independent work for qualified juniors and seniors. May be repeated for credit. *Staff*

Greek Courses

101a, 102b. First-Year Greek (3-0-3 each semester).
Designed to develop as rapidly as possible an ability to read simple Greek prose. Study of grammar, forms, and vocabulary combined with practice in reading. *Ms. Eaker*

201a, 202b. Intermediate Greek (3-0-3 each semester).
Rapid review of forms and syntax followed by readings in Greek prose (New Testament, Herodotus) and poetry (Homer). *Mr. Levin*

491a, 492b. Special Topics in Greek Literature (0-0-3 each semester).
Independent work for qualified juniors and seniors in genres or authors not presented in other courses. May be repeated for credit.

Latin Courses

101a. First-Year Latin (3-0-3).
Fundamentals of Latin grammar with emphasis on acquisition of reading skill.
Ms. Eaker

102b. Intermediate Latin (3-0-3).
Selections from the prose and poetry of the classical period, with emphasis on literary criticism of the passages. *Ms. Wallace*

201a. Medieval Latin (3-0-3).
Rapid review of forms and syntax followed by readings in medieval Latin prose and poetry. Prerequisite: Latin 101, 102, or equivalent. *Staff*

301a. Plautus and Terence (3-0-3).
Study of selected comedies. Consideration given to the position of both authors in ancient comic tradition. Prerequisite: Latin 201 or three or four years of high school Latin.
Ms. Wallace

302b. Catullus and Horace (3-0-3).
Selected lyric poems of both authors. Prerequisite: same as for Latin 301. *Mr. Levin*

411a. Roman Elegy (3-0-3).
Readings in the elegies of Tibullus and Propertius, with some attention to elegiac writings of Catullus and Ovid. Late Republican and Imperial historical background is considered. Offered in alternate years. Offered 1981-82. *Mr. Levin*

412b. Roman Novel (3-0-3).
Study of *Satyricon* of Petronius and *Metamorphoses* of Apuleius, with consideration of Greco-Roman narrative fiction. *Ms. Wallace*

421a. Virgil (3-0-3).
Study of the poet's works *(Bucolics, Georgics, Aeneid),* with special emphasis on the *Aeneid.* Offered alternate years. Offered 1982-83. *Mr. Levin*

422b. Ovid (3-0-3).
Study of selections of the major works, both epic and elegiac, with special emphasis on the *Metamorphoses.* Offered in alternate years. Offered 1982-83. *Mr. Levin*

491a, 492b. Special Topics in Roman Literature (0-0-3 each semester).
Independent work for qualified juniors and seniors in genres or authors not presented in other upper level courses. May be repeated for credit. *Staff*

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Rice

Director of Admissions
Rice University
Houston, Texas 77001