

NICE

The University General Announcements

1979-1980 1980-1981



Academic Calendar 1979-80

First Semester

<i>Monday, August 13</i>	Last day of payment of fees for continuing students
<i>Monday, August 20- Saturday, August 25</i>	Arrival and orientation week for new students and new transfers
<i>Saturday & Sunday, August 25 & 26</i>	Arrival of continuing students
<i>Monday, August 27</i>	First day of classes
<i>Monday, September 3</i>	Labor Day holiday
<i>Friday, September 7</i>	Final registration for undergraduates and candidates for B.Arch. and B.F.A. degrees, fall semester, 5 P.M.
<i>Friday, September 21</i>	Deadline for adding courses to schedule and designating Pass/Fail, 5 P.M.
<i>Friday, September 28</i>	Deadline for removal of Incompletes, 5 P.M.
<i>Monday, October 1- Tuesday, October 2</i>	Midterm recess
<i>Wednesday, October 3</i>	All classes normally held on Monday meet; all Wednesday classes are canceled to equalize holidays by days of the week during the semester
<i>Wednesday, October 10</i>	Last day to file college course plans with the dean of undergraduate affairs
<i>Wednesday, October 31</i>	Deadline for doctoral candidacy petitions, Office of the Dean of Advanced Studies and Research, 5 P.M.
<i>Friday, November 2</i>	Deadline for dropping courses or converting Pass/Fail to number grade, 5 P.M.
<i>Thursday, November 22- Sunday, November 25</i>	Thanksgiving recess
<i>Friday, December 7</i>	Last day of classes
<i>Wednesday, December 12</i>	First day of final examinations
<i>Wednesday, December 19</i>	Last day of final examinations
<i>Thursday, December 27</i>	All grades due, Office of the Registrar, 12 noon

Second Semester

<i>Monday, January 7</i>	First day of classes
<i>Friday, January 18</i>	Final registration for undergraduates and candidates for B.Arch. and B.F.A. degrees, spring semester, 5 P.M.
<i>Friday, February 1</i>	Deadline for adding courses to schedule and designating Pass/Fail, 5 P.M.
<i>Friday, February 8</i>	Deadline for removal of Incompletes, 5 P.M.
<i>Tuesday, February 12</i>	Majors Day for first- and second-year students
<i>Friday, February 22</i>	Last day to file college course plans with the dean of undergraduate affairs
<i>Monday, February 25- Sunday, March 2</i>	Midterm recess
<i>Thursday, February 28</i>	Deadline for master's degree petitions, Office of the Dean of Advanced Studies and Research, 5 P.M.
<i>Saturday, March 15</i>	Parents Day
<i>Friday, March 21</i>	Deadline for dropping courses and for converting Pass/Fail to number grade, 5 P.M.
<i>Thursday, April 3- Sunday, April 6</i>	Spring recess
<i>Friday, April 25</i>	Last day of classes
<i>Saturday, April 26- Thursday, May 1</i>	Final examinations for graduating seniors and fifth-year degree candidates
<i>Wednesday, April 30</i>	First day of finals for remaining students
<i>Friday, May 2</i>	Deadline for submission of theses for spring graduation, Office of the Dean of Advanced Studies and Research, 12 noon
<i>Monday, May 5</i>	Grades of all degree candidates due in Office of the Registrar, 9 A.M.
<i>Wednesday, May 7</i>	Last day of final examinations
<i>Saturday, May 10</i>	Sixty-seventh commencement
<i>Tuesday, May 13</i>	Deadline for filing undergraduate degree plans
<i>Wednesday, May 14</i>	Remaining grades due, Office of the Registrar, 5 P.M.

Summer 1980

<i>May-June-July</i>	Rice Summer Program for college students
<i>June-July</i>	Teaching Apprentice Session

Rice University
General Announcements
Houston, Texas

1979-1981

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
Career Placement, Part-time Employment off Campus	Placement Office 301 Lovett Hall; (713) 527-4055
Continuing Education	Office of Continuing Studies 315 Lovett Hall; (713) 527-4803
Credits, Transcripts	Office of the Registrar 103 Lovett Hall; (713) 527-4999
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

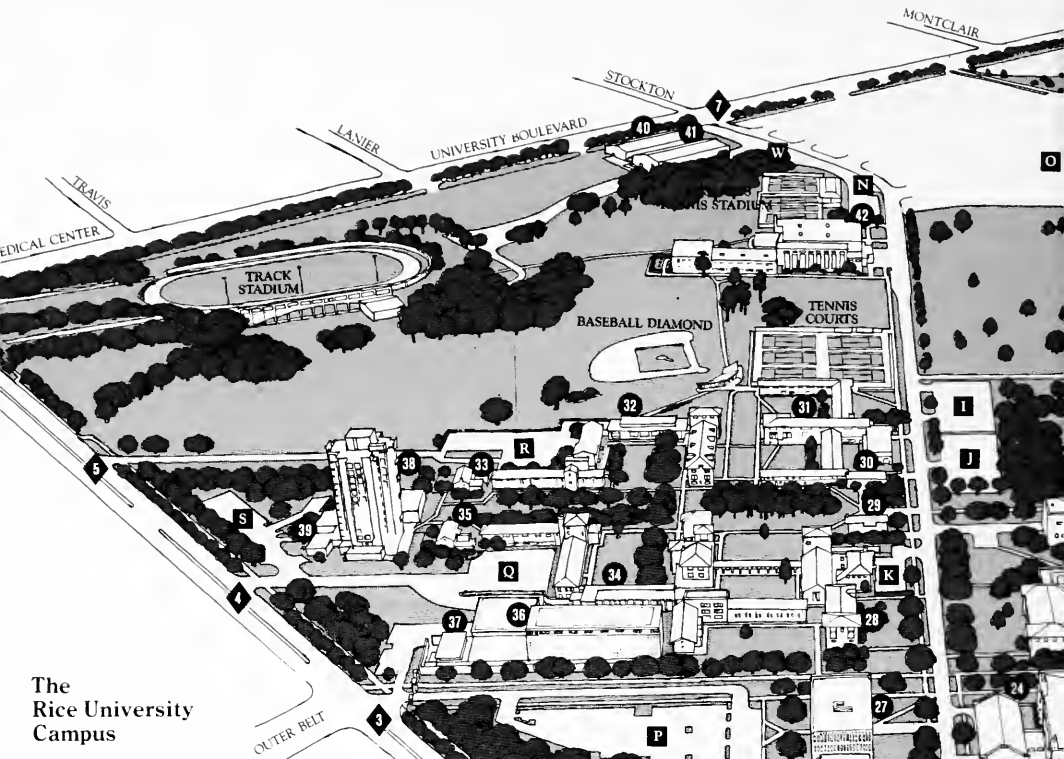
Dedicated to “the advancement of letters, science, and art,” Rice University is private, independent, nonsectarian, and coeducational. It includes among its academic divisions both undergraduate and graduate studies in humanities, social sciences, natural sciences, engineering, architecture, administrative 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 fifth largest city, and the unique experience of residential colleges.

About 60 percent of Rice’s 2,700 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 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.

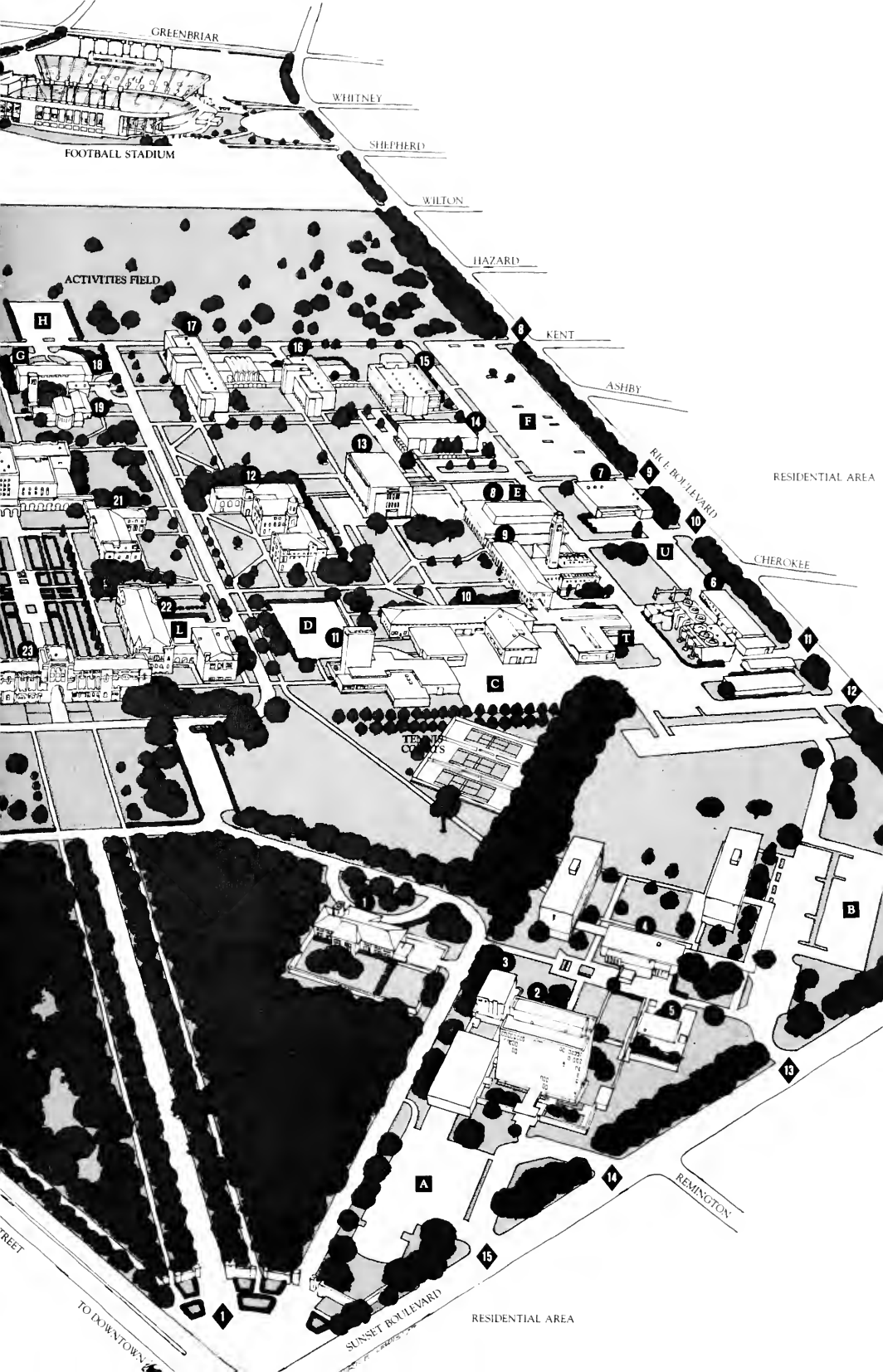
Rice’s approximately 900 graduate students work closely with faculty members who are eminent in their fields and conduct innovative research to extend the horizons of current knowledge. Graduate students live off campus. The Graduate Student Association organizes and funds regular social activities and 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 one-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. Margaret 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 (*Central 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 College
39. Richardson House
40. Rice Museum
41. Rice Media Center (*Photography*)
42. Gymnasium and Autry Court (*Health & PE/Athletics*)
43. Owl Club Room.



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SHEPHERD

WILTON

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* * *

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Instructional and Research Staff

Emeritus Faculty

- Bale, Allen M.**, 1947-78. Athletic Director Emeritus
B.S. (1939) Rice Institute; M.A. (1939) Columbia University
- Battista, Joseph Lloyd**, 1929-71. Professor Emeritus of Romance
Certificat d'études française, Diplôme d'études supérieures (1919) University of Bordeaux, France; B.A. (1920) University of Michigan; M.A. (1923) Washington University; Ph.D. (1929) Harvard University
- Bourgeois, Andre Marie Georges**, 1928-72. Favrot Professor of French, Emeritus
Bachelier ès lettres (1921), Bachelier en Droit (1923), Certifié d'études supérieures de lettres (1930) University of Paris, France; M.A. (1934) University of Texas; Docteur de l'université (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
- Freund, (Friedrich Ernst) Max**, 1925-47. Professor Emeritus of Germanics
Ph.D. (1902) University of Leipzig, Germany
- 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
- Harsook, 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
- Lecuyer, Maurice Antoine**, 1962-79. Professor of French
Baccalauréat ès lettres (1937), Licence ès lettres (1943), Diplômé d'études supérieures (1944) Université de Paris, France; Ph.D. (1954) Yale University

- McDonald, A.P.**, 1953-73. Professor Emeritus of Engineering Graphics
B.S. (1943) Texas A&M 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, Registrar, 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; MS. (1921), Ph.D. (1923) University of Wisconsin
- Richter, George H.**, 1931-74. Professor Emeritus of Chemistry
B.A. (1926), M.A. (1927), Ph.D. (1929) Rice Institute
- 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
- Simons, Verne Franklin**, 1929-69. Professor Emeritus of Accounting
A.B. (1923), A.M. (1925) University of Kansas
- 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
- Williams, George Guion**, 1924-68. Professor Emeritus of English
B.A. (1923), M.A. (1925) Rice Institute
- Welsh, Hugh Clayton**, 1929-64. Lecturer Emeritus in Biology and Medical Adviser
M.D. (1923) University of Texas

Instructional and Research Staff

- Adams, John Allan Stewart**, 1954. Professor of Geology
Ph.B. (1946), B.S. (1948), M.S. (1949), Ph. D. (1951) University of Chicago
- Adams, Thomas M.**, 1978. Captain, U.S. Army, and Assistant Professor of Military Science
B.S. (1970) Brigham Young University
- 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 External Affairs
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), Diplôme d'études supérieures (1963), Doctorat de 3^e 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
- Alphin, Arthur**, 1979. Captain, U.S. Army, and Adjunct Instructor of History
B.A. (1970) West Point Military Academy
- 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'études politiques (1955) University of Bordeaux, France; Ph.D. (1966) University of California at Berkeley
- 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. Assistant 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
- Ansevin, Krystyna D.**, 1965. Associate Professor of Biology
B.S., M.S. (1950) Jagellonian University, Poland; Ph.D. (1961) University of Pittsburgh
- Apple, Max I.**, 1971. Associate 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 ès lettres (1967) Université de Montpellier, France; Ph.D. (1975) University of Washington
- Armeniadès, 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
- 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. (1941) Rice Institute; M.S., Ph.D. (1946) University of Illinois
- Ave Lallemand, Hans Gerhard**, 1970. Associate Professor of Geology and Associate of Will Rice College
B.Sc. (1960), M.Sc. (1964), Ph.D. (1967) Leiden University, The 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

- 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
- Baker, Stewart A.**, 1964. Associate Professor of English and Associate of Wiess College
B.A. (1960) Columbia University; M.A. (1961), Ph.D. (1964) Yale University
- 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
- Bartlett, John**, 1974. Adjunct Associate Professor of Health Facilities Planning
L.L.B. (1961), M.A. (1963), Ph.D. (1970) University of Iowa
- 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. Assistant Professor in the Department 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
- Beatrous, Frank H., Jr.**, 1978. G. C. Evans Instructor of Mathematics
B.S. (1972), M.S. (1975), Ph.D. (1978) Tulane University
- 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. Assistant Professor of Environmental Science
B.S. (1969), M.S. (1972), Ph.D. (1975) University of Florida
- Bell, Philip W.**, 1978. William Alexander Kirkland Professor of Administrative Science
B.A. (1947) Princeton University; M.A. (1949) University of California at Berkeley; Ph.D. (1954) Princeton University
- Bell, Robert L., Jr.**, 1973. Adjunct Professor of Psychology
B.A. (1953) Texas Southern University; M.A. (1955), Ph.D. (1961) University of Texas
- Benjamin, Don C., Jr.**, 1978. Lecturer in Religious Studies
B.A. (1964) St. Bonaventure University; M.A. (1968) Catholic University of America
- 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

- Besen, Stanley M.**, 1965. Allyn R. and Gladys M. Cline Professor of Economics and Finance
B.B.A. (1958) City College of New York; M.A. (1960), Ph.D. (1964) Yale University
- Bible, Frances L.**, 1975. Associate Professor of Music
Artists Diploma in Singing (1942), Graduate Diploma in Voice (1947) Juilliard School of Music
- Billups, W. Edward**, 1970. Associate Professor of Chemistry and Associate of Will Rice College
B.S. (1961), M.S. (1965) Marshall University; Ph.D. (1970) Pennsylvania State University
- Blackburn, James B.**, 1975. Lecturer in Architecture
B.A. (1969), J.D. (1972) University of Texas; M.S. (1974) Rice University
- Blanchard, Robert K.**, 1978. Lieutenant, U.S. Navy, and Assistant Professor of Naval Science
B.S. (1972) U.S. Naval Academy
- 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
- Blattner, Meera M.**, 1974. Assistant Professor of Mathematical Sciences
B.A. (1952) University of Chicago; M.S. (1966) University of Southern California; Ph.D. (1973) University of California at Los Angeles
- Bochner, Salomon**, 1968. Edgar Odell Lovett Professor of Mathematics
Ph.D. (1921) University of Berlin, Germany
- 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. (1973) 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) University of California at Berkeley
- 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
- Bordelon, Cassius B., Jr.**, 1972. Lecturer in Health and Physical Education
B.S. (1964) Louisiana State University; Ph.D. (1972) Baylor College of Medicine
- 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
- 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. Visiting 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 Registrar
B.A. (1960), M.A. (1961) Texas Christian University; Ph.D. (1965) University of Texas
- Brody, Baruch**, 1975. Professor of Philosophy and Administrative Science
B.A. (1962) Brooklyn College; M.A. (1965), Ph.D. (1967) Princeton University
- 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. Visiting Lecturer in Photography 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
- Bryant, Robert L.**, 1979. Assistant Professor of Mathematics
B.S. (1974) North Carolina State University; Ph.D. (1979) University of North Carolina
- Burnett, Sarah A.**, 1972. Assistant 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 and Honorary Associate of Will Rice College
B.A., B.S.E.E. (1958) Rice Institute; M.S. (1960) Rice University; Ph.D. (1965) Stanford University
- Bush, George H. W.**, 1977. Adjunct Professor of Administrative Science
B.A. (1948) Yale University
- 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
- Callahan, Mercedes Valdivieso**, 1973. Associate Professor of Spanish and Associate of Richardson College
Bachillerato (1946) University of Chile; M.A. (1969) University of Houston
- Camfield, William A.**, 1969. Professor of Art History and Associate of Jones College
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
- Carrington, Samuel M., Jr.**, 1967. Professor of French, Acting University Librarian, Proctor, and University Associate of Will Rice College
A.B. (1960), M.A. (1962), Ph.D. (1965) University of North Carolina
- Casbarian, John Joseph**, 1973. 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. Associate Professor of Geology
A.B. (1960) San Diego State University; Ph.D. (1966) University of Southern California
- Castañeda, James A.**, 1961. Professor of Spanish, Honorary Master of Will Rice College, and Associate of Wiess College
B.A. (1954) Drew University; M.A. (1955), Ph.D. (1958) Yale University
- Caudill, William W.**, 1974. Adjunct Professor of Architecture
B. Arch. (1937) Oklahoma State University; M. Arch. (1939) Massachusetts Institute of Technology
- Cavanaugh, Kevin**, 1979. Lecturer in Architecture
B.A. (1973) Yale University; M. Arch. (1976) Massachusetts Institute of Technology
- Cech, Irina**, 1974. Adjunct Assistant Professor of Architecture
Masters, Engineering (1961) University of Moscow, U.S.S.R.; Ph.D. (1973) University of Texas School of Public Health
- 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
- 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
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. Assistant 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 Associate of Lovett 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
- Clarke, Robert W.**, 1975. Associate Professor of Accounting
B.S. (1957), M.B.A. (1962) Syracuse University; Ph.D. (1967) University of Illinois
- 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
- Coffman, Ronald L.**, 1978. Colonel, U.S. Army, and Professor of Military Science
B.S. (1956), M.A. (1966) Eastern Kentucky 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
B.S. (1975) George Mason University; M.A. (1977) Johns Hopkins University
- Cooper, Joseph**, 1967. Lena Gohlman Fox Professor of Political Science and Dean of the School of Social Sciences
B.A. (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 Associate of Richardson College
B.A. (1961) University of Colorado; Ph.D. (1965) Cornell University
- Cox, David B.**, 1978. Commander, U.S. Navy, Associate Professor of Naval Science, and University Associate of Jones College
B.S. (1958) U.S. Naval Academy; M.S. (1974) Miami University
- Cox, Donald P.**, 1978-80. Visiting Professor of Space Physics and Astronomy and University Associate of Hanszen College
B.S. (1964) Stanford University; M.S. (1967), Ph.D. (1969) University of California at San Diego
- 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
- 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, 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

- Cushman, Richard D.**, 1974. Assistant Professor of Anthropology and Resident Associate of Hanszen College
B.A. (1965), M.A. (1969), Ph.D. (1970) Cornell University
- 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
- Dadok, Jiri**, 1977. G. C. Evans Instructor of Mathematics
B.S. (1972) Carnegie-Mellon University; Ph.D. (1977) Massachusetts Institute of Technology
- 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
- 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. Associate 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. Professor in the Department of Chemical Engineering
B.A. (1953), B.S. (1954) Rice Institute; Ph.D. (1960) Princeton University
- 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, Professor of Mathematical Sciences, and Associate of Hanszen College
S.B. (1950), S.M. (1952) Massachusetts Institute of Technology; Ph.D. (1959) Harvard University
- de Montricher, Gilbert M.**, 1978. Instructor of Mathematical Sciences
Ingénieur diplômé (1957) Ecole Polytechnique, France; D.E.A. (1968) Faculté des Sciences de Paris, France; Ph.D. (1972) Rice University
- Dennis, John E.**, 1979. Professor of Mathematical Sciences
B.S. (1962), M.S. (1964) University of Florida at Miami; Ph.D. (1966) University of Utah
- 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
- 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
- Douglass, H. Robert**, 1973. Adjunct Associate Professor of Architecture
B.Arch. (1963) University of Nebraska; M.Arch. (1966) University of Minnesota
- 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. Assistant 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
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- Palmer, Graham A.**, 1974. Professor of Biochemistry and Associate of Richardson College
B.S. (1957), Ph.D. (1962) University of Sheffield, England
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- Parsons, David G.**, 1953. Professor of Art and Associate of Will Rice College
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Engineering
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B.Sc. (1952), Ph.D. (1956) University of London, England
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Certificat (1952) Paris
- 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, Neil R.**, 1972. Assistant Professor of Economics
B.S. (1968) California Institute of Technology; Ph.D. (1977) Massachusetts Institute of Technology
- 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
- Zañartu, Enrique**, 1979. Visiting Assistant Professor of Art
- Zeff, Stephen A.**, 1978. Professor of Accounting
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
B.A., M.M.S. (1973) Rice University

Professional Research Staff

- Badachhape, R. B.**, 1970. Assistant Director of the Fluorine Laboratory in Chemistry
B.S. (1953) M. J. College, India; M.S. (1955), Ph.D. (1963) University of Poona, India
- Bertino, Dorothy J.**, 1978. Research Scientist in Environmental Science and Engineering
B.A. (1967) University of Minnesota; M.Ed. (1972) University of Florida
- Bourland, H. M.**, 1961. Associate Director of Rice Engineering and 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
- 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
- Fielder, Faith M.**, 1979. Research Scientist in Environmental Science and Engineering
B.S. (1970), Ph.D. (1977) University of Texas
- Fryer, G. E.**, 1963. Research Instrumentation Scientist in Geology
B.S. (1952) University of Manitoba, Canada
- Harel, Moshe**, 1975. Research Scientist in Space Physics and Astronomy
B.S. (1969) Hebrew University of Jerusalem, Israel; M.S. (1971) University of California at Los Angeles

- 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
- Hughes, Jack B.**, 1971. Electron Microscopist in Biology
- 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
- Majoros, Stephen J.**, 1979. Project Scientist in Chemical Engineering
B.S. (1971), M.S. (1973) Cleveland State University; Ph.D. (1978) Kent State University
- Marriott, Terry D.**, 1978. Scientist and Department Instrument Manager in Chemistry
B.S. (1969), Ph.D. (1976) Oklahoma State University
- McGarity, J. O.**, 1966. Electrical Engineer in Space Physics and Astronomy
B.S. (1976) University of Houston
- Nathan, Vincent**, 1979. Research Assistant in Environmental Science and Engineering
B.S. (1972) Tennessee State University; M.S. (1979) Texas Southern University
- Nystrom, David S.**, 1967. Staff Scientist in Space Physics and Astronomy
B.A. (1962) Baylor University
- Oehme, Delbert R.**, 1964. Electronics Scientist 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
- Smith, Wayne A.**, 1966. Electronics Scientist and Contracts Administrative Manager in Space Physics and Astronomy
B.S. (1958) University of Southern California
- Stewart, Michael F.**, 1973. Electrical Scientist 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
- Waggett, Warren**, 1978. Project Director in Environmental Science and Engineering
B.S. (1950) U.S. Coast Guard Academy; M.S. (1979) University of Houston
- White, R. H.**, 1976. Spectroscopist and Lecturer in Biochemistry
B.S. (1968) Indiana University; Ph.D. (1974) University of Illinois
- 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, Bibliographic Processing
B.A. (1973) Rice University; M.L.S. (1974) University of Texas; M.A. (1977) Rice University
- Baber, Elizabeth Ann**, 1965. Catalog Librarian
B.A. (1960) Rice University; M.L.S. (1961) University of California at Berkeley

- Borlase, Rodney R.**, 1972. Collection Development Coordinator
B.A. (1968) University of Kansas; M.L.S. (1969) Kansas State Teachers College
- 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. Acting Codirector, R.I.C.E.
B.A. (1973) State University of New York, College at Oneonta; M.L.S. (1965) University of Texas
- Carrington, Samuel M., Jr.**, 1967. Professor of French, Proctor, Acting University Librarian, and Associate of Will Rice College
A.B. (1960), M.A. (1962), Ph.D. (1965) University of North Carolina
- Cho, Keiko**, 1968. Music Catalog Librarian
B.A. (1964) University of Manitoba; B.L.S. (1965) University of Toronto; A.R.C.T.—Piano (1966) Royal Conservatory of Toronto
- Damico, James**, 1977. Associate University Librarian for Public Services
B.S. (1959) C. W. Post College, Long Island University; M.L.S. (1961) Rutgers University
- Gibson, Charles M.**, 1974. Head, Circulation Services
B.A. (1968) Texas Technological College; M.A. (1973) Texas Tech University; M.L.S. (1974) University of Texas
- Holibaugh, Ralph W.**, 1975. Head, Music Library, and Lecturer in Music
B.A. (1964) University of Cincinnati; M.A. (1970) Kent State University; M.S.L.S. (1975) University of Illinois
- Hyman, Ferne B.**, 1968. Social Sciences Reference/Collection Development Librarian 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, 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
- Law, Daniel T.**, 1975. Acting Codirector, R.I.C.E.
B.A. (1966) University of California at Los Angeles; M.Sc. (1968) Oregon State University; M.A.L.S. (1972) Rosary College Graduate School of Library Science; Ph.D. (1975) Oregon State University
- Marsales, Rita**, 1963. Catalog Maintenance Librarian
B.A. (1957) Louisiana State University; M.L.S. (1973) University of Texas
- 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 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
- Redmon, Alice Jane**, 1962. Head, Special Processing
B.A. (1937) University of Denver
- Silversteen, Sophy**, 1965. Head Serials Librarian
B.A. (1952) Rice Institute; M.S.S.W. (1954), M.L.S. (1965) University of Texas

Professional Staff of the Institute for Computer Services and Applications

- Beale, Alan R.**, 1976. Systems Programmer
M.A. (1971) Harvard University
- Berry, Betty Mae**, 1979. Programmer/Analyst
- Fields, Corinne V.**, 1968. Manager of Programing and Data Control
B.B.A. (1950) Southern Methodist University
- Gerbode, Farrell E.**, 1974. Manager, Systems Support
B.A. (1973), M.A.M.S. (1977) Rice University
- Huston, Priscilla Jane**, 1969. Director
B.A. (1964) Mount Holyoke College
- Lane, Joni Sue**, 1968. Systems Programmer
B.S. (1960) University of Oklahoma
- Nichols, Clyde C.**, 1969. Manager, Computer Operations
B.S.E. (1965) University of Nebraska
- Schafer, Richard**, 1974. Systems Programmer
B.A. (1973), M.A.M.S. (1974) Rice University
- Wakefield, James F.**, 1978. Programmer/Analyst
- Williamson, Mark**, 1971. Systems Programmer
- Woodruff, Clifford E.**, 1978. Assistant to the Director
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
- Chappell, James Anderson, M.D.**, 1979. Director, Health Services
A.B. (1953) Vanderbilt University; M.D. (1957) Wakeforest College of Medicine
- Fullen, Dollie, L.V.N.**, 1959. Head Nurse

Staff of the Athletic Department

- Alborn, Raymond**, 1972. Head Football Coach
B.S. (1962) Rice University
- Backest, Richard**, 1978. Assistant Football Coach
B.S. (1968) Texas A&M University
- 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
- Dean, Michael**, 1976. Assistant Football Coach and Defensive Coordinator
B.S. (1970), M.E.D. (1977) University of Alabama
- 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
- Estes, George**, 1977. Assistant Basketball Coach
B.A. (1971) University of North Carolina; M.A.T. (1973) The Citadel
- Mainord, Carlos**, 1978. Assistant Football Coach
B.S. (1966) McMurry College; M.E.D. (1969) Texas Tech University
- 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
- Norwood, Gordon W.**, 1976. Assistant Football Coach
B.S.E. (1970) University of Arkansas
- Osburn, Douglas E.**, 1972. Baseball Coach and Club Sports Coordinator
B.S. (1955) University of Houston
- Plumbly, John**, 1970. Golf Coach and Executive Secretary of the Owl Club
B.S. (1948) Rice Institute; M.E.D. (1951) University of Texas
- Rossley, Thomas**, 1978. Assistant Football Coach
B.S. (1969) University of Cincinnati
- Schuler, Michael H.**, 1977. Head Basketball Coach
B.S. (1962) University of Ohio
- Sexton, Anthony**, 1976. Assistant Football Coach and Recruiting Coordinator
B.S. (1971) University of Cincinnati
- Straub, Stephen M.**, 1974. Assistant Track and Field Coach
B.A. (1972) Rice University
- Tucker, Linda**, 1978. Women's Basketball/Volleyball Coach
B.S. (1969) Wayland College
- Unbehagen, Theodore G.**, 1975. Assistant Head Football Coach and Offensive Coordinator
B.B.A. (1969) Texas A&I University
- 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 1979-80

The president is an *ex officio* member of all committees.

Committee on Admissions: Prof. Bowen, *chairman*; Profs. Castañeda, Clark, Cuthbertson, Curtis, Dunning, Evans, Grob, Jump, McIntire, Marcus, Modrak, Sass, E. M. Thompson; Prof. K. T. Brown, Mr. Stabell, *ex officio*; Prof. Stebbings (college master); Ms. Beverly W. Baker, Ms. Shirley S. Ossenfart (alumnae); Ms. Meredith Gibbs, Ms. Jean Marie Amend (undergraduates).

Committee on Affirmative Action: Prof. E. J. Lee, *chairman*; Profs. Burnett, Cooper, Long; Ms. Laura Branch, Ms. Virginia Gonzales, Ms. Marian Jordan, Ms. Kathleen Murfin, Mr. John Pesl, Mr. Harold McLeod, Mr. Anthony Sexton; Mr. Mitchell Sadler, *ex officio*; Mr. Clinton F. Morse (alumnus); Mr. Michael Petry, Ms. Suzanne Tolbert (undergraduates).

Committee on Campus Safety: Prof. Sims, *chairman*; Profs. Kilpatrick, Parry, Phillips, A. M. Santos; Mr. R. J. Berger, *ex officio*; Mr. H. R. Rhodes, Mr. R. H. Perrine (consultants); Mr. William Cober (undergraduate).

Committee of the College Masters: Prof. Brotzen, *chairman* (fall semester); Prof. Stebbings, *chairman* (spring semester); Profs. Armeniades, J. W. Freeman, Huston, Kurtzman, W. C. Martin, Winningham; Prof. K. T. Brown, Mr. Marion Hicks, *ex officio*.

Committee on Computers: Prof. Dyson, *chairman*; Profs. Carrington, de Bremaecker, Gow, Hirschberg, Jump, Mandel, Quiocho, K. J. White, Wolf; Mr. C. M. Gibson, Ms. Priscilla Huston, Prof. Vandiver, *ex officio*; Mr. James E. Gerhardt (alumnus); Mr. Andrew Sleeper, Mr. Ron Cytron (undergraduates).

Education Council: Prof. Wood, *chairman*; Profs. Ambler, J. D. Austin, D. R. Baker, Bearden, Burnett, Class, Davidson, Glass, Iammarino, B. F. Jones, R. G. Jones, Levin, Meixner, Nelson, Norbeck, Pfeiffer, Urrutibéheity, Wiener, Winkler; Prof. Topazio, *ex officio*.

Committee on Examinations and Standing: Prof. Lewis, *chairman*; Profs. Citron, Estle, Holt, Parish, Spence, Stokes, W. F. Walker; Profs. Brelsford, K. T. Brown, *ex officio*; Ms. Patricia Gonzales, Mr. John Riordan (undergraduates).

Faculty Council: Profs. Bowen, Brotzen, Burrus (on leave 1979-80), Bedient, Duck, Greanias, Howell, D. H. Johnson, B. F. Jones, Leland (on leave fall 1979), Patten, Pfeiffer, Rathjen, Rorschach, Spears, von der Mehden.

Committee on Fringe Benefits: Prof. Rimlinger, *chairman*; Profs. Bourland, Brody, Dowden, Matthews; Ms. Jackie Ehlers, Mr. Glenn Fryer, Mr. Karl Virtue, Mr. Joseph Nagy; Mr. Mitchell Sadler, Ms. Teresa J. Legrue (consultants).

Graduate Council: Prof. Margrave, *chairman*; Profs. F. M. Fisher, Giannoni, Hellums, Huddle, McLellan, Palmer, Polking, Rowe; Tipton, Tuggle, Walters, C. H. Ward, Weissenberger; Prof. Vandiver, *ex officio*; Mr. James R. Doty (alumnus).

Committee on the Library: Prof. Isle, *chairman*; Profs. Bayazitoglu, Boorman, Class, Cuthbertson, Kulstad, J. R. Thompson, J. B. Walker, W. L. Wilson, Zeff; Profs. Carrington, Vandiver, *ex officio*; Mr. Walter S. Baker (alumnus); Mr. David Cooper (undergraduate).

- Committee on Public Lectures:** Prof. Camfield, *chairman*; Profs. Brotzen, P. Cooper, Hyman, Kolenda, Palmer, D. P. Cox; Mr. David Rodwell, *ex officio*; Ms. Mary Anne Collins (alumna); Ms. Amy Grossman (undergraduate).
- Committee on Religious Activities:** Prof. Nielsen, *chairman*; Profs. Garside, Melton, Reiff, Shaper, R. J. Smith, Wright; Rev. John T. King (alumnus); Ms. Camille Jones (undergraduate).
- Research Council:** Prof. Dowden, *chairman*; Profs. P. Brady, Brelsford, Hyman, Olson, Smalley, Thrall, Tittel, Walters, Windsor; Profs. Chapman, J. Cooper, W. E. Gordon, Holloway, Margrave, Mitchell, Sterling, Topazio, *ex officio*; Dr. Fred G. Dorrance, Dr. Margaret P. Sullivan (alumni).
- Residential Colleges Management Advisory Committee:** Mr. Marion Hicks, *chairman*; Prof. Armeniades (college master, fall semester); Prof. J. W. Freeman (college master, spring semester); Prof. S. D. Baker (faculty representative); Mr. Joe White (comptroller's office representative); Mr. Timothy Case (undergraduate).
- Rice University Athletics Committee:** Prof. Castañeda, *chairman*; Profs. Chapman, Howell, Matthews, Stebbings; Profs. Akers, Vandiver, Mr. Joseph Nalle (treasurer), *ex officio*; Mr. William H. Lane, Ralph S. O'Connor (trustees); Mr. Theodore N. Law (board of governors); Mr. Temple Tucker (alumnus); Mr. Huey Kinney (R Association).
- Rice University Marshals:** Prof. Widrig, *chief marshal*; Profs. J. W. Clark, H. C. Clark, Disch, Hempel, Lee, Lutes, D. H. Nelson, Smalley, Wiener.
- Rice University Studies Review Board:** Prof. Eifler, *chairman*; Profs. P. W. Bell, Curtis, Dipboye, Drew (editor), Morris, Parish.
- ROTC Committee:** Prof. Boterf, *chairman*; Profs. Blanc, Coffman, Melton, Modrak, Wilhoit; Prof. Armeniades (college master); Mr. Steven Schooner (undergraduate).
- Committee on Scholarships and Awards:** Prof. Cloutier, *chairman*; Profs. Brooks, Casbarian, Sanders, Sinclair, Skura; Profs. K. T. Brown, H. C. Clark, *ex officio*; Mr. James H. Depenbrock (alumnus).
- Committee on Space Assignment:** Mr. H. R. Pitman, *chairman*; Profs. Chapman, J. Cooper, W. E. Gordon, Mitchell, Sterling, Topazio; Profs. K. T. Brown, Margrave, Vandiver, *ex officio*.
- Committee on Student Affairs:** Prof. K. T. Brown, *chairman*; Profs. Carrington (proctor), Martin (college master), Brotzen (college master), Schubert (Student Association faculty adviser); Mr. John Cockerham (Student Association president), Ms. Martha Proctor (college president), Mr. Christopher Kilgore (college president); Prof. H. C. Clark, Ms. Hellums, Prof. Vandiver, *ex officio*; Mr. A. Ray Pentecost (alumnus).
- Committee on Student Financial Aid:** Prof. Rorschach, *chairman*; Profs. Drew, Doughtie, Engel, Gottschalk, L. T. Johnson, Parks; Prof. K. T. Brown, Mr. G. D. Hunt, Mr. R. N. Stabell, *ex officio*; Mr. James P. Jackson (alumnus); Mr. J. Matt Hisle (undergraduate).
- Committee on Student Health:** Prof. Cushman, *chairman*; Profs. Disch, Eggert, Tomson, Van Helden; Dr. James A. Chappell, Ms. Bonnie Hellums, Mr. Daniel Brener, *ex officio*; Dr. A. Thomas Adkins (alumnus); Ms. Cynthia Somerville (undergraduate).

Committee on the Undergraduate Curriculum: Prof. Wiener, *chairman*; Profs. S. D. Baker, Dix, Doody, Hightower, Leal de Martinez, Long, Lutes, Matthews, Milburn, D. W. Scott, W. L. Wilson; Profs. K. T. Brown, Vandiver, *ex officio*; Mr. Chalres C. Szalkowski (alumnus); Ms. Karen Appling, Ms. Suzanne Kemmer (undergraduates).

Committee on Undergraduate Teaching: Prof. Garside, *chairman*; Profs. Davidson, Hannon, B. F. Jones, Kennedy, D. M. Lane, Merwin, Nietzsche, Patten, Rowe, Schnoebelen; Prof. K. T. Brown, *ex officio*; Ms. Christine Keller (alumna); Mr. Edwin Poole, Ms. Indira Lanig (undergraduates).

University Council: Prof. Hackerman, *chairman*; Profs. Akers, Bedient, Brotzen, Burrus, Margrave, Patten, Pfeiffer, Rathjen, Rorschach, Vandiver, von der Mehden; Profs. Chapman, J. Cooper, W. E. Gordon, Holloway, Mitchell, Sterling, Topazio, *ex officio*; Prof. K. T. Brown, *secretary*; Mr. David Cooke (graduate); Ms. Cindy McCabe, Ms. Gloria Meckel (undergraduates).

University Review Board: Prof. Pfeiffer, *chairman*; Profs. Boorman, Higginbotham, Spence, Thomas; Ms. Becky Mathre, Mr. Noel Shenoi (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 bases. 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
- 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
 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, 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 only 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 also 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 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) completed in fulfillment of the degree requirements must be on an advanced level (numbered 300 or higher).

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. Fine arts, music, philosophy (except logic), and religion
- II. 3. Economics, history, and political science
4. Anthropology, behavioral science, linguistics, psychology, and sociology
- III. 5. Biological science, physical science, and engineering
6. Mathematics, mathematical sciences, and logic

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 Department 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 eighty 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.

SCHOOL, DEPARTMENT	DEGREES OFFERED	MAJORS, OPTIONS, AREAS OF CONCENTRATION
The Jesse H. Jones Graduate School of Administration	Master of Business and Public Management, Master of Accounting, Ph.D. in Accounting (For B.A., see interdepartmental major in managerial studies)	Business entrepreneurship, finance, international management, management accounting, organizational behavior, operations research, public accounting, public management, taxation
The George R. Brown School of Engineering		
Chemical Engineering	B.A., B.S., Master of Chemical Engineering, M.S., Ph.D.	Chemical engineering, nuclear engineering, polymer science, petroleum reservoir engineering, thermodynamics, biomedical engineering
Civil Engineering	B.A., B.S., Master of Civil Engineering, M.S., Ph.D.	Civil engineering, structural analysis and design, structural mechanics, geotechnical engineering, environmental engineering
Electrical Engineering	B.A., B.S., Master of Electrical Engineering, 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	Master of Environmental Science, Master of Environmental Engineering, M.S., Ph.D. (For B.A. as double major, see department)	Environmental science and engineering
Mechanical Engineering and Materials Science	B.A., B.S., Master of Materials Science, Master of Mechanical Engineering, 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
The School of Natural Sciences		
Biochemistry	B.A., M.A., Ph.D.	Biochemistry, biophysical chemistry, molecular biology, organic chemistry
Biology	B.A., M.A., Ph.D.	Biology, environmental biology, physiology, comparative physiology, developmental genetics, ecology, cell biology
Chemistry	B.A., M.A., Ph.D.	Chemistry, organic chemistry, physical chemistry, inorganic chemistry, chemical physics
Geology	B.A., M.A., Ph.D.	Geology, geochemistry, geophysics, marine geology and oceanography, meteoritics
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, dynamics, ergodic theory, Lie groups, numerical analysis, partial differential equations, topology
Physics	B.A., M.A., Ph.D.	Physics, space physics and astronomy, biophysics, nuclear energy, geophysics
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
The School of Architecture	B.A., B. Arch., Master of Architecture, Master of	Architecture, architectural studies

SCHOOL, DEPARTMENT	DEGREES OFFERED	MAJORS, OPTIONS, AREAS OF CONCENTRATION
The School of Architecture	Architecture in Urban Design, Doctor of Architecture	
The Shepherd School of Music	B. Mus./M. Mus. simultaneously, M. Mus.	Composition, conducting, music history, performance, theory
The School of Humanities		
Art and Art History Education	B.A., B.F.A. Master of Arts in Teaching	Art history, studio art, film and photography Teacher preparatory program in twenty-one subject areas
English	B.A., M.A., Ph.D.	English
French and Italian	B.A., M.A., Ph.D. None	French language and literature 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
Legal Studies	B.A.	Legal studies
Linguistics	B.A.	Linguistics
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
The School of Social Sciences		
Anthropology	B.A.	Anthropology, ethnology, archaeology, linguistics, physical anthropology
Behavioral Science	M.A., Ph.D. (For B.A., see interdepartmental major in behavioral science below)	Anthropology, sociology
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,
Managerial Studies	B.A.	Accounting, economics, mathematical sciences, political science, psychology
Materials Science	B.A.	Chemistry, materials science

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 programs, 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 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 studies 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 newly established 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 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 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.

Managerial Studies

The managerial studies program is intended to prepare students for 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 Accounting, Economics, Mathematical Sciences, Political Science, and Psychology.

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 Office of the Dean, Jesse H. Jones Graduate School of Administration, 232 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 coursework and/or independent research and writing and (2) to provide recognition for students who have demonstrated unusual competency in managerial studies.

The managerial studies program is administered by a committee consisting of representatives from the Departments of Accounting, Economics, Mathematical Sciences, Political Science, and Psychology. Dean Robert R. Sterling of the Jesse H. Jones Graduate School of Administration chairs this committee. Student records for all managerial studies majors are maintained in the Jones 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 Bachelor of Music is offered by the Shepherd School of Music only in conjunction with the Master of Music both of which are awarded simultaneously upon completion of a five-year program of professional studies. All music majors are required to take the school's core curriculum, which spans the first five semesters.

The final two years are devoted to specialization and can be entered only upon passing qualifying examinations administered in the fifth or sixth semester. Students in the specialized curriculum may elect to be performance majors or applied majors (composition, conducting, music history, theory). Students specializing in conducting may require a sixth year to complete the degrees.

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.

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, 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 pre dental studies and other areas of the health sciences. Those interested in legal 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, for assistance in designating a suitable program. 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.

Students successfully completing the full program in either military science or naval science are granted the equivalent of eight semester hours (two course credits) toward their degree. Such credit is not attached to specific courses, and no other degree credit is given for military science or naval science programs.

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, 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.

Programs with Other Universities

Rice currently participates in cooperative programs with several other colleges and universities at the undergraduate level. These include programs with Swarthmore College, Trinity College of Cambridge University in England, Texas Southern University, and Williams College.

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.

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

This exchange program sponsored by the Abraham Student Aid Foundation 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 1979-80, a Rice student will study at Trinity, and during 1980-81, a Trinity student will study at Rice. During the fall semester of 1980, Rice students may apply to study at Trinity in 1981-82. The deadline for

applications is December 1, 1980. 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 Albert Van Helden, Department of History, Rice's coordinator for the program.

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 three years, majoring in mathematics, physics, or chemistry. At the end of the third year, if their work has been satisfactory, the students transfer to Rice as juniors 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.

While the students are still enrolled at Texas Southern, generally during their third year, they will take two or more courses at Rice in order to prepare themselves for their engineering majors here.

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 in April for the following 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.

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 \$25.00. 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 \$10.00 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.

Courses in ROTC are not included in determining the number of semester hours of enrollment in a semester.

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 April each year, 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

Any student may enroll in one course of not more than four semester hours on a pass-fail basis in any four semesters of the normal eight-semester program. This option does not apply to the required courses taken within a student's major department or to related required courses in other depart-

ments which the major department may specify as not available for the pass-fail option. Students wishing to enroll on a pass-fail basis in a course of more than four semester hours may apply to the Committee on Examinations and Standing for approval.

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 and ROTC 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 coursework 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.

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. 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 a faculty member who acts as program coordinator under 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 500 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 Entrance Examination Board, (3) evaluations made by teachers and counselors, and (4) personal interviews and the student's statements 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-	
A foreign language	2	listed subjects	3
		Total 16	

Courses in chemistry, physics, trigonometry, and additional advanced mathematics are required of applicants for the engineering and science divisions.

2. **Entrance Examinations.** The required entrance examinations are administered by the College Entrance Examination Board. Formal arrangement for applying to take the CEEB examinations, as well as for paying fees, is a matter between the applicant and the College Entrance Examination Board. The CEEB 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 101-269.

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 interview with the music faculty.

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 1980 or 1981 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 soon after 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 who apply for financial aid are notified of admission in mid-November but may have to wait until December 1 to be notified of their financial aid package.

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 CEEB 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 nonrefundable registration deposit within thirty days in order to hold his or her place in the incoming class. 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 are considered in the Interim Decision Plan and notified of the outcome by February 9.

Applicants offered admission under this plan must make a \$100 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 especially stringent 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.



Admissions Calendar

EARLY DECISION	INTERIM DECISION	REGULAR DECISION	TRANSFER
Application by October 1	Application by December 1	Application by February 1	Application by April 2 for fall; November 1 for spring
Interview by October 16	Interview by January 1	Interview by February 1	Interview by April 2 for fall; November 1 for spring
Required SAT and Achievement Tests in the junior year by May and June	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 early May
Financial Aid Form filed by October 1; Financial Aid notification by December 1	Financial Aid Form filed by January 15; Financial Aid notification by February 9	Financial Aid Form filed by February 1; Financial Aid notification by April 10	Notification when admitted; allow two months 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 CEEB 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 high scores on the College Level Examination Program (CLEP) tests in chemistry or biology 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 early 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 CEEB tests, they must take the Scholastic Aptitude Test no later than January 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. Financial Aid is not available for visiting students.

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 the Dean of Advanced Studies and Research. For information on tuition and fees for Class III students, see page 72. Financial Aid is not available for Class III students. 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 \$125 per semester hour plus a \$50 registration fee, the total not to exceed \$1,350. Application for admission should be made to the Admissions Office. Financial assistance is not available for this program.

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 60 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 colleges 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 1979-80 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 1979-80 is \$2,700 per year, payable \$1,350 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 \$125 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 \$1,350 per semester.

The tuition charge for Class III students is \$125 per semester hour plus a \$50 registration fee, the total not to exceed \$1,350 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 the balance before the beginning of the spring semester.

Subsidies to student activities	\$34.80
Tickets to athletic events	4.00
College fee	35.00
Health Service	66.00
Total fees	\$139.80

Special Charges

Orientation week (room and board — all new students)	\$32.00
Late payment	25.00
Late change of registration	10.00
Diploma	22.00
ROTC	25.00
Health insurance, twelve months, single student (see pages 84 and 85)	141.75
Late application fee for Class III	50.00

Guaranty Bond

Every undergraduate student, regardless of age, is required to provide a \$300 guaranty signed by the student and a parent, guardian, or other responsible adult, excluding a spouse or another student. A deposit is not required for this bond.

Refund of Tuition

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.

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 1979-80, the yearly room and board charge for residence in a residential college is \$2,190. 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.

All items included, the young man or woman entering Rice University in August 1979 and living on campus needs to have available about \$6,100 the first year. For a student living at home, the cost is about \$5,250.

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. It is assumed that (1) students will rely upon their own resources as much as possible and will make a reasonable effort to increase them through summer work and other sources which may be available to them, (2) student expenses will be held to a reasonable minimum, and (3) parents will contribute in proportion to their means and other obligations.

A brochure entitled *Rice: Financial Aid 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.

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 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 October 31. Interim Decision candidates must file the Rice University financial aid application and the Financial Aid Form by January 10, and Regular Decision candidates must file the Financial Aid Form by March 1.

Notifications of offers of financial aid accompany notices of admission to Rice. 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 August 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 Rice University federal insured loan program to those for whom lump sum payments would require undue hardship.

Federal Insured Student Loans (FISL) are available to almost any undergraduate student, regardless of financial need. An FISL may be obtained from a bank, credit union, savings and loan association, or Rice University. An initial FISL may not be made by Rice University to an undergraduate unless a statement of loan refusal from a commercial lender is provided.

An undergraduate may borrow up to \$2,500 each year to a total of \$7,500 for four 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 7 percent interest charge, will begin twelve 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). In addition, deferment is available for a return to **full-time** study at an eligible institution or for pursuit of a course of study under a graduate fellowship program approved by the commissioner of education. 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.

FISL 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
 Louise Adele Drenkle Loan Fund
 Mary Alice Elliott Loan Fund
 Houston Bridge League Loan Fund
 Leo M. Levy Memorial Loan Fund
 Lora B. Peck Loan Fund
 Rice University Federal Insured 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 nonrefundable 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
 John McKnitt Alexander Chapter of The Daughters of the American Revolution 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
 Donald R. Baker Scholarships
 Graham Baker Studentship
 James A. and Alice Graham Baker Distinguished Scholarship
 James A. and Alice Graham Baker Honor Scholarships
 H. Leroy Bell Scholarship
 Board of Governors Scholarships
 Fetabel Denton Briggs Memorial Scholarships, Trinity College

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
 Arthur B. Cohn Prize Scholarships
 College Bowl Champions Scholarship
 College Women's Club Scholarship
 Continental Airlines Foundation Scholarship
 Thomas A. and Pauline M. Dickson Scholarship
 Thomas P. and Maude Seeger Dow Scholarships
 Thomas Flaxman Scholarship
 Thomas R. and Julia H. Franklin Scholarships
 Lady Geddes Prize in Writing
 Mary Parker Gieseke Scholarship
 Harold B. Hamilton Scholarship
 Annette Schreiber Hill Scholarship
 William Clifford Hogg Fund Scholarships
 Hohenthal Scholarships
 Mercer T. Ingram Scholarship
 M. M. Feld and J. P. Hamblen Interfaith Charity Scholarships
 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
 Patrons of E. L. Lester and Company Scholarship
 Lottman Scholarship
 Margaret Brokaw McCann Scholarship
 J. L. C. McFaddin Scholarship
 W. P. H. McFaddin Scholarship
 Emma S. McGree Scholarships
 Byron Meredith Scholarship
 Achille and Malline Meyer Memorial Scholarship
 Fannie Bess Emery Montgomery Scholarship
 Motheral-Neilan Scholarship
 Muller Scholarship
 Rice Sponsored National Merit Scholarships and National Achievement
 Scholarships
 Ida R. and Hanna E. Nussbaum Scholarship
 Rebecca Raphael and Lilly G. Nussbaum Scholarship
 Raymond Pearson Scholarship
 Emanuel and Mose Raphael Scholarship
 Robert H. Ray Memorial Scholarships
 Ernest R. Rechel Memorial Scholarships
 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
 Jackie Schnell Memorial Scholarship
 Scholarship from a Graduate of the Class of '19
 Anita and Campbell Sewall Scholarship
 Mr. and Mrs. James T. Sikes Scholarship
 Society of Rice University Women Scholarship
 Sara Stratford Scholarship
 Teagle Foundation Scholarships
 James U. and Margot Teague Scholarship
 Herschel M. Vaughan Student Scholarship
 John B. Warren, Jr., Scholarships
 Lady Washington Texas Centennial Award
 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

Awards and Scholarships in Departmental Disciplines

Accounting and Management

Leo M. Acker Memorial Scholarship
 Atlantic-Richfield Scholarships
 Financial Executives Institute Award
 Foley Brothers Scholarship
 Haskins and 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

PALS Art Awards
 Christine Croneis Sayres Memorial Art 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
 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

American Institute of Chemical Engineers, South Texas Section, Scholarship
 R. C. Baker Foundation Scholarships
 Mr. and Mrs. Val T. Billups Scholarship
 Brown Scholarships in Engineering
 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 Senior Engineering Student Awards
 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

Military Science

American Legion Scholastic Excellence Awards
Armed Forces Communications and Electronics Association Awards
Society of American Military Engineers Award
Superior Cadet Decoration Awards

Music

Elva Kalb Dumas Award in Music
Erwin and Emily Heinen Award in Music
Joseph A. and Ida Kirkland Mullen Scholarships
Sallie Shepherd Perkins Award
Burt Duke Raiza Piano Scholarship
Benjamin A. Shepherd Awards
Dorothy Richard Starling Awards

Naval Science

Jesse H. Jones Naval Scholarships
Leonard S. Mewhinney Scholarship
Navy League Award
Society of American Military Engineers Award

Physical Education

G. L. Hermance Award in Physical Education

Physics

Claude W. Heaps Prize in Physics

Political Science

Charles Breckenridge Parkhill Scholarship in Political Science

College Awards

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, Manufac-
 tures, 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 at 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.

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. Lovett, Richardson, and Wiess are men's colleges; Brown and Jones are women's colleges. Baker, Hanszen, and Will Rice 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 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.

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 recognizes 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: Shaw's *Arms and the Man*, Durrenmatt's *The Visit*, Shakespeare's *Twelfth Night*, Albee's *Who's Afraid of Virginia Woolf?*, and Stoppard's *Jumpers*. 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 each semester. Rice University participates in the student health service operated by the University of Texas Health Science Center for its own students across the street from the Rice campus. On campus, a student health clinic, housed in the north wing of Hanszen College and staffed by a nurse or qualified attendant and a resident physician during specified hours, provides first aid and limited medical care. Emergency room services, hospital facilities, and referral to specialists are all available through the University of Texas Health Science Center.

Group health insurance is mandatory for all students except those demonstrating comparable coverage. The plan offered through the university covers the student for twelve months beginning with the fall semester. The charge, payable in one or two installments, is \$141.75 for a single student and \$352.00 for a student with one dependent.

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.

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 over a million volumes plus more than a million microforms and 9,700 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 documents and 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 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, a lounge, and ballroom facilities are also located in the RMC.

Placement Office

The Placement Office is a service provided by Rice University to assist students and alumni in finding employment. 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, racquet ball, 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 men and women students. Every year, over two hundred teams and over half the student body participate in some thirty tournaments.

An individual may participate in individual or dual sports; any group of interested students may form teams for the various tournaments. A student must compete in the university tournaments to become eligible to represent his or her college in the college team sports tournaments which follow the open tournaments. The most common units for team competition come from the various class sections of the Basic Health and Physical Education program, students in the same major field, students in the same college, and faculty and graduate students.

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, 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, architecture, behavioral science, biology, biochemistry, 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 teaching 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, and materials science. 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 two years of full-time study, or the equivalent of sixty semester hours, must be in residence at Rice. 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 may 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. 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 101. 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. For the master's oral committee, the third member may be from within 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 the previous week. 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 dean 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 Management

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 in Accounting. Applicants to these programs must submit scores on the Graduate Management Aptitude 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 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 School after completion of their junior year.

For admission to either master's degree program, undergraduates should take the following Rice courses or their equivalents: Introduction to Accounting (Accounting 305) and Principles of (Micro) Economics (Economics 211). For the Master of Accounting program, the following Rice course or its equivalent should also be taken: Business Data Processing (Mathematical Sciences 222), which is strongly recommended for the Master of Business and Public Management program. Students may be admitted without such coursework but must complete these requirements without graduate credit prior to entering graduate courses. These courses are generally offered at Rice during the summer session.

Completion of the Master of Accounting program requires one to two academic years, depending upon the student's undergraduate preparation, while the Master of Business and Public Management program requires two academic years. To qualify for either degree, the student must maintain a "2" ("B") average and may be required to pass an oral examination during the last semester in residence.

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) coursework 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 ten 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 at 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 student's area of concentration (at least five courses) 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.

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 admissions to its Master of Music program from recipients of a bachelor's degree from other accredited institutions. 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 Shepherd School of Music five-year professional degree, the Master of Music with the Bachelor of Music awarded simultaneously, 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 of the dean 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. Further information on enrollment of Class III students is found on pages 70-71.

Tuition, Fees, and Expenses

Tuition and fees for graduate students given here are for academic year 1979-80 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 \$2,700 per year (\$1,350 per semester) for all students through six semesters. In addition, each full-time graduate student pays a health service fee of \$66 per year (\$33 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 \$125 per semester hour plus \$50 registration fee each semester, the total not to exceed \$1,350 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 "Require-

ments 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. 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.

All students are required to carry health insurance. Such insurance is available through the director of student activities. This expense is not included in the tuition or fees.

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 the 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
 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
 Haskins & Sells Foundation Scholarship in Accounting
 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
 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 Awards 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 is 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 National Direct Student Loan, 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.

Assistance through the National Direct Student Loan program may not exceed \$5,000 per academic year. The interest rate is a simple 3 percent on the outstanding balance, and interest does not begin to accrue until nine months after a student ceases to be enrolled.

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.

Federal Insured Student Loans (FISL) are available to graduate students, regardless of financial need. An FISL 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 \$15,000, 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.

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 7 percent interest charge, begins twelve 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). In addition, deferment is available for a return to **full-time** study at an eligible institution or for pursuit of a course of study under a graduate fellowship program approved by the commissioner of education. 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.

FISL 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 \$100 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 82.

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, 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, 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 with other Houston area libraries 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 also 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, 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 often 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

Graduate students pay the same health service fee as undergraduates and must be covered by medical insurance under the same provisions as undergraduates. A small health clinic is maintained on campus to provide limited care and referral service to doctors and to the emergency room of Hermann Hospital. Access to limited psychiatric consultation, including marriage counseling, is also available to graduate students through the Rice Psychiatric Service. For more information, refer to pages 84-85.

Student Automobiles

All automobiles on campus must be registered with the Rice University Police Department. For more information, refer to page 86.



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 parenthesis.

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. In general, this section includes *only* those courses *likely* to be offered sometime during 1979-81 in the best judgment of each department; it does not

represent a comprehensive list of departmental offerings nor a guarantee that any particular course will be given. Uncertainty about when or whether a particular course will be offered during this two-year period is indicated by the designation "not offered every year." Moreover, the faculty lists preceding each departmental section are more accurate for the 1979-80 academic year as they cannot anticipate 1980-81 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 Sterling, *Dean*

**Professors P. W. Bell, J. Cooper, Edwards,
Howell, Oliver, Thomas, Thrall, Tuggle,
von der Mehden, E. E. Williams, and Zeff**

Adjunct Professors Bush, Spitz, and Valentine

Associate Professor L. T. Johnson

Assistant Professors Driskill, Greanias, Mandel, and Windsor

Adjunct Assistant Professor Krumland

Lecturers Lucas and Viebig

Degrees Offered: B.A. with major in managerial studies (interdisciplinary program); Master of Business and Public Management; Master of Accounting; Ph.D. in Accounting.

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 management 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 Accounting, in which students undertake highly individualized research studies under the direction of distinguished scholars.

Undergraduate Program. No undergraduate major is offered in the Jones 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 55-56.

Students admitted to the Honors Program in Managerial Studies may elect certain graduate courses in accounting and administration as part of their major requirements. In addition, the undergraduate major in managerial studies may be used to satisfy prerequisites for admission to both the Master of Business and Public Management and Master of Accounting programs.

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 in Accounting. Applicants to these programs must submit scores on the Graduate Management Aptitude 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 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 an oral examination during their last semester in residence. Admission to the Jones School is highly selective and limited to those who have performed with distinction in their previous academic work and on the GMAT.

Master of Business and Public Management (M.B.P.M.). The M.B.P.M. 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 administration and related subjects, plus the Dean's Seminar (Administration 501, 502). Undergraduate preparation for the M.B.P.M. program must include, as a minimum, the following Rice courses or their equivalents: Introduction to Accounting (Accounting 305) and Principles of (Micro) Economics (Economics 211). Undergraduates are also encouraged to take Business Data Processing (Mathematical Sciences 222) or its equivalent. These courses are generally offered at Rice during the summer session. No specific undergraduate major is required for admission.

The following courses are required for the M.B.P.M. program: Administration 511, 512, 531, 532, 541, 542, 561, 562, 591, 592, 593, 594; Accounting 521, 522. 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 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 Administration 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, business entrepreneurship, international management, and public management. Coursework 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, 572, 574, and 575. 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 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. 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.

The Master of Accounting program consists of sixty semester hours in accounting and related subjects, plus the Dean's Seminar (Administration 501, 502). Up to thirty semester hours of advanced standing may be granted to students with appropriate previous preparation. Undergraduate preparation for the Master of Accounting program must include, as a minimum, the following Rice courses or their equivalents: Introduction to Accounting (Accounting 305), Principles of (Micro) Economics (Economics 211), and Business Data Processing (Mathematical Sciences 222). These courses are generally offered at Rice during the summer session. No specific undergraduate major is required for admission.

The following courses are required for the Master of Accounting program: Accounting 511, 512, 513, 521, 522, 527, 551, 552; Administration 531, 532, 541, 542, 543. In addition, twelve semester hours of the elective coursework must be graduate courses in accounting. The remainder of the coursework may be graduate courses in administration or other appropriate upper division or graduate courses in the university.

Doctor of Philosophy in Accounting. The Ph.D. program in accounting prepares candidates for teaching and research careers. The program, which emphasizes research in accounting theory, usually requires at least two years beyond the master's degree. Applicants must have a master's degree in accounting or an equivalent 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 the field of accounting.

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*

406b. 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. Designed as a terminal course for nonmajors; open only to seniors. Jones School students take Accounting 521, 522. Prerequisite: Accounting 305, Economics 211, and a statistics course. *Mr. Bell*

495a, 496b. Senior Independent Study (0-0-3 each semester).

Independent study on an approved project under faculty supervision. Enrollment by special permission. *Staff*

500a,b. Master's Thesis Research.

Staff

511a. Asset Accounting (3-0-3).

Major topics are the valuation of assets and the measurement of income in accordance with generally accepted accounting principles. Prerequisite: Accounting 305 and graduate standing. *Mr. Johnson*

512b. Equity Accounting (3-0-3).

Major topics are the valuation of equities and the measurement of income in accordance with generally accepted accounting principles. Prerequisite: Accounting 305 and graduate standing. *Mr. Thomas*

513b. Special Topics in Accounting (3-0-3).

Major topics are partnerships, consolidations, interim reporting, foreign operations, and fiduciary accounting. Corequisite: Accounting 512. *Mr. Johnson*

521a. Managerial Accounting I (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 305, Economics 211, and graduate standing. *Mr. Thomas*

522b. Managerial Accounting II (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. Prerequisite: Accounting 521 or equivalent and graduate standing. *Mr. Edwards*

524b. Seminar in Managerial Accounting (3-0-3).

Accounting applications of quantitative, behavioral, and financial tools in planning, decision making, and control. Prerequisite: Accounting 522 and graduate standing. *Mr. Mandel*

527a. Management Information Systems (3-0-3).

Case studies concerning 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, partnerships, and sole proprietorships; tax planning in business situations. Prerequisite: Accounting 305 and graduate standing. *Mr. Viebig*

532b. Federal Taxation of Individuals (2-0-2).

United States individual income taxation, including consideration of tax shelter investments and family tax planning. Prerequisite: Accounting 531 and graduate standing. *Mr. Viebig*

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. Lucas*

551a. Seminar in Accounting Theory I (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*

552b. Seminar in Accounting Theory II (3-0-3).

Recent theory on valuation income and cash flow concepts; evaluation of decisions; predictability, distributability, and taxability of income; measurement of social costs and benefits. Prerequisite: Accounting 511, 512, and graduate standing. *Mr. Edwards*

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. Course runs year long, beginning in the fall. *Mr. Greanias*

590b. Accounting Workshop (3-0-3).

Review of recent literature on major accounting issues leading to writing of a substantial research paper. Prerequisite: Accounting 551, 552, and graduate standing. *Staff*

597a, 598b. Independent Study (0-0-3).

Independent study 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. Sterling*

511a. Organizational Behavior and Communication (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. Organization Theory (3-0-3).

Examination of the development of organization theory, of current approaches to the study of complex organizations, and of the operation of major types of complex organizations in both private and public sectors. Prerequisite: graduate standing. *Mr. Cooper*

514b. 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. *Mr. Howell*

531a. Quantitative Methods I (3-0-3).

Use of statistical methods to analyze decision problems. Prerequisite: graduate standing. *Staff*

532b. Quantitative Methods II (3-0-3).

Application of operations research to decision problems. Prerequisite: Administration 531 or equivalent and graduate standing. *Staff*

534b. Topics in Decision Analysis (3-0-3).

Decision models, including decision trees, benefit-cost and cost-effectiveness models, handling of hard and soft data; applications to energy management, ecology management, health care, and legal actions. *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: Accounting 305, Economics 211, and graduate standing. *Mr. Bell*

542b. Economic Environments of Managerial Decisions (3-0-3).

Problems of economic growth, stability, allocative efficiency, and distributional equity within and among nations; managerial decisions in private and public economic entities. Prerequisite: Administration 541 or equivalent and graduate standing. *Mr. Bell*

543a. Financial Markets and Institutions (3-0-3).

Types of money market and capital market instruments and role of financial institutions in those markets. Prerequisite: Administration 542 or equivalent and graduate standing. *Mr. Valentine*

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. Prerequisite: Administration 542 or equivalent 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 or equivalent and graduate standing. *Mr. Williams*

546b. Quantitative Methods in Finance (3-0-3).

Advanced topics in financial planning and control with emphasis on application of quantitative techniques. Prerequisite: Administration 543 or 544 or equivalent and graduate standing. *Mr. Valentine*

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 topic areas by analytic and case presentation methods regarding legal implications of decisions by private and public administrators. Prerequisite: Administration 561 or equivalent and graduate standing. *Mr. Oliver, Mr. Greanias*

571a. Problems of International Management (3-0-3).

Decision problems of private and public sector entities involved in international economic activities. Prerequisite: Administration 511, 512, 542, 562, and graduate standing or consent of instructor. *Mr. Bell*

572b. 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*

574b. Regulatory Law of Transnational Business Operations (3-0-3).

Examination of the national laws of sending and receiving states and of customary and treaty based international rules pertaining to trade in goods and services; direct foreign investment, including multinationals; foreign exchange operations. *Mr. Oliver*

575a. International Tax Planning (3-0-3).

Legal and financial aspects of international tax strategy, multinational transactions, and tax minimization. The emphasis is on tax planning from the international manager's viewpoint. *Mr. Spitz*

591a, 592b. Management Workshop I, III (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 and student presentations. Prerequisite: second-year graduate standing. *Mr. Tuggle*

593a. Management Workshop II (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 Workshop IV (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 (3-0-3 each semester).

Independent study on an approved project under faculty supervision. Enrollment by special permission. Prerequisite: graduate standing.

*Managerial Studies Courses***303a,b. Personal Finance (3-0-3).**

Planning, organization, and control for financial decisions.

Mr. Hale

404a,b. Investment Analysis and Portfolio Management (3-0-3).

Investment analysis and portfolio management for the individual investor. *Mr. Hale*

495a, 496b. Senior Honors Thesis (0-0-3).

Completion of senior honors thesis. Open only to seniors in managerial studies honors program.

Anthropology

Professor Hole, Chairman
Professors Norbeck and Tyler
Associate Professor P. W. Davis
Adjunct Associate Professor Schreiber
Assistant Professors Cushman and Marcus

Degrees Offered: B.A.; B.A. and Ph.D. in behavioral science

Undergraduate Program. Anthropology is a discipline that encompasses many subjects of study, all related to understanding human beings and their culture. 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) including Anthropology 201 and nine other courses, seven of which must be upper-level courses. With the approval of the departmental adviser, a maximum of two

semester courses in biology, history, and the social sciences may be substituted for courses in anthropology. Within the general requirements, the program of each student majoring in anthropology is planned to meet individual interests and plans for future careers. Majors who plan to pursue graduate training toward a professional 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.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 90 semester hours outside the departmental requirements, for a total program of at least 120 semester hours. See Degree Requirements and Majors, page 50-51.

Honors Program. The department offers an honors program 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. Students accepted into the program will undertake research leading to a thesis which must be presented at the end of the first semester of the senior year. Admission to the program and acceptance of the thesis is determined by the Honors Committee. Interested students may apply to the honors program chairman, Mr. Cushman, during the first semester of the junior year.

Graduate Program. The Doctor of Philosophy in behavioral science with a major in anthropology is offered under the Behavioral Science Program.

Anthropology Courses

201a. Introduction to Anthropology (3-0-3).

Introduction to the study of human societies and cultures within the main components of anthropology: archaeology, physical anthropology, linguistics, and cultural and social anthropology. Offered every year.

207a. Introduction to General Linguistics (3-0-3).

Introduction to the study of language and linguistics, including basic synchronic concepts and techniques; phonetic transcription, phonological, grammatical, and semantic systems. Also offered as Linguistics 201. Offered every year.

208b. Introduction to General Linguistics (3-0-3).

Continuation of the above with an introduction to diachronic linguistics and methods in linguistic prehistory. Also offered as Linguistics 202. Offered every year.

225. Primitive Art (3-0-3).

The arts of sub-Saharan Africa and the Pacific islands, including Australia: their known history, theories of their evolution, and their regional styles at the time of European colonization. Also listed as History of Art 225.

235. Art of Beginning Civilizations (3-0-3).

Comparative human expression in the visual arts and architecture from Neolithic origins to the establishment of empires in the ancient Near East (Egypt to Mesopotamia) and Pre-Columbian America (Mexico to Peru).

302. Syntactic Analysis (3-0-3).

The theory and techniques of syntactic analysis. Prerequisite: Anthropology 207, 208 or consent of instructor. Also offered as Linguistics 302.

303. Modern Linguistic Theory (3-0-3).

A survey of the development of linguistic theory from de Saussure to the present. Prerequisite: Anthropology 207, 208 or consent of instructor. Also offered as Linguistics 303.

304. Phonological Analysis (3-0-3).

The techniques and assumptions of phonological analysis: an examination of various phonological theories current in modern linguistics. Prerequisite: Anthropology 207, 208 or consent of instructor. Also offered as Linguistics 304.

305. Historical Linguistics (3-0-3).

Mechanisms of language change in terms of transformational generative grammar are developed and related to the social and geographical context of language and language acquisition. Also offered as Linguistics 305.

306. Anthropological Study of Religion (3-0-3).

Comparative survey of religion and magic and anthropological interpretations of their nature and roles in human life.

310. 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 Geography 310.

312. North American Ethnology (3-0-3).

A general survey of native cultures north of Mexico. Intensive study of selected peoples in light of the processes of culture.

313. Language and Culture (3-0-3).

Investigates the systematic relations between linguistic form and expression and culture. Also offered as Linguistics 313.

316. Fundamentals of Archaeology (3-0-3).

Principles and methods of archaeology as exemplified by case studies.

320. Old World Prehistory (3-0-3).

A survey of the origin and development of human culture to the beginnings of literate civilizations in Southwest Asia. Emphasis on Africa, Southwest Asia, and Europe.

321. New World Prehistory (3-0-3).

Humankind's entry into the Americas; its dispersal and varied ecological adaptations; the development of these cultures to the beginning of food producing and village life.

322. New World Prehistory (3-0-3).

The evolution of New World civilizations, in Mesoamerica and the Central Andes, to the Spanish conquest.

323. Archaeological Techniques (2-4-3).

Introduction to archaeological theory as it relates to excavation; the principal techniques used in field work, laboratory analysis of artifacts, and interpretation of archaeological data. Prerequisite: Anthropology 316, 320, 321, or 322.

325. Peoples and Cultures of Latin America (3-0-3).

Survey of the Spanish- and Portuguese-speaking peoples of the New World. Development of cultures and subcultures as a response to local, national, and world situations.

326. African Art (3-0-3).

The traditional tribal arts of sub-Saharan West Africa in the context of their cultures. Function and style areas stressed. Consideration given to common forms, their meaning and distribution. Also offered as History of Art 325.

327a, b; 328a, b. Problems in Media in Anthropology (1-6-3 each semester).

Application of film and videotape to problems in anthropology as research method or as means of communicating anthropological observations and ideas. Grounding in film and videotape techniques followed by individual projects. Also offered as Arts 327, 328.

330. Early Civilizations (3-0-3).

The growth and characteristics of civilization in Mesopotamia, Egypt, India, Mesoamerica, and Peru are examined historically and comparatively.

331. Culture Contact (3-0-3).

Intercultural communication and understanding, including Western and non-Western; cultural contact from early European explorations, through colonization, to contemporary development and modernization.

332. Physical Anthropology (3-0-3).

Cultural and biological factors in the evolution of humans, human genetics, races, and race problems.

336. Oceanic Art (3-0-3).

The art of the aboriginal peoples of Melanesia, Polynesia, Micronesia, and Australia. Emphasis on stylistic analysis and function of objects within the context of each culture; the meaning, origin, and diffusion of similar forms. Also offered as History of Art 336.

341. Kinship and Social Structure (3-0-3).

Introduction to anthropological concepts and theories relating to kinship, marriage, and social structure in cross-cultural perspective.

348. Economic Anthropology (3-0-3).

Comparative structure and operation of economic systems in small-scale, non-Western societies and the contemporary development of such systems in larger national and international entities.

352. Peoples and Cultures of Oceania (3-0-3).

The ethnology of the three major cultural divisions of Oceania: Polynesia, Melanesia, and Micronesia. Emphasis on political and cultural evolutions of Pacific societies from pre-European times to the present.

353. Cultures of India (3-0-3).

Summary of the prehistory, ethnography, and ethnology of the Indian subcontinent. Special emphasis on ideology and social organization.

356. Peoples and Cultures of China (3-0-3).

A survey of the prehistory and ethnology of China with special emphasis on traditional Chinese society, regional variation, Chinese-minority relations, and the Communist transformation.

361. Culture and Personality (3-0-3).

Consideration of studies of interaction between personality and culture in various societies from the point of view of cultural relativity.

366. Political Anthropology (3-0-3).

Emphasis on fundamentals of political order in kingships, bands, tribes, and feudal systems. The political systems and processes of these social systems compared with those of modern, complex societies.

371. 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.

373. The Anthropology of Literature (3-0-3).

Comparison of oral traditions and written literatures, Western and non-Western, and of their use for ethnographical and ethnohistorical research.

381. The Study of Cities (3-0-3).

Comparative study of cities in different areas of the world, identifying constants and variables of urban culture, ancient and modern.

383. Utopian Societies and Communes (3-0-3).

A consideration of utopian and communal societies in historical and cross-cultural perspectives as alternatives to the dominant social structures and cultures in which they developed.

385. History and Culture of Japan (3-0-3).

A general survey of Japanese culture from its prehistoric beginnings with emphasis on modern times.

394. 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 Linguistics 394 and English 394.

400. Ethnological Theory (3-0-3).

Seminar surveying major trends of ethnological theory from the beginning of anthropology. Also offered as Behavioral Science 515. Offered every year.

402. Cultural Ecology (3-0-3).

Discussion of systematic relations of humans and their biological and social environments.

403. Field Methods and Analytic Techniques (3-0-3).

Techniques of observation, analysis, and recording of human language. Prerequisite: Anthropology 207, 208 or consent of instructor. Also offered as Linguistics 407.

404a, b. Independent Study (0-0-3 each semester).

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.

406. Cognitive Anthropology (3-0-3).

Focuses 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 Linguistics 406.

407, 408. Special Topics in Anthropology (3-0-3 each semester).

Lectures or seminar devoted to restricted topics reflecting current research interests of the staff. May be repeated for credit.

410. Archaeological Analysis (3-0-3).

Tutorial course covering techniques of studying and interpreting archaeological data. Students work individually on collections of excavated material. Limited to ten students. Prerequisite: Anthropology 316.

411. 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.

420. Classics in Ethnography (3-0-3).

Detailed consideration of selected ethnographic accounts with primary emphasis on their contributions to the development of anthropological theory and the refinement of field techniques.

430. Medical Anthropology (3-0-3).

Introduction to the rapidly growing field of medical anthropology, which concerns anthropological aspects of medicine.

438. Indian Art of North America (3-0-3).

Indian art of the United States and Canada with emphasis on the Southwest, the Northwest Coast, and the Alaskan Eskimo. Formal analysis of types, meaning, and function. Also offered as History of Art 438.

444. The Ethnography of the Past (3-0-3).

Examination of anthropological approaches to the reconstruction of social history in Western and non-Western societies with primary emphasis on the problems of interpreting original historical materials.

446. Ancient Art of South America (3-0-3).

Survey of the evolution of the arts in Andean civilizations from preceramic coastal communities to the Inca state. Includes northern South America, lower Central America, and Antilles. Also offered as History of Art 446.

447. Ancient Art of Mesoamerica (3-0-3).

Art of Mexico, Guatemala, and Honduras, from the Olmec culture (ca. 1200-600 B.C.) to the Aztec. Chronological development, stylistic analysis, and the origin and meaning of forms. Also offered as History of Art 447.

490b, 491a. Directed Honors Research (0-0-3 each semester).

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.

508. Linguistic Anthropology (3-0-3).

Devoted to the application of linguistic theory and method in the analysis of cultural materials. Also offered as Behavioral Science 546 and Linguistics 508.

School of Architecture

Professor Mitchell, *Dean*

Professors Cannady, Evans, Krahl, Ransom,

A. M. Santos, A. P. Santos, and Todd

Visiting Professors Crane, Taniguchi, and Wilford

Adjunct Professors Caudill and Thomsen

Associate Professors Casbarian, Papademetriou,

S. W. Parsons, Rowe, and D. L. Williams

Adjunct Associate Professors Bartlett, Douglass, France, and Perrine

Assistant Professor Sharpe

Adjunct Assistant Professors Cech and Turner

Lecturers Berkman, Blackburn, C. J. Brown, Cavanaugh,

Colaco, Kerner, Lord, Mixon, Moore, Naman,

Pieper, Preston, Scouler, and Tapley

Instructor Bavinger

Degrees Offered: B.A., B.Arch., M.Arch., M.Arch. in Urban Design, D.Arch.

Preceptors

The Architects Collaborative, Inc. Cambridge, Massachusetts	Mitchell/Giurgola Associates Philadelphia, Pennsylvania
Brown/Sullivan Associates Philadelphia, Pennsylvania	S. I. Morris Associates Houston, Texas
Cambridge Seven Associates Cambridge, Massachusetts	C. F. Murphy Associates Chicago, Illinois
Caudill Rowlett Scott Houston, Texas	I. M. Pei & Partners New York, New York
Community Planning & Development Woodlands Development Corp. Houston, Texas	Rice Center for Community Design and Research Houston, Texas
David A. Crane & Partners Philadelphia, Pennsylvania	Skidmore, Owings, & Merrill Chicago, Illinois
Daniel, Mann, Johnson & Mendenhall Los Angeles, California	Robert A. M. Stern Associates New York, New York
Gensler & Associates Houston, Texas	Vastu-Shilpa, B. V. Doshi Ahmedabad, India
Hellmuth, Obata & Kassabaum San Francisco, California	Venturi & Rauch, Architects Philadelphia, Pennsylvania
McKittrick, Drenna, Richardson & Wallace Houston, Texas	Wallace, McHarg, Roberts & Todd Philadelphia, Pennsylvania

Frank R. Welch, Architect
Midland, Texas

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 one and one-half to three and one-half 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 and talents through an individual set of seminars, studio projects, and interdisciplinary 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 cause serious problems later on.

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

Third and fourth years:

Architecture 301, 302
Architecture 401, 402
Architecture 313, 314
Electives, at least thirty semester
hours (ten semester courses)

Preceptorship year:

Architecture 500

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

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)

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 38 semester hours 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 a liberal arts education for its own sake, 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, including:

1. Housing and community development
2. Community facilities and community development
3. Transportation and urban infrastructure
4. Health care facilities and delivery systems
5. Land and natural resource utilization

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 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. Two alternative vehicles for clinical service are available:

The Rice Center for Community Design and Research is an off-campus, non-profit corporation concerned with practical problems of planning and designing, 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 experts from many other fields.

Full-time internships provide clinical service in applied research and innovative design projects, under supervision of practitioners in the Houston area as determined by the special expertise of the chosen office.

Graduate studies are open to candidates who hold the degree of Bachelor of Architecture or who have a Bachelor of Arts with a major in architecture. 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 a 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*

123. Design Analysis and Representation (1-6-3).

Staff

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. *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, 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. *Staff*

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. Cannady, 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*

313a,b; 314b. Intermediate Architectural Technology (3-0-3 each semester).

Analysis and design of structural systems. Investigation of environmental controls systems. Self-paced "Keller Method" with lectures and exercises. Prerequisite: Architecture 213, 214. *Staff*

322b. Architectural Presentation Techniques (3-0-3).

Exploration and practice with varying types of presentation techniques with emphasis on graphic communication of architectural concepts. *Mr. Cannady*

331b. Housing Design Problems and Principles (3-0-3).

Review of international problems in housing and community development. Design criteria and processes responding to user needs and aspirations. Open to students outside of architecture. *Mrs. Santos*

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. *Staff*

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. *Mr. Santos*

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. Sharpe*

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*

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. Cannady, Mr. Todd, Visiting Critics

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. *Mr. Krahl*

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. *Mr. Krahl*

417a, 418b. Teaching of Technology (0-0-3 each semester).

Classroom teaching under the supervision of the instructors. *Staff*

419a. Human Factors in Space Use (3-0-3).

Elaboration of studio and other special design projects. Particular concern related to the integration of interior design development and refinement within the total architectural product. Enrollment by permission of instructor. *Mr. Ransom*

420b. Special Technical and Aesthetic Problems in Architectural Design (3-0-3).

Deals with specific architectural materials and construction techniques and their ultimate effects on aesthetic and functional results. Student work includes ongoing field observation of a local project in construction, comparisons of nineteenth- and early twentieth-century construction techniques with those currently in use, and preparation of detailed drawings of specific architectural elements. Limited enrollment. *Staff*

437a. Advanced Computer Projects (3-0-3).

Individual projects in the application of computer technology to architectural programming, 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 programming, 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. Permission of instructor required. *Mr. Papademetriou*

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. *Mr. Parsons*

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. *Mr. Santos*

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. *Ms. Evans*

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. *Mr. Santos*

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. Krahl*

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*

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*

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. Santos, 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, Mrs. Santos, 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*

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. *Mr. Krahl*

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. *Mr. Krahl*

613a, 614b. Teaching of Technology (0-0-3 each semester).

Same as Architecture 417, 418. *Staff*

615a, 616b. Industrialized Building Technologies I, II (3-0-3 each semester).

Changing forces in the building industry contributing to industrialized processes and technologies of factory production, distribution, assembly, site erection of building components, and management. *Staff*

618b. Management of Building Processes (3-0-3).

The manifest professional concerns, responsibilities, and strategies of the architect in the organization of construction. Particular heed paid to the sequence of building and to the integration of the skeletal and energetic procedures. Enrollment by permission of instructor. *Mr. Ransom*

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*

622b. History and Theory of Modern Movements in Architecture and Urban Design (3-0-3).

Same as Architecture 342.

Mr. Santos

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.

Mrs. Santos

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. *Mr. Santos*

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*

634b. Architectural Programing (3-0-3).

Fundamental procedures of programing architectural facilities and systems for various types of public and private construction. Emphasis on health care and correctional facilities. *Mr. Douglass*

636b. Local Government Policy Making and the Relationship to the Private Sector (3-0-3).

Develops and demonstrates the relationship between government decision making and technical information tools to improve those decisions and between professional designers and the elected decision maker. *Mr. Linville*

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. Rowe*

638b. Computer Applications in Achitecture (3-0-3).

Individual projects in the application of computer technology to architectural programing, planning, and urban design, graphic display, and problem analysis. *Mr. Rowe*

640b. Seminar in Recent Trends in Architecture (3-0-3).

Same as Achitecture 442.

Mr. Papademetriou

646a. 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*

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. *Mrs. Santos*

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, Mr. Brown*

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*

700a,b. Practicum (0-0-12).

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, *Chairman*
Professors K. T. Brown, Camfield, Havens,
Oliver-Smith (on leave fall 1979), **O'Neil,**
D. G. Parsons (on leave fall 1979), **and Winningham**
Assistant Professors Poulos, J. F. Scott, Widrig, and
Wirz (on leave 1979-80)
Visiting Assistant Professor Zañartu (1979-80)
Lecturers P. T. Brown and Huberman
Visiting Lecturer McEvelley
 (Faculty list subject to change)

Degrees Offered: B.A., B.F.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-six semester hours (twelve semester courses) is required, including at least nine 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 semester hours (ten courses), including at least nine semester hours (three courses) in both the creative arts and the history of art. History of Art 205, 206 are required of all majors.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 84 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.

Sewall Art Gallery
Basilios Poulos, *Director*

Sewall Art Gallery, located on the main floor of Sewall Hall, operates under the auspices of the Department of Art and Art History. Exhibitions of moderate size, usually directly related to departmental courses, are held throughout the academic year. Works from the departmental collection, student exhibitions, as well as shows drawn from outside sources are recurrent parts of the program.

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 (3-0-3 each semester).

A survey of painting, sculpture, and architecture from the Paleolithic period to the twentieth century. Open to all students. *Mr. Scott, Mr. Widrig, 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*

225. Primitive Art (3-0-3).

The arts of sub-Saharan Africa and the Pacific islands, including Australia: known history, theories of evolution, and regional styles at the time of European colonization. Also offered as Anthropology 225. Offered spring 1979-80. *Mr. Scott*

235. Art of Beginning Civilization (3-0-3).

Comparative expression in visual arts and architecture from Neolithic origins to establishment of empires in the ancient Near East (Egypt to Mesopotamia) and pre-Columbian America (Mexico to Peru). Also offered as Anthropology 235. Offered fall 1979-80. *Mr. Scott*

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. *Staff*

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. *Staff*

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. Not offered every year. *Staff*

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 1979-80. *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 1979-80. *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. *Staff*

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. Offered spring 1979-80. *Mr. Davezac*

319, 320. Gothic Art (3-0-3 each semester).

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*

325. African Art (3-0-3).

Traditional arts of sub-Saharan West Africa in the context of tribal cultures. Distribution of common forms and courtly arts. Also offered as Anthropology 325. Not offered every year.

336. Oceanic Art (3-0-3).

Aboriginal arts of the Pacific Islanders in the context of their cultures. Diffusion of similar forms and Asiatic sources. Also offered as Anthropology 336. 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. Offered fall 1979-80. *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. Offered spring 1979-80. *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 1979-80. *Mr. Camfield*

356. American Art of the Twentieth Century (3-0-3).

Survey of painting, sculpture, photography, and architecture in the United States from 1900 to the 1960s. Offered spring 1979-80. *Mr. Camfield*

400. Classicism and Its Revivals (3-0-3).

Origins of classicism in architecture, sculpture, and painting in fifth-century Greece. Analysis of subsequent revivals in later periods to the twentieth century. Offered spring 1979-80. *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. Not offered every year. *Staff*

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 1979-80. *Mrs. Brown*

425. The Art of Venice (3-0-3).

Venetian art and architecture traced from its Late Antique origins to its flowering in the sixteenth century and its subsequent reflorescence in the eighteenth century. Not offered every year. *Staff*

438. Indian Art of North America (3-0-3).

Arts of historic and prehistoric Indian cultures of the United States and Canada; emphasis on Southwest, Northwest Coast, and the Alaskan Eskimo. Also offered as Anthropology 438. Not offered every year. *Staff*

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. Permission of instructor required. Also offered as Architecture 442. Not offered every year. *Staff*

446. Ancient Art of South America (3-0-3).

Survey of the evolution of the arts in Andean civilizations from preceramic coastal communities to the Inca state. Includes northern South America, lower Central America, and Antilles. Also offered as Anthropology 446. Not offered every year. *Staff*

447. Ancient Art of Mesoamerica (3-0-3).

The pre-Hispanic art of Mexico, Guatemala, and Honduras, beginning with the Olmec culture (ca. 1200-600 B.C.) and culminating with that of the Aztec. Also offered as Anthropology 447. Offered spring 1979-80. *Mr. Scott*

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 fall 1979-80. *Mr. Camfield*

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. *Staff*

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 1979-80. *Mr. Camfield*

491a. Special Topic: 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 1979-80. *Mr. Davezac*

491-496. Special Topics.

Advanced courses irregularly offered or special research and reading tailored to the individual student. 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. Permission of faculty required.

Studio Art

Arts Courses

101a. Design I (1-6-3).

Principles of two-dimensional design, including color theory. Strongly recommended for art majors; open to all students. Architecture 101 accepted as equivalent.

Mr. O'Neil, Staff

102. Design I (1-6-3).

Continued study of the elements and principles of design. Three-dimensional problems are introduced. Architecture 102 accepted as equivalent. Not offered every year.

Staff

225a,b; 226b. Drawing I (1-6-3 each semester).

An introduction to the problems of drawing, using various media (pencil, charcoal, pen-and-ink). Open to all students.

Staff

325a, 326b. Life Drawing (1-6-3).

Drawing from the model in various media. Prerequisite: permission of instructor.

Mr. Poulos, Mr. Boterf, Staff

411a, 412b. Print Making (1-6-3 each semester).

Etching, lithography, and other printmaking methods, both in black and white and in color. Prerequisite: Arts 225, 226.

Mr. Zaňartu, Staff

423. Painting on Paper (1-6-3).

Watercolor, both transparent and opaque. In addition, pastel, collage, and various contemporary mixed media may be employed. Prerequisite: Drawing I or Design I. Offered spring 1979-80.

Mr. O'Neil, Staff

425a, 426. Painting I (1-6-3 each semester).

Problems of painting, both traditional and experimental, in various opaque media. Open to all students. Prerequisite: Arts 225, 226 or permission of instructor. Arts 426 not offered every year.

Mr. Zaňartu, Staff

435a,b; 436a,b. Sculpture I (1-6-3 each semester).

Sculpture in clay, ceramics, metal welding, and other sculptural media. Open to all students.

Mr. Ferber, Mr. Parsons

449a, 450b, 451a, 452b, 453a, 454b. Special Problems (1-6-3 each semester).

Advanced problems in creative art with individual instruction and criticism. Admission by permission of department chairman and instructional staff. May be repeated for credit.

Staff

465a,b; 466a,b. Sculpture II (1-6-3 each semester).

Advanced problems in various media. Prerequisite: Arts 435, 436.

Mr. Ferber, Mr. Parsons

501a,b-507a,b. Independent Study (1-6-3 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 (2-12-6 each semester).

The same as Arts 501-507 with increased credit hours.

515a,b-521a,b. Independent Study (3-18-9 each semester).

The same as Arts 501-507 with increased credit hours.

522a,b-528a,b. Independent Study (4-24-12 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

305a, 306b. Photography II (3-3-3 each semester).

Advanced problems in photography. Emphasis on independent pursuit of projects submitted by students.
Mr. Brown, Mr. Winningham

327a,b; 328a,b. Film and Videotape Making I (3-0-3 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, 330b. Film Form I (3-0-3 each semester).

Viewing, analysis, and discussion of modern and classic films. Also offered as English 329, 330. Offered 1979-80.
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 (3-0-3 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

429, 430. Film Form II (3-0-3 each semester).

Viewing, analysis, and discussion of films. More academic course with assigned reading and reports. Not offered every year.
Staff

431. New American Independent Avant Garde Cinema (3-0-3).

An historical and analytical study of the efforts and ideas shaping the development of the new American Independent Avant Garde Cinema, sometimes known as the Underground. Not offered every year.
Staff

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 (1-6-3 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. In recent years, these have included classics such as Shakespeare's *Much Ado About Nothing* and the *Alchemist* by Ben Jonson, as well as modern experimental shows such as *The Serpent* of Jean Claude van Italic and Charles Marowitz's *A Macbeth*. The Players have presented their own adaptation of *Alice in Wonderland* and the musicals *Zorba* and *The Canterbury Tales*. Participation is open to any Rice student or faculty member.

Theater Course

301a, 302b. Introduction to Theater (3-0-3 each semester).

Analysis and interpretation of plays from the viewpoints of the theater artists: director, actor, and designer. Techniques of theater production.
Mr. Havens

Behavioral Science

Degrees Offered: B.A. (interdisciplinary degree), M.A., Ph.D.

Undergraduate Program. 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.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 90 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 Anthropology offers a graduate program in behavioral science leading to the doctorate with specialization in all major fields of anthropology except physical anthropology. The program of study of each student is planned insofar as possible to meet the needs and interests of the student as well as certain general standards. A qualifying examination must be taken at the end of the first year and must be passed not later than the end of the second year. Competence in one foreign language is usually required. Comprehensive examinations must be passed before the student is admitted to candidacy for the Ph.D. and undertakes work on the doctoral dissertation.

An important part of the student's training is participation in research and teaching. Each student has an individual adviser and ordinarily participates in research programs and teaching. Upon completion of the comprehensive examinations and approval of candidacy for the Ph.D., the M.A. is optionally offered, but 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, a passing grade on the qualifying examination, and a thesis.

Additional information may be obtained from the Department of Anthropology.

Behavioral Science Courses

500. Basic Trends in Sociological Theory (3-0-3).

Classical theories of Durkheim and Weber and their contribution to contemporary sociological perspective. Examination of current sociological theory: conflict theory, exchange theory, social behaviorism, and microsociology. Also offered as Sociology 315.

505a,b. Independent Study and Tutorial (0-0-3 to -9 each semester).

515. Ethnological Theory (3-0-3).

Seminar surveying major trends of ethnological theory from the beginning of anthropology. Also offered as Anthropology 400.

546b. Linguistic Anthropology (3-0-3).

Linguistic theory and method in the analysis of cultural materials. Also offered as Anthropology 508 and Linguistics 508.

597a, 598b; 697a, 698b. Research and Thesis in Behavioral Science (0-0-3 to -9 each semester).**700c. Summer Graduate Research.****800b. Degree Candidate Only.**

Biochemistry

Professor Schroepfer, *Chairman*

Professors Awapara, Palmer, and J. B. Walker

Associate Professors Matthews, Olson, Quiocho, and Rudolph

Assistant Professors 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 88-90) 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 of 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. *Mr. Palmer, Mr. Rudolph*

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. *Staff*

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. *Mr. Palmer, Mr. Rudolph*

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. *Staff*

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 F. M. Fisher, Chairman

Professors Campbell (on leave 1979-80),

Philpott, Sass, Storck, Subtelny, and C. H. Ward

Associate Professors Ansevin (on leave 1979-80),

Glantz, Harcombe, and Stewart

Assistant Professor Procunier

Adjunct Assistant Professor Schroder

Instructors Green and Vorhaben

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. Biology majors are required to take 12 semester hours in introductory mathematics (Mathematics 10 or equivalent), seven semester hours of introductory physics (Physics 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.

Undergraduate Double Major. Double majors including biology must comply with the above requirements except that one biology course may be deleted. Students interested in a program in environmental biology should contact Dr. Harcombe for curriculum requirements.

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, preferably 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), and chemistry (including organic) is required as a prerequisite for biochemistry. The above requirements do not preclude admission of qualified applicants who have majored in areas other than biology. Any deficiencies must 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 88-90), 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

322b. General Physiology (3-0-3).

Basic principles and mechanisms of animal physiology. Special emphasis on cellular and subcellular processes. Staff

324. Laboratory for General Physiology (1-3-2).

Experimental methods in cellular and membrane physiology. Emphasis on electrophysiological techniques and measurements. Not offered every year. Staff

341a. Ecosystem Biology (3-0-3).

Analysis of species interactions, plant and animal community organization, and ecosystem function. *Mr. Harcombe*

343a. Laboratory in Ecosystem (1-3-2).

Field studies of natural ecosystems. Saturday field trips required. Corequisite: Biology 341. *Mr. Harcombe*

350b. Plant Biology (3-0-3).

Analysis of the physiology, morphology, and evolution of plants in terms of adaptation to environment. *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 consent of instructor. Limited to thirty-two students. *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 consent of instructor. *Mr. Stewart*

381a. 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 consent of instructor. *Staff*

384b. Laboratory in Advanced Experimental Biology (1-6-3).

Identification and characterization of cells and subcellular components including macromolecules. *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*

412b. Parasitism and Symbiosis (3-0-3).

Introduction to the biology of symbiosis; special emphasis on parasitism and on the physical and chemical relationships between organisms. Not offered every year. *Mr. Fisher*

414b. Laboratory in Parasitology (1-3-2).

Survey of animal parasites of medical and veterinary importance, emphasizing techniques of identification, diagnosis, and necropsy. Not offered every year. *Mr. Fisher*

418b. Biological Oceanography (3-3-4).

Study of the biological aspects of oceanography, emphasizing planktonic, nektonic, and benthonic organisms. Prerequisite: consent of instructors. 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 consent of instructor. Enrollment limited to twenty students. Not offered every year. *Staff*

422b. 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. Prerequisite: Biology 203, 384; Chemistry 101, 102. *Mr. Sass*

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 prokaryotes and eukaryotes and of 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*

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 consent 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 to develop eggs and embryos; individual research projects. *Mr. Subtelny*

534b. Advanced Developmental Biology (3-0-3).

Informal seminars on recent advances in problems of embryonic development. *Mr. Subtelny*

543b. Marshland and Estuarine Biology (3-6-5).

Student reports, conferences, and field work on the physical composition and biota of nearby coastal environments. Field trips on weekends. Prerequisite: consent of instructor. Not offered every year. *Mr. Fisher*

545a. Marine Biology and Ecology (3-3-4).

Study of shallow water marine communities with emphasis on Gulf Coast habitats and biota. Field trips to selected locations on weekends. Prerequisite: consent of instructors. 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: consent of instructor. *Mr. Harcombe*

533a,b. Topics in Plant Biology (3-0-3).

Seminar on current literature and research in plant biology. Prerequisite: consent of instructor. *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: consent of instructor. *Mr. Stewart*

571a,b. Topics in Microbiology (3-0-3).

Discussion of research literature. Prerequisite: consent 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 Wenkert, *Chairman*

Professors Brooks, Curl, Hackerman, Kilpatrick,

Lewis, Margrave, Sass, and Schroeffer

Associate Professors Billups, Engel, Glass, Parry, and L. J. Wilson

Assistant Professors Fukuyama, Mukamel, Smalley, and Sosinsky

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. Interdepartmental majors are offered in chemical physics and materials science by the Department of Chemistry in conjunction with the Departments of Physics and Materials Science, respectively. Students electing one of these majors should discuss their programs with both the Department of Chemistry and the other department concerned.

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 pages 93-94). 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 demonstrate a reading knowledge of scientific German, French, or Russian; 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. They must possess a reading knowledge of one modern language, besides English, in which there is a significant body of chemical literature, usually German, French, or Russian. 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. 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 and gravimetric methods of quantitative analysis; fundamentals and methods of qualitative analysis. Normally taken with Chemistry 101, 102; the three courses (or equivalent) are prerequisite for advanced courses in chemistry. *Mr. Brooks, Mr. Curl*

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. *Mr. Billups*

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.

Mr. Engel, Mr. Fukuyama

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. Brooks, Mr. Glass

313a. Experimental Physical Chemistry (1-4-2).

Experiments illustrating techniques employed in high vacuum, optical spectroscopy, calorimetry, electrochemistry, and surface area measurements.

Staff

314b. Advanced Instrumental Laboratory (0-8-2).

Principles and application of modern instrumental methods to inorganic and physical chemistry. Prerequisite: Chemistry 311 and 313.

Staff

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. Engel

403a. Advanced Organic Laboratory (1-8-2).

Covers the techniques of modern organic chemistry. Designed to accompany Chemistry 401. Prerequisite: Chemistry 211, 212.

Mr. Lewis

411b. 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.

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. Glass

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, 303; Physics 201, 202 or 211, 212.

Mr. Kilpatrick

430a. Quantum Chemistry (3-0-3).

Quantum mechanics, atomic structure, the nature of the chemical bond, and statistical mechanics. Prerequisite: Mathematics 211, 212 and 303; Physics 101, 102 and 201, 202 or 211, 212; Chemistry 311.

Mr. Curl

445a. 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.

Mr. Lewis

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. Margrave

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.

Staff

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 thesis 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. Sosinsky

- 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. *Staff*
- 541, 543, 545, 546. Special Topics in Organic Chemistry** (3-0-3 each semester).
Not offered every year. *Staff*
- 542b. Special Topics in Organic Chemistry** (3-0-3).
Chemistry and mechanisms of reactions of organic compounds containing non-metallic elements in addition to carbon, hydrogen, oxygen, and amine nitrogen. *Mr. Lewis*
- 544. Special Topics in Organic Chemistry** (3-0-3).
Photophysics of organic molecules and their light-induced chemical reactions. Not offered every year. *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. Engel, Mr. Fukuyama*
- 581-584. The Chemistry of Organic Natural Products** (3-0-3 each semester).
Not offered 1979-80. *Staff*
- 590, 591. Advanced Topics in Physical and Theoretical Chemistry** (3-0-3 each semester).
Not offered every year. *Staff*
- 592. Special Topics in Physical Chemistry** (3-0-3).
Not offered every year. *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*
- 596. Special Topics in Inorganic Chemistry** (3-0-3).
Physical techniques used in modern transition metal chemistry, including magnetochemistry, electrochemistry, and esr, pmr, photoelectron, and Mossbauer spectroscopy. Not offered every year. *Staff*
- 597. Special Topics in Inorganic Chemistry** (3-0-3).
Synthetic and theoretical approaches to new areas of inorganic chemistry, e.g., fluorine chemistry, baron chemistry, radiochemistry. Not offered 1979-80. *Staff*
- 605, 606. Special Topics in Inorganic Chemistry** (3-0-3 each semester).
Advanced survey of descriptive inorganic chemistry. Self-study reading course by permission of the instructor. Not offered 1979-80. *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, 303. *Staff*
- 652b. Quantum Mechanics** (3-0-3).
Application of quantum mechanics to atomic and molecular systems. *Staff*
- 700c. Summer Graduate Research.**
- 800b. Degree Candidate Only.**

Computer Science

Professor Jump, *Chairman*
Associate Professors Feustel and Kennedy
Assistant Professors Blattner, Hirschberg, and Sinclair

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 1979-81, the committee consists of Professor Jump (chairman), Associate Professor Kennedy, and Assistant Professor Hirschberg.

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 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).

A semi-self-paced introduction to programing in PL/1 for students in computer science and engineering. Also offered as Electrical Engineering 220 and Mathematical Sciences 220.

221a,b. Digital Computing for the Humanities and Social Sciences (3-3-4).

A semi-self-paced introduction to programing in APL and PL/1 with emphasis on problems from the humanities and social sciences. Also offered as Electrical Engineering 221 and Mathematical Sciences 221.

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 Electrical Engineering 222 and 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 Electrical Engineering 322 and 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. Prerequisite: Computer Science 316, 320, 321. Also offered as Electrical Engineering 421 and Mathematical Sciences 421.

422b. Case Studies in Management Information Systems and Data Processing (3-0-3).

Semester project includes building a decision model and making computer runs to obtain recommended policy decisions. Also listed as Mathematical Sciences 422.

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.

517. Topics in Automata Theory (3-0-3).

Topics may include algebraic structure of machines, Krohn-Rhodes decomposition, probabilistic automata, a-transducers, and tree automata. Prerequisite: Computer Science 416 or consent of instructor. Also offered as Electrical Engineering 517 and Mathematical Sciences 517. Not offered every year.

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. Programing laboratory projects. 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.

524b. Operating System Components (1-6-3).

Laboratory in operating systems involving team projects on a minicomputer system. Prerequisite: Computer Science 420, 421. Also listed as Electrical Engineering 524. Not offered every year.

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.

Economics

Professor Rimlinger, *Chairman*
Professors Besen (on leave 1979-80), Huddle,
Krzyzaniak, Soligo, Young
Visiting Professor North (fall 1979)
Associate Professors G. W. Smith and K. J. White
Adjunct Associate Professors Lairson and Swint
Assistant Professors Cooke, Wright, and Zodrow
Visiting Assistant Professor Starnes

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, 212 and 370
2. Economics 375 or 355
3. At least three of the following: Economics 301, 355, * 415, 416, 417, 420, 430, 435, 436, 438, 445, 448, 450, 461, 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, 104 and Mathematical Sciences 381 and 480 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*

212b. 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*

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. Not offered every year. *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. *Mr. North*

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 USSR, 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 oligopoly pricing. Application of micro theory to industry problems. Prerequisite: Economics 211 or approval of instructor. *Mr. Wright*

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. *Mr. Besen*

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. *Mr. Wright*

448b. Corporation Finance (3-0-3).

Financial analysis, planning, and control in modern corporations; includes valuation, cost and allocation of capital, capital markets. *Mr. Wright*

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*

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 approval of instructor. *Mr. Cooke*

471a. Linear Programming (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 programming and microeconomic theory is strongly recommended. Also offered as Mathematical Sciences 475. *Staff*

476b. Operations Research, Stochastic Models (3-0-3).

Decision theory, waiting-in-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*

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 each 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. *Mr. Krzyaniak*

505b. Monetary Theory (3-6-5).

The nature of monetary economy; asset choice; the role of financial institutions; inflation. *Mr. Starnes*

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. *Mr. Wright*

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. *Mr. North*

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*

520b, 521a. Workshop in Economics I, II (3-0-3 each semester).

Intensive study of selected advanced topics. *Mr. Huddle*

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, 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 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, 410 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 91 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: History 211, 212; 105, 106; or consent 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*
- 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 cur-
riculum and current trends in administration of secondary schools. Introductory educa-
tional research. *Mr. Baum, Mr. Wood*
- 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. 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 Alan J. Chapman, professor of mechanical engineering and a member of the faculty since 1949.

The programs in engineering are accredited by the Engineer's Council for Professional Development (ECPD). In civil, electrical, and mechanical

engineering and in materials science, the B.S. degree is accredited. In chemical engineering, the M.Ch.E. is accredited, and the B.S. degree has been evaluated recently, and accreditation is pending.

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 and 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 their major department.

A program which satisfies the requirements of all engineering departments for the first year is given below. There is enough difference in the second-year requirements so that it is not possible for a student to keep entry into all engineering departments open during the second year. Proper orientation during the first year, however, should make such a plan unnecessary. To determine the courses that are required in the second year by any of the engineering departments, the student should obtain lists of required and recommended courses from departments they are considering for a major. This should be done early enough to plan courses for the second year.

First year

Mathematics 101, 102 (or equivalent honors courses) (required by all engineering departments)

Physics 101, 102, 132 (required by all engineering departments)

Chemistry 101, 102, 107

Electives (four semester courses)

Basic Health and Physical Education

ROTC, if elected

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).

Engineering drawing as a means of communication. Orthographic projection, pictorial projection, dimensioning, lettering, sketching, and computer graphics.

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).

Programming; algorithms and flow charts; languages. FORTRAN programming. Data structures and representation. Numeric and nonnumeric computing techniques. Introduction to numerical analysis. Prerequisite: Mathematics 101, 102.

241a,b. Electrical Circuits (3-4-4).

Models of electrical circuit elements. Formulation, solution, and interpretation of network equations. Application to electronic circuits, signal analysis, and general system theory. Prerequisite: Mathematics 101, 102.

Chemical Engineering

The George R. Brown School of Engineering

Professor S. H. Davis, *Chairman*

Professors Akers, Armeniades (on leave 1980),

Deans (on leave fall 1979), Dyson, Hellums, Hightower,

Kobayashi, Leland (on leave fall 1979), and McIntire

Adjunct Professor G. D. Fisher

Assistant Professor Rowley

Adjunct Assistant Professors Aghili, Schaezler, V. C. Smith, and Venable

Degrees Offered: B.A., B.S., M.Ch.E., M.S., Ph.D.

Undergraduate Program. A general outline of the first year of an undergraduate engineering program is given under Engineering and Applied Science. A list of courses specifically required by the department is available from the chemical engineering adviser in each college or from the departmental office, 246 Abercrombie Lab.

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, biomedical 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 departmental requirements for a total of at least 137 semester hours. For the B.S. major, the department may require up to 104 semester hours, prerequisites and laboratory courses included. Students seeking the B.S. must also satisfy the distribution requirements and complete no fewer than 33 semester hours outside the departmental requirements for a total of at least 137 semester hours.

Graduate Program. Graduate study in chemical engineering can lead either to the Master of Science or Doctor of Philosophy. University requirements for these degrees are outlined on pages 88-90.

Candidates for the Master of Science degree are required to complete a minimum of twenty-four approved semester hours with high standing. They must also submit and defend the thesis in an oral examination indicating research ability.

Candidates for the Doctor of Philosophy degree must demonstrate competence in one foreign language and 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 which 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.

Mr. Deans, Mr. Hightower

302a. 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

344b. Chemical Engineering Laboratory (1-3-2).

Experiments demonstrating the principles presented in Chemical Engineering 301, 302.

Staff

401a. Introduction to Transport Phenomena (3-0-3 each semester).

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. Hellums

402b. Introduction to Transport Phenomena (3-0-3 each semester).

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. A supervised computation laboratory included.

Mr. McIntire

404b. Equipment Design II (3-3-4).

Continuation of 403, including optimal design of chemical reactors and transfer equipment, and an introduction to process control. Prerequisite: Chemical Engineering 490 or permission of instructor.

Staff

411a. Fundamentals of Thermodynamics (3-0-3).

Development and application of the first and second laws of thermodynamics.

Mr. Rowley

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*

490b. Kinetics and Reactor Design (3-0-3).

Principles and significance of chemical kinetics; procedures for evaluating kinetic parameters from reaction rate data; and 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*

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, Mr. Davis*

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*

512b. Thermodynamics II (3-0-3).

Advanced treatment of chemical and physical equilibrium in multicomponent systems. A detailed study of nonideal solutions. *Mr. Leland*

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 programming. 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. *Staff*

551a/b. Advanced Separation Processes (3-0-3).

Multistage calculations for multicomponent systems; digital computer solutions of separation problems; development of mathematical models for real stages. *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. Not offered 1979-80. *Mr. Armeniades*

601a/b. Advanced Topics in Fluid Mechanics and Transport (3-0-3).

Advanced study in 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 waves on liquid surfaces, diffusion in liquids, motion of drops and bubbles, and electrophoresis. *Mr. McIntire*

611b. Advanced Topics in Thermodynamics (3-0-3).

Thermodynamics of multicomponent systems. Topics include phase and chemical equilibria, property estimation and prediction, mixture theories, systems with surfaces, and systems with external fields. *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. Only 631b offered 1979-80. *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. *Staff*

672b. Special Topics in Applied Mathematics (3-0-3).

Introduction to hydrodynamic stability analysis. Classical problems in linear and nonlinear stability, with emphasis on the general techniques of analysis and applications in chemical engineering systems. *Mr. McIntire*

675a/b. Process Dynamics (3-0-3).

Dynamic equations for discrete and continuous models of chemical systems. Linearization applied to control problems in chemical processes. Simulation techniques using digital computers. Stability and phase plane analysis. *Mr. Davis*

683a, 684b. Master's Research and Thesis.**685. Molecular Theory of Fluids (3-0-3).**

Not offered every year.

*Staff***692b. Advanced Topics in Chemical Reaction Engineering (3-0-3).**

Modeling of fixed-bed reactors with emphasis on computational efficiency. Applications of generalized dispersion theory and multicomponent perturbation chromatography. *Mr. Deans*

700c. Summer Research.**720a/b. Advanced Topics in Chemical Engineering (3-0-3).***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 Krahl, Merwin, Sims, and Veletsos (on leave fall 1979)

Associate Professors Holt and Lutes

Lecturer Ghazzaly

Degrees Offered: B.A., B.S., M.C.E., M.S., Ph.D.

Preceptors

George E. Brandow
Brandow and Johnston Associates
Los Angeles, California

William J. LeMessurier
LeMessurier Associates/SCI
Cambridge, Massachusetts

Fazlur R. Khan
Skidmore, Owings, and Merrill
Chicago, Illinois

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, 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. The curriculum is designed to provide a sound basis for future professional growth. Two programs are offered, a basic program which has considerable strength in structural engineering and an environmental option given in collaboration with the Department of Environmental Science and Engineering. Each is a broad program that includes fundamental courses in mathematics and the engineering sciences and specialized courses in structural engineering and mechanics, geotechnical engineering, transportation engineering, and environmental engineering. Many advanced courses in structural engineering and mechanics and in environmental engineering may be taken as free electives by students interested in more specialization.

The accredited professional degree in civil engineering is the Bachelor of Science in civil engineering. A Bachelor of Arts degree with a civil engineering major is also available. The B.A. program has less technical content than the B.S.C.E. program and hence more flexibility with electives.

In addition to the departmental requirements for the major, students must also satisfy the distribution requirements and complete no fewer than 60 semester hours for the B.A. and 42 semester hours for the B.S. outside the departmental requirements for a total program of at least 129 semester hours for the B.A. and 134 for the B.S. See Degree Requirements and Majors, pages 50-51. Detailed course requirements for each degree may be obtained from the departmental office. The program of each student is formulated in consultation with an adviser.

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. A student may apply for admission to the graduate program in civil engineering after receiving either bachelor's degree.

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 civil 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.

Preceptorships in management are also offered. In this program, the student works one year for a large engineering and construction company under the guidance of an outstanding engineer, which provides exceptional experience in project management. He or she then returns to Rice to work for

the degree of Master of Business and Public Administration in the Jesse H. Jones Graduate School of Administration.

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 92. University requirements for other advanced degrees are described on pages 88-90. 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; (5) pass a final public oral examination on the thesis and related topics; and (6) demonstrate a reading knowledge of one foreign language, usually French, German, or Russian. 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; applications of probability theory to civil engineering problems, particularly random vibrations; behavior of concrete components and structural systems; structural instability; plasticity; optimization of structural design; experimental studies of fatigue in steel structural assemblies; and the design of innovative structural systems.

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. Elementary Structural Analysis (2-0-2).

Analysis of statically determinate structures. Stability and determinacy. Influence lines. Approximate analysis of indeterminate structures. Prerequisite: Engineering 211 and concurrent registration in Civil Engineering 300.

Mr. Holt

305a. Indeterminate Structural Analysis (4-0-4).

Deflections of statically determinate structures. Analysis of statically indeterminate structures. Limit analysis. 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***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. For graduate credit a student should register for Civil Engineering 517. Prerequisite or corequisite: Civil Engineering 403. Meets with Architecture 413.

*Mr. Krahl***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. For graduate credit a student should register for Civil Engineering 518. Prerequisite: Civil Engineering 403. Meets with Architecture 414.

*Mr. Krahl***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. Steam-flow hydrograph techniques; flood routing in open channels and river systems. Hydrologic analysis 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. Sims***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 1980-81.

*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 1979-80.

*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 1979-80.

Mr. Austin

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, probability theory, and economic analysis to design and operation of civil engineering systems. Topics include problem formulation, linear and nonlinear optimization, and scheduling problems. Not offered 1979-80.

Mr. Lutes

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 structure, 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 1979-80.

Mr. Veletsos

517a. 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: Civil Engineering 403. Meets with Architecture 611.

Mr. Krahl

518b. 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. Prerequisite: Civil Engineering 403. Meets with Architecture 612.

Mr. Krahl

519. Shells (3-0-3).

Introduction to theories of shells with applications to practical problems. Not offered 1979-80.

Mr. Veletsos

521a. Structural Dynamics I (3-0-3).

Dynamics of force-excited linear structures having from one to an infinite number of degrees of freedom, with application to design.

Mr. Veletsos

522b. Structural Dynamics II (3-0-3).

Dynamics of ground-excited elastic and inelastic structures. Introduction to earthquake engineering, problems of foundation vibration, and dynamics of foundation-structure systems.

Mr. Veletsos

523b. Probabilistic Structural Dynamics (3-0-3).

Dynamic response of structural systems to excitations characterized as stochastic processes. Prerequisite: Civil Engineering 521.

Mr. Lutes

524. Stress Waves in Solids (3-0-3).

Theory of wave propagation with applications to structural engineering. Not offered 1979-80.

Mr. Lutes

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*

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 1979-80. *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 1979-80. *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,
Leeds, T. W. Parks, Pearson, Pfeiffer, Tittel, and Troelstra**

Adjunct Professor Saltzberg

Associate Professors Feustel, Glantz,

Kim, and W. L. Wilson

Adjunct Associate Professor P. M. Stevens

Assistant Professors Hirschberg, D. H. Johnson, and Sinclair

Adjunct Instructor Garcia

Lecturers Bourland and Cyprus

Adjunct Lecturer Calfee

Degrees Offered: B.A., B.S., M.E.E., M.S., Ph.D.

Undergraduate Program. The first year of the engineering program is described on pages 152-53. 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; and three courses plus one laboratory chosen from Chemistry 101, 102, 107 and Physics 211, 212, 231. Other courses of interest are Engineering 200 and 211, which can be used to satisfy the B.S. requirement for an engineering science course from another engineering department.

In addition to the departmental requirements for the major, students seeking the B.A. 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., no fewer than 42 semester hours outside departmental requirements for a total of 134 semester hours are required. See Degree Requirements and Majors, pages 50-51.

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 Engineering Council on Professional Development, 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. With satisfactory achievement, students may qualify for a fifth year of study leading to the professional degree of Master of Electrical Engineering. This degree is also available, on a part-time or full-time basis, for students other than Rice undergraduates.

Suggested programs and upper level requirements for the Bachelor of Arts, Bachelor of Science, and Master of Electrical Engineering are available from the department. These programs are flexible and may be adjusted to suit individual interests and needs.

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.

Graduate Degrees. Requirements of a general nature for advanced degrees are outlined on pages 88-90. Students should consult departmental advisers for specific courses of study.

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. 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 devote a minimum of three academic years of graduate study in this program.

Although a general program of study may be arranged and some attention given to professional preparation in breadth, the program in electrical engineering may be described in terms of four major areas of concentration.

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.

Two main research areas have been developed, namely: (1) cardiopulmonary-renal systems and (2) neurophysiological systems. For a student interested in clinical applications, close cooperation with faculty at the Texas Medical Center in Houston is possible. At the graduate level, research is generally in one of these two areas, while courses are selected to ensure a sound engineering background and competence in several areas of the life sciences.

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.

Computer Science and Engineering

This program is divided into the following three topics: (1) hardware engineering, (2) software engineering, and (3) discrete system modeling. Students selecting the computer science and engineering option must complete a broad program of courses from each of these areas.

Lasers, Microwaves, and Solid-State Electronics

This area of concentration permits undergraduate and graduate 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 millimeter and submillimeter detector devices that can be used in astronomy, bubble computer memories, and integrated optics and circuits.

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).

Stresses the analytical approach to the study of living systems.

Mr. Clark

381b. Introduction to Medical Physiology and Biophysics II (3-0-3).

Continuation of Electrical Engineering 380 covering primarily nervous system control of the internal environment of the body. Prerequisite: Electrical Engineering 380.

Mr. Clark

482b. Bioengineering Instrumentation and Techniques (3-3-4).

Survey of components, instrumentation systems, and techniques related to bioengineering and selected clinical problems. Prerequisite: Electrical Engineering 380, 381, 342.

Mr. Clark, Mr. Troelstra

580b. Mathematical Modeling of Physiological Systems: Techniques and Applications (4-0-4).

Introduction to mathematical physiology that applies techniques in signal theory, control theory, and numerical analysis to a variety of physiological systems. Prerequisite: Electrical Engineering 380, 381, 401.

Mr. Clark

581. Cardiovascular Dynamics (3-0-3).

Not offered every year.

Staff

587. Computers in Biomedicine (3-0-3).

Computer applications in processing clinical signals such as EEG and EKG; characteristics of computerized patient monitoring systems. Clinical engineering aspects and current research. Not offered every year.

Staff

Circuits, Control, and Communication Systems

Electrical Engineering Courses

301a,b. Network and Systems Theory (3-0-3).

Network topology and differential equations; analysis of networks and systems based on state variable and Laplace transform descriptions; frequency domain properties; introduction to filter design. Prerequisite: Engineering 241. *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.

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. *Mr. Troelstra, Mr. Leeds*

401a. Signals and Linear Systems (3-0-3).

Unified study of signals and linear systems. Continuous-time and discrete-time analysis. Fourier, Laplace, and Z transforms. Prerequisite: Electrical Engineering 301, 342, Mathematical Sciences 330.

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.

Mr. Leeds

404. 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. Prerequisite: Electrical Engineering 301. Offered alternate years.

Mr. Leeds

430b. Introduction to Communication Theory and Systems (3-0-3).

Random processes. Baseband transmission. Analog and pulse code modulation. Communication systems design and operation concepts. Prerequisite: Electrical Engineering 331, 401.

Mr. Johnson

436b. Control Systems I (3-0-3).

Representation, analysis, and design of simple control systems in the frequency domain. Nyquist, Bode diagrams, root locus. Prerequisite: Electrical Engineering 401.

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.

Mr. Leeds

501. Advanced Linear Systems (3-0-3).

Not offered every year.

Staff

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. Advanced Communication Theory (3-0-3).

Review of stochastic processes. Gaussian and Poisson processes. Statistical detection theory and digital communication techniques. Channel models. Estimation theory; application to waveform communications. Optimal receivers in communications system. 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. Spectral estimation-maximum entropy, maximum likelihood. Speech coding, separation of overlapping signals. Interpolation and extrapolation. Prerequisite: Electrical Engineering 401, 531. *Mr. Parks*

533b. Stochastic Processes (3-0-3).

Mathematical foundations for advanced study of applied random processes. Topics such as separability and measurability; analytic properties of sample functions; linear transformation; independent increments; stochastic integrals. Prerequisite: Mathematical Sciences 482. Also offered as Mathematical Sciences 582. *Mr. Pfeiffer*

535a. Information Theory (3-0-3).

Introduction to information theory concepts. Measures of information. Noiseless coding. The discrete memoryless channel. Error bounds. Techniques of coding and decoding. Convolutional codes. Source encoding. Also offered as Mathematical Sciences 585. Not offered every year. *Staff*

536a. Control Systems II (3-0-3).

Introduction to the theory of linear multivariable control systems. Realization theory, controllability, observability, stabilizability. Topics may include state estimation, compensation, decoupling, model matching, and tracking. Prerequisite: Electrical Engineering 436. *Mr. Pearson*

538b. Detection Theory and Pattern Recognition (3-0-3).

Statistical detection theory with applications to radar. Principles of statistical pattern recognition. Clustering and syntactic approaches to pattern recognition applications. Prerequisite: Electrical Engineering 534. Also offered as Mathematical Sciences 583. *Staff*

696b. Seminar in Digital Filtering (3-0-3).*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 in PL/1 for students in computer science and engineering. Also offered as Mathematical Sciences 220 and Computer Science 220. *Mr. Hirschberg*

221a,b. Digital Computing for the Humanities and Social Sciences (3-3-4).

Semi-self-paced introduction to programing in APL and PL/1, with emphasis on problems from the humanities and social sciences. Also offered as Mathematical Sciences 221 and Computer Science 221. *Ms. Blattner*

222a,b. Introduction to Business Data Processing (3-3-4).

Semi-self-paced introduction to programing in PL/1, with emphasis on business applications and problems. Also offered as Mathematical Sciences 222 and Computer Science 222. *Staff*

223a,b. Introduction to Computing (3-3-4).

Semi-self-paced introduction to the computer solution of equations using APL and FORTRAN. Also offered as Mathematical Sciences 223 and Computer Science 223. *Staff*

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. *Staff*

320a,b. Computer Organization and Software (3-4-4).

Basic computer architecture and assembly language programming. Systems software, including loaders and assemblers. Input-output devices and programming. Prerequisite: Electrical Engineering 220. Also offered as Mathematical Sciences 320 and Computer Science 320. *Staff*

321a,b. Advanced Programing (3-3-4).

Advanced programming methods, including structured programming, team programming, data structures, searching and sorting, data management, and information retrieval. Also offered as Mathematical Sciences 321 and Computer Science 321. Prerequisite: Electrical Engineering 220. *Ms. Blattner*

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: Electrical Engineering 222. Also offered as Mathematical Sciences 322 and Computer Science 322. *Staff*

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. *Mr. Jump, Mr. Sinclair*

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. *Ms. Blattner*

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. *Mr. Hirschberg*

421a. Systems Programing (3-3-4).

Introduction to the design and construction of important software systems programs including assemblers, compilers, and operating systems. Prerequisite: Electrical Engineering 316, 320, 321. Also offered as Mathematical Sciences 421 and Computer Science 421. *Mr. Kennedy*

425b. Computer Systems (3-3-4).

Memory utilization, storage management, addressing, control, and input-output microprogramming. Comparison of solutions to computer system design problems. Prerequisite: Electrical Engineering 320, 331. Also listed as Computer Science 425. *Mr. Sinclair*

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. *Mr. Jump*

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. *Mr. Cyprus*

517. Topics in Automata Theory (3-0-3).

Topics may include algebraic structure of machines, Krohn-Rhodes decomposition, probabilistic automata, a-transducers, and tree automata. Prerequisite: Electrical Engineering 416 or consent of instructor. Also offered as Mathematical Sciences 517 and Computer Science 517. Not offered every year. *Ms. Blattner*

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. *Mr. Hirschberg*

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. *Mr. Sinclair*

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 programming. Programming laboratory projects. Prerequisite: Electrical Engineering 420, Mathematical Sciences 381. Also offered as Mathematical Sciences 521, Computer Science 521, and Linguistics 521. *Ms. Blattner*

523b. Compiler Construction (3-3-4).

Advanced topics in the design of programming 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. *Mr. Kennedy*

524b. Operating System Components (1-6-3).

Laboratory in operating systems involving team projects on a minicomputer system. Prerequisite: Electrical Engineering 420, 421. Not offered every year. *Staff*

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. *Mr. Cyprus*

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. *Mr. Jump*

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. *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. *Mr. Gordon*

308b. Acoustics (3-0-3).

Acoustic theory, atmospheric acoustics, room acoustics, attenuation, nonlinear effects, measurement techniques, transducers, and acoustical standards. Also offered as Mechanical Engineering 378. Not offered every year. *Mr. Few*

362b. Quantum Electronic Devices (3-0-3).

Lasers, optoelectronics, integrated optics, and semiconductor devices. *Mr. Rabson*

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. *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. *Mr. Rabson*

462b. Semiconductor Devices (3-4-4).

Physical principles and operational characteristics of semiconductor devices. Prerequisite: Electrical Engineering 461. *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 anisotropic 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*

560. Ferromagnetic Theory and Devices (3-0-3).

Not offered every year.

Staff

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 the Solid State (3-0-3).

Fundamental concepts about crystalline solids and basic preparation for further courses in the sequence Electrical Engineering 564-567. Also offered as Chemistry 563, Materials Science 563, and Physics 563.
Staff

564b. Electron Transport and Superconductivity (3-0-3).

Various aspects of electron transport, including semiconductor junction theory. Prerequisite: Electrical Engineering 563 or equivalent. Also listed as Materials Science 564 and Physics 564. Not offered every year. *Staff*

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, Materials Science 565, and Physics 565. Not offered every year. *Staff*

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. *Staff*

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. *Staff*

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).

One-semester 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.

Staff

697. Seminar on Magnetism (3-0-3).

Not offered every year.

Staff

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*

Professor Leeds

Adjunct Professors Characklis and Stallones

Associate Professor Few

Adjunct Associate Professors Gesell and Pier

Assistant Professors Bedient and Tomson

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., or M.E.E. 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, Economics, and Psychology 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.

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 88-90.

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, distribution, 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.

Mr. Leeds

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.

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.

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

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 simulation.

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).

Lectures 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, Wierum, and Wilhoit**

Adjunct Professor Paslay

Assistant Professors Bayazitoglu and Picologlou

Adjunct Assistant Professors Harkins and Krawitz

Degrees Offered: B.A., B.S., M.M.E., M.M.S., M.S., Ph.D.

Requirements for baccalaureate, professional, and graduate degrees in mechanical engineering and in materials science are summarized on pages 50-51, 88-90, and 92. A list of representative courses and their normal sequence during the student's undergraduate years is available from the department. By proper choice of electives in the senior and fifth years, the student can specialize in one of several options as part of the mechanical engineering degree programs: thermal sciences and energy conversion, gas-dynamics, hydrodynamics and ocean engineering, stress analysis and mechanical behavior of materials, aerospace engineering, and air pollution.

In addition to the departmental requirements for the major, students seeking the B.A. 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 135 semester hours. The B.S. degree program requires 42 semester hours outside departmental requirements and a total of 134 semester hours. See Degree Requirements and Majors, pages 50-51.

After completing the requirements for the Bachelor of Science degree or the Bachelor of Arts degree, the student is eligible to apply for the fifth-year program leading to the professional degrees, Master of Mechanical Engineering or Master of Materials Science.

Graduate degrees within this department are the Master of Science and the Doctor of Philosophy. These degree programs are open to students who have demonstrated outstanding performance in their undergraduate studies. The general university requirements for these degrees are outlined on pages 88-90. Specific course requirements are variable, depending upon preparation, performance on qualifying examinations, etc. The granting of a graduate degree presupposes superior quality academic work and demonstrated ability to do original research. For both the M.S. and Ph.D. degrees, the thesis must be defended in public oral examination.

The research interests of the faculty and the laboratory research equipment available provide the following areas of specialization: (1) engineering mechanics; (2) materials science; (3) fluid dynamics, gasdynamics, heat transfer, physical oceanography; (4) aeroastronautics; and (5) bioengineering.

Mechanical Engineering Courses

311a. Mechanics of Deformable Solids (3-0-3).

312b. Advanced Mechanics of Deformable Solids (3-0-3).

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.

371a. Fluid Mechanics I (3-0-3).

Introduction to fluid statics and dynamics; the development of the fundamental equations and their solution for classical viscous flows and high Reynolds number flows.

372b. Fluid Mechanics II (3-0-3).

Continuation of Mechanical Engineering 371 devoted to airfoil theory, lubrication, boundary layers, and turbulence.

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 1979-80.

402b. Mechanical Engineering Design (2-3-3).

Prerequisite: Mechanical Engineering 311 or equivalent.

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, performance of research project of the student's choice.

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.

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.

477a. Introduction to Atmospheric Science (3-0-3).

Fundamentals of meteorology and climatology, including radiation transfer.

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.

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 1979-80.

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).

Not offered 1979-80.

508. Perturbation Methods (3-0-3).

Approximate solutions of nonlinear equations using perturbation techniques. Not offered 1979-80.

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 thermodynamics, and porous media theories. Not offered 1979-80.

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.

514a. Theoretical Plasticity (3-0-3).

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. Also offered as Civil Engineering 514.

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.

516. Advanced Dynamics (3-0-3).

Dynamics of a particle and systems of particles. Not offered 1979-80.

517a. Finite Element Methods in Engineering (3-0-3).

Introduction to the finite element analysis with applications to problems in fluid and solid mechanics.

518b. Elements of Flow in Porous Media (3-0-3).

Introduction to the dynamics of fluids flowing in deformable porous materials.

521. Flight Mechanics (3-0-3).

General principles of kinematics and aerodynamics necessary for the derivation of the equations of motion for rocket and jet powered vehicles.

530a. Heat Exchanger Design (3-0-3).

Description and calculation of various types of present day heat exchangers. Not offered 1979-80.

531b. Solar Power (3-0-3).

Solar collector design and performance—heat storage systems and power production.

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 Mathematics 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 utilization patterns and resources; conventional conversion systems, central station power from fossil fuels; power plant design; alternative fuels; nuclear fission and fusion; energy conversion systems. Not offered 1979-80.

576. Propulsion (3-0-3).

Basic principles of gasdynamics, thermodynamics, and chemistry applied to prediction of the behavior of airbreathing and rocket propulsion devices.

578b. Combustion (3-0-3).

Study of physical and chemical processes of combustion and application to mobile and stationary systems. Not offered 1979-80.

584b. Biomechanics and Fluid Mechanics of Physiological Systems (3-0-3).

Topics include flow situations in living organisms; blood flow in capillaries, arterioles, and arteries; flow in the urinary, gastrointestinal, and reproductive tract, etc. Prerequisite: a first undergraduate course in fluid mechanics. Not offered 1979-80.

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.

592b. Advanced Gasdynamics (3-0-3).

Principles of one-dimensional unsteady and two-dimensional steady gasdynamics applied to the study of aerodynamics and physical acoustics. Prerequisite: Mechanical Engineering 591. Not offered 1979-80.

593a, b. Mechanical Engineering Problems (Credit variable).

With approval, mechanical engineering students may elect at least nine hours a week on approved investigation or design under the direction of a member of the staff.

594a. Advanced Aerodynamics (3-0-3).

Application of engineering principles and aerodynamic theory to the design and analysis of flight vehicles. Prerequisite: Mechanical Engineering 591. Not offered 1979-80.

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 1979-80.

626. Theory of Elasticity II (3-0-3).

Special topics in the linear theory of elasticity. Not offered 1979-80.

627b. 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.

671, 672. Nonequilibrium Thermodynamics I, II (3-0-3 each semester).

Foundations of the thermodynamics of irreversible processes. Not offered 1979-80.

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.

675. Special Application of Fluid Dynamics (3-0-3).

Geostrophic flows in meteorology and oceanography investigated and applied to secondary flow phenomena of laminar and turbulent character. Not offered 1979-80.

676b. Turbulence (3-0-3).

General introduction to turbulence covering isotropic, free shear, and wall shear turbulence.

682b. Convective Heat Transfer (3-0-3).

Rigorous study of the transfer of heat by free and forced convection.

683a. 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 1979-80.

684a. 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.

685b. Conduction Heat Transfer (3-0-3).

Formulation of steady, unsteady, and multidimensional conduction in different geometrics. Not offered 1979-80.

697. Hypersonic Gasdynamics (3-0-3).

Not offered 1979-80.

698. Physical Gasdynamics (3-0-3).

Equilibrium and nonequilibrium phenomena in the dynamics of high temperature gases. Not offered 1979-80.

700c. Summer Graduate Research.**800b. Degree Candidate Only.***Materials Science Courses***245a. Thermodynamics of Engineering Materials (3-0-3).**

Introduction to the kinetics and thermodynamics of engineering materials.

295. Introduction to Materials Technology Design (2-3-3).

Project course utilizing the scanning electron microscope and other analytical tools to explore the nature of metallic, ceramic, polymeric, and other materials. Not offered 1979-80.

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.

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.

404b. Materials Engineering and Design (2-3-4).

Technological aspects of materials selection, design, failure, and analysis. Laboratory time is spent in an industrial setting.

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.

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.

415. Ceramics and Glasses (3-0-3).

Fundamentals of ceramic and glassy materials, including phase relations, theoretical properties, structure, and bonding. Not offered 1979-80.

453b. Extractive and Chemical Metallurgy (3-0-3).

Survey of nonclassical beneficiation, reduction, oxidation, and refining processes for the preparation of research and reactor grade metals.

502b. Imperfections in Solids (3-0-3).

Point, line, and planar defects in ionic, homopolar, and metallic solids.

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 characterization of structure and constitution of materials.

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.

543b. Physical Metallurgy Laboratory (0-3-1).

Experiments to complement the course work of Materials Science 521.

545. Applied Physical Metallurgy (3-0-3).

Materials processing. Casting and welding of metallic materials from a fundamental point of view. Nondestructive testing by ultrasonic, magnetic, and other techniques. Not offered 1979-80.

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.

563a. Introduction to the Solid State (3-0-3).

Fundamental concepts about crystalline solids, preparation for further courses in the sequence Materials Science 564-567. Prerequisite: introductory background in wave mechanics and statistical mechanics, enrollment in a graduate level quantum mechanics course. Also offered as Chemistry 563, Electrical Engineering 563, and Physics 563.

564b. Electron Transport in Solids and Superconductivity (3-0-3).

Various aspects of electron transport, primarily from a microscopic viewpoint. Prerequisite: Materials Science 563 or equivalent. Also offered as Chemistry 564, Electrical Engineering 564, and Physics 564. Not offered 1979-80.

565. Dielectric and Optical Properties of Matter (3-0-3).

Polarization and the static model of a dielectric medium in an electric field; extension of the above model to the dynamic case and dielectric dispersion in solids. Not offered 1979-80.

566. Imperfections and Mechanical Properties of Crystalline Solids (3-0-3).

Point defects in crystals, geometrical description of dislocations, and the mathematical theory of lattice imperfections. Not offered 1979-80.

567b. Magnetism and Magnetic Resonance (3-0-3).

Magnetic properties of solids. Diamagnetism, paramagnetism, ferromagnetism, antiferromagnetism, and ferrimagnetism. Nuclear magnetic resonance, electron paramagnetic resonance, and ferromagnetic resonance. Also offered as Chemistry 567, Electrical Engineering 567, and Physics 567. Not offered 1979-80.

569b. Corrosion Science and Engineering (3-0-3).

Survey of surface activity and corrosion processes on metals, semiconductors, and insulating materials.

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.

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 1979-80.

609b. Fracture Mechanics (3-0-3).

Theory of elasticity and theory of plasticity pertinent to fracture mechanics. Not offered 1979-80.

615a,b. Special Topics (3-0-3).

Detailed course offering is based upon graduate student interest.

634a. Thermodynamics of Alloys (3-0-3).

Relation between classical thermodynamics and statistical mechanics applied to understanding solid and liquid alloys. Solid-solid, liquid-solid, and gas-solid equilibria in metallurgy.

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.

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 1979-80.

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 1979-80.

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 1979-80.

English

Professor Minter, *Chairman*
Professors Dowden, Grob, Isle, Meixner, Morris, Parish, Patten,
Piper, Spears, and J. A. Ward
Associate Professors Apple, S. A. Baker, Doody, Doughtie,
Huston, and Nietzsche
Assistant Professors Driskill and Skura

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, especially if they plan to do graduate work, at least six semester hours at the advanced level in Latin, German, or French.

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 examinations 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 satisfactorily 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 following 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, 102b. Critical Reading and Writing (3-0-3 each semester).

103a. Basic Composition (3-0-3 each semester).

104b. Basic Composition (3-0-3 each semester).
Not offered every year.

231. World Drama to 1660 (3-0-3).
Not offered every year.

232. World Drama: Isben to the Present (3-0-3).
Not offered every year.

241. World Narrative to 1500 (3-0-3).
Not offered every year.

242. World Narrative: 1500 to the Present (3-0-3).
Not offered every year.

- 251. Major British Writers: Chaucer to 1800 (3-0-3).**
Not offered every year.
- 252b. Major British Writers: 1800 to the Present (3-0-3).**
- 262. Major American Writers (3-0-3).**
Not offered every year.
- 271a, 272b. Aspects of Modern Literature (3-0-3 each semester).**
- 302. Ballad and Folksong (3-0-3).**
Not offered every year.
- 303. Literature of American Ethnic Minorities (3-0-3).**
Not offered every year.
- 304. Images of Women in Literature (3-0-3).**
Not offered every year.
- 307. Science Fiction (3-0-3).**
Not offered every year.
- 308. Detective Fiction (3-0-3).**
Not offered every year.
- 311a, 312b. Fiction Writing (3-0-3 each semester).**
- 313. Dramatic Writing (3-0-3 each semester).**
Not offered every year.
- 314. Poetry Writing (3-0-3).**
- 315. Expository Writing (3-0-3).**
- 317. Technical Writing (3-0-3).**
- 319. Publishing Procedures (3-0-3).**
Not offered every year.
- 323. Chaucer (3-0-3).**
- 328. Middle English Literature (3-0-3).**
Not offered every year.
- 329. Sixteenth-Century British Literature (3-0-3).**
Not offered every year.
- 334. Elizabethan and Jacobean Drama (3-0-3).**
Not offered every year.
- 339a, 340b. Shakespeare: Representative Plays (3-0-3 each semester).**
- 343. British Literature of the Later Renaissance (3-0-3).**
- 344. Milton (3-0-3).**
- 345. Restoration Literature (3-0-3).**
Not offered every year.
- 346. Eighteenth-Century British Literature (3-0-3).**
Not offered every year.
- 351a, 352b. British Literature of the Romantic Period (3-0-3 each semester).**
- 357. British Literature of the Victorian Period (3-0-3).**
Not offered every year.
- 361. Eighteenth-Century British Fiction (3-0-3).**
Not offered every year.
- 362. Nineteenth-Century British Fiction (3-0-3).**
- 363. Twentieth-Century British Fiction (3-0-3).**

- 364. Twentieth-Century British Poetry (3-0-3).**
Not offered every year.
- 367. Modern Drama: Ibsen to 1940 (3-0-3).**
Not offered every year.
- 368. Modern Drama: 1940 to the Present (3-0-3).**
Not offered every year.
- 378. American Literature to 1860 (3-0-3).**
Not offered every year.
- 379. American Literature: 1860-1910 (3-0-3).**
Not offered every year.
- 383. American Fiction: 1910-40 (3-0-3).**
- 384. American Fiction: 1940 to the Present (3-0-3).**
- 387. Twentieth-Century American Poetry (3-0-3).**
- 394. Structure of the English Language (3-0-3).**
Also offered as Linguistics 404. Not offered every year.
- 399. Literary Criticism: History and Theory (3-0-3).**
Not offered every year.
- 403, 404. Studies in a Major British Author (3-0-3 each semester).**
Not offered every year.
- 405, 406. Studies in a Major American Author (3-0-3 each semester).**
Not offered every year.
- 407, 408. Studies in Literary Types (3-0-3 each semester).**
Not offered every year.
- 411, 412. Studies in Modern Literature (3-0-3 each semester).**
Not offered every year.
- 413. Studies in Literary Criticism (3-0-3).**
Not offered every year.
- 421a, 422b. Directed Reading (3-0-3 each semester).**
- 423a, 424b. Senior Thesis (3-0-3 each semester).**
- 501a, 502b. Topics in British and American Literature or Literary Theory (3-0-3 each semester).**
- 521. Old English (3-0-3).**
Not offered every year.
- 528. Middle English Literature (3-0-3).**
Not offered every year.
- 529. Sixteenth-Century British Literature (3-0-3).**
Not offered every year.
- 534. Elizabethan and Jacobean Drama (3-0-3).**
Not offered every year.
- 539. Shakespeare (3-0-3).**
Not offered every year.
- 543. Seventeenth-Century British Literature (3-0-3).**
Not offered every year.
- 545. Restoration and Eighteenth-Century British Literature (3-0-3).**
Not offered every year.
- 552. British Literature of the Romantic Period (3-0-3).**
Not offered every year.

- 557. British Literature of the Victorian Period (3-0-3).**
Not offered every year.
- 561. Eighteenth-Century British Fiction (3-0-3).**
Not offered every year.
- 562. Nineteenth-Century British Fiction (3-0-3).**
Not offered every year.
- 563. Twentieth-Century British Fiction (3-0-3).**
Not offered every year.
- 564. Twentieth-Century British Poetry (3-0-3).**
Not offered every year.
- 567. Modern Drama (3-0-3).**
Not offered every year.
- 578. American Literature to 1900 (3-0-3).**
Not offered every year.
- 584. Twentieth-Century American Fiction (3-0-3).**
Not offered every year.
- 587. Twentieth-Century American Poetry (3-0-3).**
Not offered every year.
- 599. Literary Criticism (3-0-3).**
Not offered every year.
- 603. Studies in a Major British Author (3-0-3).**
Not offered every year.
- 605. Studies in a Major American Author (3-0-3).**
Not offered every year.
- 607. Studies in Literary Types (3-0-3).**
Not offered every year.
- 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 Raaphorst, *Chairman*
Professors P. Brady, Carrington, and Topazio
Associate Professor Alcover
Assistant Professors Aresu and D. H. Nelson

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*

110a,b. 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).

Not offered every year. *Staff*

306b. The French and World Novel (3-0-3).

Comparative study of novelists of the twentieth century. Offered 1979-80. *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. Prerequisites: French 202, 204, or placement exam. Not offered every year. Offered 1979-80. *Mr. Brady*

310. French Civilization (3-0-3).

Not offered every year.

Staff

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. Prerequisites: French 202, 204, or placement exam. *Staff*

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. *Staff*

318. The Middle Ages and Renaissance (3-0-3).

Not offered every year.

Staff

321a/b. The Seventeenth Century (3-0-3).

Not offered every year.

Staff

331b. 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, Baumarchais, Marivaux. Offered 1979-80. *Ms. Raaphorst*

351. French Romanticism (3-0-3).

Not offered every year.

Staff

353. Romantic Drama (3-0-3).

Not offered every year.

Staff

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. *Staff*

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. *Staff*

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 1979-80. *Ms. Nelson*

451b. Nineteenth-Century Poetry (3-0-3).

Offered 1979-80.

Mr. Brady

452. French Realism and Naturalism (3-0-3).

Not offered every year.

Staff

480. Modern French Drama (3-0-3).

Not offered every year.

Staff

482. Modern French Novel (3-0-3).

Not offered every year.

Staff

483. Twentieth-Century French Literature (3-0-3).

Not offered every year.

Staff

487. Syntax and Translation (3-0-3).

Not offered every year.

Staff

488. Translation and Interpretation (3-0-3).

Not offered every year.

*Staff***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. The topic for spring 1980 is: 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. The topic for spring 1980 is: La Comédie de Corneille à Regnard.

*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. The topic for fall 1979 is: Voltaire and Rousseau.

*Mr. Topazio***555a/b. Seminar in Romanticism (3-0-3 each semester).**

The topic changes from year to year. May be repeated for credit. The topic for fall 1979 is: Lamartine, Vigny, Hugo, and Musset. Not offered every year.

*Mr. Brady***568a/b. Seminar in Realism and Naturalism (3-0-3 each semester).**

Not offered every year.

*Staff***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. The topic for fall 1979 is: the novel before 1940 with emphasis on Malraux and Camus.

*Ms. Raaphorst***577a/b. Seminar in Contemporary Literature (3-0-3 each semester).**

Not offered every year.

*Staff***579a/b. Studies in French Poetry (3-0-3 each semester).**

Not offered every year.

*Staff***592a/b. French and English Stylistics (3-0-3 each semester).**

Not offered every year.

*Staff***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 D. R. Baker, *Chairman*
Professors J.A.S. Adams, De Bremaecker, and Heymann
Associate Professors Avé Lallemand, Casey, and H. C. Clark
Adjunct Associate Professor Streltsova-Adams
Assistant Professors J. B. Anderson, Leeman, and Oldow
Adjunct Assistant Professor Schwarzer
Lecturer Powell

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 or 104, 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 or 121, 122; Physics 132
 Mathematical Sciences 220 or Engineering 240

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 138 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. Students with a bachelor's degree in geology or related sciences from Rice University, or an equivalent degree from another institution of similar standing, are considered for admission to graduate work. Students who have not satisfactorily completed courses in geology, physics, chemistry, and mathematics (including Mathematics 211 and Mathematical Sciences 220 or Engineering 240) equivalent to the Rice bachelor's program (see above) are expected to remove these deficiencies, usually during their first year of residency.

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 at a high level of an approved program in geology and related subjects. Unless waived by a special examination, the following core courses must be completed during the first year of residency: Geology 401 or 538, 403, 412, 441, 456, 463, and 537. To remain in good standing, a student must maintain a "2" average or better in these courses. During the second semester of the first year of residency, all students must register for Geology 482 for the preparation of a thesis proposal.
2. Satisfactory performance on a Ph.D. qualifying examination administered by the thesis committee is required of all doctoral candidates.
3. For the Ph.D. degree, demonstration of competence in one approved foreign language
4. Completion for publication of a thesis which represents an original contribution to the science
5. Oral defense of the research work and conclusions of the thesis
6. 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. *Mr. Anderson*

104b. The Earth (3-0-3).

A course on major earth processes. Topics include: origin, chronology, plate tectonics, mineralogy, weathering, sedimentation, volcanism, plutonism, geophysics, geochemistry, and structural geology. *Mr. Heymann*

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 (3-3-4).

Basic introduction to crystallography, crystal chemistry, systematics and classification, physical and chemical properties, distribution, occurrence and genesis of minerals, and optical mineralogy. *Mr. Leeman*

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. Powell*

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.

Staff

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.

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.

Mr. Clark

390. Field Geology (1-9-4).

Summer field course taken at any of several approved camps operated by various universities or Rice University Field Course.

401a. Stratigraphy and Advanced Historical Geology (3-3-4).

Principles of stratigraphy and environmental interpretation of stratigraphic sequences.

Staff

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 taxonomy. Offered 1979-80.

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 consent of department. Offered 1980-81.

Mr. Casey

412b. Igneous and Metamorphic Petrology (3-3-4).

Development of geologic, petrologic, mineralogic, physical, chemical, and experimental principles of petrology; origin and evolution of major rocks emphasized.

Mr. Avé Lallemand, Mr. Baker, Mr. Leeman, Mr. Powell

417a. 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. Offered 1980-81.

Mr. Casey

418b. Geological Oceanography (3-3-4).

Study of geological aspects of oceanography, including geomorphology, nearshore processes, seafloor spreading, plate tectonics, marine geophysics, marine sediments, and paleoceanography. Offered 1980-81.

Mr. Anderson, Mr. Casey, Mr. Clark

419b. Biological Oceanography (3-3-4).

Study of the biological aspects of oceanography emphasizing planktonic organisms; nektonic and benthonic organisms and paleoceanography also considered. *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 (3-0-3).

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. Offered 1980-81.

Mr. Clark

456b. Geochemistry (3-3-4).

Study of terrestrial mechanisms governing the distribution of the chemical elements.

Mr. Adams, Mr. Baker, Mr. Heymann, Mr. Leeman

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.

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.

Mr. De Bremaecker

463a. Advanced Tectonics I (3-3-4).

Mechanics of rock deformation in theory, in experiments, and in nature.

Mr. Avé Lallemand

464b. Advanced Tectonics II (3-3-4).

Regional tectonic analysis.

Mr. Oldow

481a, 482b. Research in Geology (Credit variable).

Advanced work adapted to the needs of the individual student.

Staff

491a, 492b. Special Studies (Credit variable).

A study of recent research 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. Registration permitted only with consent 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—528b. 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

535b. Stable Isotope Geochemistry (3-0-3).

Review of basic principles of isotope fractionation mechanisms and distributions of isotopes with focus on significance to major geological problems.

Mr. Baker

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.

Mr. Baker

537a. Advanced Sedimentary Geology I (3-3-4).

Lecture, lab, and field problems focusing on sedimentology and sedimentary petrography.

Mr. Anderson, Mr. Baker

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. *Staff*

551a. Chemical Geology I (3-3-4).

Application of physical chemistry to geology. Includes basic thermodynamics, phase and mineral equilibria, solution chemistry, chemical bonding. Offered 1979-80. *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. Offered 1980-81. *Mr. Heymann*

555a. Advanced Topics in Geochemistry (3-3-4).

Study of selected topics, particularly geochronology, radiometry, isotope and trace element analysis. Offered 1980-81. *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. Offered 1980-81. *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. Offered 1980-81. *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. Offered 1980-81. *Mr. Avé Lallemant*

574a. Electron Microprobe/Scanning Electron Microscope: Theory (2-1-2).

Fundamental principles, techniques, and applications of the Electron Microprobe/SEM. Emphasis on geological problems. Practical instruction and experience in analytical techniques. *Mr. Powell*

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.
Mr. Anderson

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. No prerequisite. 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,
Ushinsky (on leave fall 1979), and J. B. Wilson
Assistant Professor Harris-Schenz

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.

Staff

103a/b. Accelerated Beginning German (6-2-8).

The equivalent of German 101 and 102 in one semester. Permission of instructor required. Not offered every year. *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. *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. *Staff*

203a, 204b. Intermediate German: Scientific (3-0-3 each semester).

Language skills based on readings from German scientific books and journals (some from the student's own field), films, and radio. Prerequisite for German 204 is German 201, 203, or equivalent. German 203 not offered fall 1979. *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. Offered 1980-81. *Mr. Wilson*

303a/b. Intermediate German: Commercial (3-0-3).

Introduction to general business practices and terminology useful in a subsequent business career. Prerequisite: second-year competence or consent 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. *Staff*

322a/b. Reading Dutch and Scandinavian (3-0-3).

A good reading knowledge of German and English is applied toward at least a fair 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. Offered spring 1980. *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. *Staff*

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*

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. *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 Expressionism 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. *Mr. Weissenberger*

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.

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. *Staff*

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. *Staff*

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. *Staff*

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. Offered fall 1979. *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 language, its significance in the Germanic subfamily, readings from the *Bible* translation of Bishop Ulfilas (fourth century). Not offered every semester. *Staff*

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. *Staff*

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. *Staff*

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. Offered spring 1980. *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. *Staff*

531a/b. Linguistic Structure of German (3-0-3).

Synchronic study of Modern German syntax, phonology, and semantics, including discourse structure. Offered spring 1980. *Mr. Copeland*

532a/b. Special Topics in German Linguistics (3-0-3).

Topics change from year to year. Not offered every year. *Staff*

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. *Staff*

562a/b. Seminar in Literary Theory (3-0-3).

Historical studies of poetic theories and literary aesthetics. Not offered every year. *Staff*

563a/b. Seminar in Literary Genres (3-0-3).

May be repeated for credit. Not offered every year. *Staff*

565a, 566b. Special Topics in German Literature (3-0-3 each semester).

May be repeated for credit. Not offered every year. *Staff*

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. Topic for fall 1979: realism. Not offered every year. *Mr. Weissenberger*

572a/b. Seminar in the Nineteenth and Twentieth Centuries (3-0-3).

Specific aspects, problems, and authors of the period. May be repeated for credit. Topic for spring 1980: exile literature. 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 fall 1979: the contemporary German novel. Not offered every year. *Ms. Eifler*

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. Offered fall 1979. *Mr. Winkler*

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. *Staff*

- 351a, 352b. Great German Authors of the Twentieth Century in Translation** (3-0-3 each semester).
Topic changes from year to year. May be repeated for credit. Not offered every year. *Staff*
- 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. In English. Not offered every year. *Staff*
- 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. *Staff*
- 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. *Staff*

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*
- 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. *Staff*
- 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. *Staff*

351a/b. Dostoevsky (3-0-3).

Study of the major novels of Dostoevsky. No knowledge of Russian required. Not offered every year. *Staff*

352a/b. Tolstoy (3-0-3).

Study of the major novels and stories of Tolstoy. No knowledge of Russian required. Not offered every year. *Staff*

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. *Mr. Ushinsky*

412a/b. Solzhenitsyn (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. *Mr. Ushinsky*

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 (0-0-3).

Qualified students may conduct research and write a paper on a topic of particular interest.

Health and Physical Education

Professor Bearden, Chairman

Professor Spence

Adjunct Professors Fred and Skaggs

Visiting Professor Poindexter

Associate Professors Barker, Bland, Disch, and Lee

Assistant Professors Hampton and Iammarino

Lecturers Bordelon and Eggert

Dance Consultant J. M. Karff

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 seven 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. Basic Health and Physical Education (0-2-0).

Includes a variety of physical education activities with emphasis on team sports. Required for the baccalaureate. *Staff*

102b. Basic Health and Physical Education (0-2-0).

Includes a variety of physical education activities with emphasis on individual sports. Required for the baccalaureate. *Staff*

105a. Foundations of Contemporary Sport (3-0-3).

A study of the interactions of philosophy, economics, politics, education, and contemporary social issues in the evolution of sport. For first- and second-year students (a prerequisite to Physical Education 128). *Ms. Poindexter*

120b. Scientific Foundations of Physical Education (3-0-3).

An introduction to the scientific areas of physical education: anatomy, physiology, kinesiology, motor learning, evaluation, and research. *Mr. Dish*

123a. Laboratory (0-3-1).

Instructions in basic aquatic activities, including mechanics of the various strokes and basic lifesaving. *Staff*

126b. Laboratory (0-3-1).

Designed to certify students as Water Safety Instructors. Prerequisite: consent of instructor. *Mr. Bland*

128b. Laboratory (0-3-1).

Methods of teaching and coaching badminton, racquetball, squash, and tennis. Formerly offered as Physical Education 225. Prerequisite: concurrent enrollment in Physical Education 120. *Mr. Barker*

135a. Laboratory (0-3-1).

Physical education activities included are archery, golf, and fencing. Formerly offered as Physical Education 325. Prerequisite: concurrent enrollment in Physical Education 105. *Mr. Bearden*

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. Sociology of Sport (3-0-3).

Study of the influence of sport as an institution in American society. *Ms. Lee*

221a. Laboratory (0-3-1).

The Red Cross multimedia standard first aid course, including CPR (a prerequisite to Health 308). *Mr. Iammarino*

226b. Laboratory (0-3-1).

Introduction to gymnastics, including tumbling, vaulting, and activities on trampoline, parallel bars, balance beam, and uneven parallel bars. *Mr. Hampton*

228a/b. Laboratory (0-3-1).

Advanced instruction in tennis for the prospective coach and/or highly skilled performer. Prerequisite: consent 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 (a prerequisite to Physical Education 321). *Mr. Spence*

301a. 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 consent of instructor. *Mr. Disch*

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).

Study of methods of planning, organizing, and executing a physical education program (formerly offered as Physical Education 310). Prerequisite: consent of instructor. *Ms. Lee*

312b. Motor Learning (3-0-3).

Preceptual motor development from childhood through adulthood. Consideration of physiological and psychological factors affecting skill acquisition and development. *Ms. Poindexter*

314b. Laboratory (0-3-1).

Practicum in physical education methodology (for students enrolled in Physical Education 308). *Ms. Lee*

319a. Tests and Measurements (3-0-3).

Introduction to basic statistics, test construction, and evaluation as related to physical education. *Mr. Hampton*

321a. Physiology of Exercise (3-0-3).

Considers physiologic response of the circulatory, respiratory, and muscular systems to exercise stress. Prerequisite: Physical Education 250. *Mr. Spence*

323a. Laboratory (0-3-1).

Measuring physiologic response to exercise stress (for students enrolled in Physical Education 321). *Mr. Spence*

324b. Laboratory (0-3-1).

Rules and mechanics of officiating basketball, volleyball, and softball. Formerly offered as Physical Education 327. *Staff*

326a. Laboratory (0-3-1).

Management and rehabilitation of sports related injuries (for students enrolled in Physical Education 341). *Mr. Eggert*

328a. Laboratory (0-3-1).

Development of basic movement in dance. *Ms. Karff*

329a. Laboratory (0-3-1).

Rules and mechanics of officiating football and soccer. Formerly offered as Physical Education 327. *Staff*

336a/b. 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 226 or consent of instructor. *Mr. Hampton*

338b. Laboratory (0-3-1).

Development of dance technique and improvisation. *Ms. Karff*

341a. Sports Medicine and Training (3-0-3).

The following areas are integrated: orthopedic anatomy, sports physiology, clinical medicine, and athletic training. Prerequisite: approval of instructor. *Mr. Spence*

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: consent of instructor. *Mr. Bearden*

411a. Concepts and Techniques of Athletic Coaching (3-0-3).

Coaching techniques, concepts, and problems in major athletic sports. Prerequisite: consent of instructor. *Mr. Bland*

416b. Sports Management (3-0-3).

Study of personnel and fiscal management of sports programs. Prerequisite: consent of instructor. *Staff*

431-436. Athletic Coaching of Team Sports (2-0-2 each).

Study of coaching methods 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*

495, 496. Independent Study (Credit variable).*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).

Study of the sociological, economic, political, legal, scientific, and engineering aspects of pollution and pollution abatement. *Mr. Ward*

208b. Chemical Alterations of Behavior (3-0-3).

Investigates the use, abuse, and misuse of alcohol, tobacco, and psychoactive drugs. *Mr. Hampton*

221a. Laboratory (0-3-1).

The Red Cross multimedia standard first aid course, including CPR (a prerequisite to Health 308). *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. *Mr. Iammarino*

308b. Emergency Care/Advanced First Aid Instructor (2-1-2).

Emergency care procedures for illness and traumatic injuries. Prerequisite: Health 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. *Mr. Kaplan*

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, materials of the program and curriculum construction in secondary school health education programs. Required for Teaching Certification in Health. *Mr. Iammarino*

History

Professor Drew, *Chairman*

Professors Garside (on leave spring 1980), Gruber, Higginbotham,

Hyman, Loewenheim, Matusow (on leave 1980),

Rath (retires June 1980), and Vandiver

Associate Professors Haskell, R. J. Smith (on leave fall 1979),

Stokes (on leave spring 1980), Van Helden,

and Wiener (on leave fall 1980 and/or spring 1981)

Instructor Hyland

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*, the *Austrian History Yearbook*, or *The Papers of Jefferson Davis*, all 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 or Staff*

105a, 106b. Varieties of the American Experience (3-0-3 each semester).

Interpretive approaches to American history.

Mr. Gruber, Mr. Higginbotham, Mr. Matusow, Mr. Vandiver, or Staff

201a. Ancient History (3-0-3).

History of the ancient Near East, Greece, the Roman Republic, and the Early Empire. *Mrs. Drew or Staff*

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. *Mr. Van Helden*

250b. Chinese Culture: Past and Present (3-0-3).

An introduction to the philosophy, religion, literature, arts, and social customs of China. *Mr. Smith*

293. The Art of War from Alexander to Napoleon (3-0-3).

The theory and practice of warfare from the classical age to the early nineteenth century. Not offered 1979-80. *Mr. Gruber*

297, 298. Constitutional and Legal History of the United States (3-0-3 each semester).

Major questions in the historical development of American law and governing institutions. Not offered 1979-80. *Mr. Hyman*

303a, 304b. Independent Readings (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*

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*

312. Readings in the History of the Black American (3-0-3).

Discussion, written and oral reports of selected reading. Offered occasionally on demand. *Mr. Higginbotham*

317a. America's Alternatives (3-0-3).

Major public policy decisions from the beginning of the national period to the present. Not offered 1980-81. *Mr. Hyman*

319a. America in the Sixties (3-0-3).

An examination of the major social, political, and economic developments of the sixties. Not offered 1980-81. *Mr. Matusow*

333. Martin Luther and the Reformation in Germany, 1517-55 (3-0-3).

An analysis of the Protestant Reformation as one of the decisive events in German history. Not offered 1979-80. *Mr. Garside*

334a. Calvin and Geneva, 1509-64 (3-0-3).

The intellectual and religious development of Calvin and the Reformation in Geneva. Not offered 1980-81. *Mr. Garside*

337. 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 1980-81. *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. *Mr. Wiener*

341. History of China to 1800 (3-0-3).

Survey of Chinese history from antiquity to about 1800, highlighting salient aspects of China's heritage. Not offered 1979-80. *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*

345a. Medieval and Early Modern Russia (3-0-3).

The history of Russia from the ninth century to the Crimean War. Not offered 1980-81. *Mr. Stokes*

346. The Russian Revolution (3-0-3).

The history of the Russian Revolution in its broadest sense, Marx through 1984. Not offered 1979-80. *Mr. Stokes*

349a. Nineteenth-Century Europe (3-0-3).

An advanced survey of European history from the Congress of Vienna until World War I. *Mr. Rath or Staff*

350b. Twentieth-Century Europe (3-0-3).

An advanced survey of European history from the outbreak of World War I to the present. *Mr. Rath or Staff*

353. The Modernization of China and Japan (3-0-3).

Comparative study of social, political, and intellectual change in China and Japan from 1800 to 1945. Not offered 1979-80. *Mr. Smith*

361a. The History of England to 1776 (3-0-3).

Survey of English history: how England became the most advanced country in the world. *Mr. Wiener*

362b. The History of England since 1776 (3-0-3).

England as the world's first industrial society and the political, social, and intellectual implications. *Mr. Wiener*

367a. 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. *Mr. Wiener*

370a. The 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*

371. France from the Enlightenment to the Third Republic (3-0-3).

The place of the French Revolution in the evolution of French history from the mid-eighteenth century to 1870. Not offered 1979-80. *Staff*

372. France from the Third Republic to the Present (3-0-3).

Study of continuity and change as France enters the twentieth century. Not offered 1979-80. *Staff*

375a. Germany from the Middle Ages to the Nineteenth Century (3-0-3).

Survey of German history from the decline of the Holy Roman Empire to the emergence of Bismarck. Not offered 1980-81. *Mr. Loewenheim*

376b. Germany from Bismarck to the Present (3-0-3).

Survey of German history from the Prussian constitutional conflict to a reassessment of German politics, culture, and society after World War II. Not offered 1980-81. *Mr. Loewenheim*

382b. History of American Cities (3-0-3).

Aspects of American urban development, eighteenth century through the present, with stress on constitutional, institutional, and social considerations. Not offered 1980-81. *Mr. Hyman*

392. Europe in the Age of the Democratic Revolution (3-0-3).

Ideas, politics, and international relations in Europe from George III to Congress of Vienna, with emphasis on England and France. Not offered 1979-80. *Mr. Gruber*

393. The Art of War from Alexander to Napoleon (3-0-3).

An enriched version of History 293. Students may not receive credit for both 293 and 393. Not offered 1979-80. *Mr. Gruber*

395. A History of the South (3-0-3).

The life and economy of the Southern people from the colonial period. Not offered 1979-80. *Staff*

397, 398. Constitutional and Legal History of the United States (3-0-3 each semester).

An enriched version of History 297, 298. Students may not receive credit for both 297, 298 and 397, 398. Not offered 1979-80. *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*

412. The Early Republic (3-0-3).

The development of the United States from 1789 to 1848 with particular emphasis on political ideas and practices. Not offered 1979-80. *Mr. Higginbotham*

421. Chinese Communism (3-0-3).

Development of Marxism in China from 1911 through the Great Proletarian Revolution of 1966-69. Not offered 1979-80.
Mr. Smith

426. America in the 1960s — Seminar (3-0-3).

Research seminar on political, economic, and social topics. Open to all undergraduates. Not offered 1979-80.
Mr. Matusow

427a. Recent American Intellectual History (3-0-3).

Research seminar examining the thought of selected liberal intellectuals and cultural radicals, 1945-70. Limited enrollment. Open to undergraduates by permission of instructor. Not offered 1980-81.
Mr. Matusow

428. Problems in American Social and Intellectual History (3-0-3).

Not offered 1979-80.
Mr. Haskell

433. 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 1979-80.
Mr. Garside

434a. 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. Not offered 1980-81.
Mr. Garside

440. Social and Economic History of Europe in the Middle Ages (3-0-3).

Seminar covering selected problems in the social and economic history of medieval Europe. Not offered 1979-80.
Mrs. Drew

442b. History of Astronomy and Cosmology (3-0-3).

History of astronomy and cosmology from antiquity to about 1850. *Mr. Van Helden*

446. Twentieth-Century Military Biography (3-0-3).

Biographies of selected world military leaders from the 1890s through World War II. Not offered 1979-80.
Mr. Vandiver

448. Military History of the United States (3-0-3).

American wars from the American Revolution through World War II. Not offered 1979-80.
Mr. Vandiver

450b. Chinese Culture: Past and Present (3-0-3).

An enriched version of History 250. Students may not receive credit for both History 250 and 450.
Mr. Smith

453. Balkan History (3-0-3).

Rumania, Yugoslavia, Bulgaria, Albania, Greece, and Turkey from the Byzantine period to the present. Not offered 1979-80.
Mr. Stokes

455. 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 1979-80.
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.
Mr. Loewenheim

458. Problems in Russian and East European History (3-0-3).

Selected topics from nineteenth- and twentieth-century Russia and Eastern Europe. Prerequisite: Russian or Balkan history or consent of instructor. Not offered 1979-80.
Mr. Stokes

460b. Europe and World Politics from Pearl Harbor 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.
Mr. Loewenheim

461. The Age of Bismarck (3-0-3).

The man and his time; ways he changed the course of Prussian, German, and European history. Not offered 1979-80.
Mr. Loewenheim

462. Hitler, Europe, and the World (3-0-3).

How and why Hitler and National Socialism took over Germany, conquered most of Europe, and finally met defeat and destruction. Not offered 1979-80. *Mr. Loewenheim*

463, 464. Truman, Stalin, and the World: From Yalta to Korea I, II (3-0-3 each semester).

The turbulent world from the death of F. D. Roosevelt to Korean War. Not offered 1979-80. *Mr. Loewenheim*

465. 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 1979-80. *Mr. Gruber*

466. The American Revolution, 1754-89 (3-0-3).

The origins and implications of the American Revolution, emphasizing constitutional, social, and political developments. Not offered 1979-80. *Mr. Gruber*

478. Nationalism (3-0-3).

Pro-seminar in historical problems related to nationalism. Not offered 1979-80. *Mr. Stokes*

493. Comparative Studies in Russian and Chinese History (3-0-3).

Investigation of problems common to Chinese and Russian experience with emphasis on modernization. Prerequisite: Russian or Chinese history. Not offered 1979-80. *Mr. Smith, Mr. Stokes*

495b. Civil War and Reconstruction (3-0-3).

A study of the background of the war, the course of the war itself, and the economic and social consequences of the war. Not offered 1980-81. *Mr. Vandiver*

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 Non-Western 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*

533a. Colloquium in Nineteenth- and Twentieth-Century European History (3-0-3).

A critical examination of the chief historical trends and main literature in the field. Not offered 1980-81. *Mr. Rath*

534b. Colloquium in Nineteenth- and Twentieth-Century European History (3-0-3).

Continuation of History 533. Not offered 1980-81. *Mr. Rath*

545a. Historiography (3-0-3).

Seminar in historical method and issues. Undergraduates admitted with special permission. *Mr. Haskell*

565a. Seminar in Nineteenth- and Twentieth-Century European History

(3-0-3).

Selected topics in nineteenth- and twentieth-century European history. Qualified undergraduates admitted by special permission. Not offered 1980-81. *Mr. Rath*

566b. Seminar in Nineteenth- and Twentieth-Century European History

(3-0-3).

Continuation of History 565. Not offered 1980-81.

*Mr. Rath***571a, 572b. Seminar in First World War (3-0-3 each semester).**

Studies in the causes of World War I and the course of the war itself. Open to properly qualified graduate students after consultation with the instructor. *Mr. Vandiver*

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.**

Doctoral dissertation. For students not in residence.

800b. Degree Candidate Only.

Legal Studies

Degree Offered: B.A.

Undergraduate Program. Students majoring in legal studies are required to take the following ten courses: Economics 438; History 297 or 397 and 298 or 398; Legal Studies 201 and 401; Philosophy 307, 316; Political Science 309, 326, and 310 or 321. In addition, students must take two of the following electives: Anthropology 371; Economics 436, 461, 483; Environmental Science and Engineering 401; History 337, 338; Philosophy 101, 314; Political Science 315, 321, 325, 337, 410; Psychology 444; Sociology 321.

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.

*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. *Staff*

401a. Senior Seminar I (3-0-3).*Staff*

Linguistics

Associate Professor Copeland, *Chairman*
Professor Tyler

Associate Professors P. W. Davis, R. G. Jones, and Urrutibéheity

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 and linguistics including basic synchronic concepts and techniques: phonetic transcription, phonological, grammatical, and semantic systems. Also offered as Anthropology 207. *Staff*

202b. Introduction to General Linguistics (3-0-3).

Continuation of the above with an introduction to diachronic linguistics and methods in 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. Syntactic Analysis (3-0-3).

Theory and techniques of syntactic analysis. Prerequisite: Linguistics 201, 202 or consent of instructor. Also offered as Anthropology 302. Not offered every year. *Staff*

303a/b. Modern Linguistic Theory (3-0-3).

Survey of the development of linguistic theory from de Saussure to the present. Prerequisite: Linguistics 201, 202 or consent of instructor. Also offered as Anthropology 303. Not offered every year. *Staff*

304a/b. Phonological Analysis (3-0-3).

Techniques and assumptions of phonological analysis; various phonological theories current in modern linguistics. Prerequisite: Linguistics 201, 202 or consent of instructor. Also offered as Anthropology 304. Not offered every year. *Staff*

305a/b. Historical Linguistics (3-0-3).

Language change in terms of transformational generative grammar, social and geographical context, and process of language acquisition. Also offered as Anthropology 305. Offered fall 1979. *Mr. Davis*

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. Offered fall 1979. *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 Anthropology 394 and English 394. Offered spring 1980. *Mr. Davis*

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. Offered spring 1980.
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 consent of instructor. Not offered every year. *Staff*

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 listed as Anthropology 406. Offered spring 1980. *Mr. Tyler*

407a/b. Field Methods and Analytic Techniques (4-0-4).

The techniques of observation, analysis, and recording of human language. Prerequisite: Linguistics 201, 202 or consent of instructor. 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 to include such subjects as mathematical and computational linguistics, transformational grammar, stratificational theory, tagmemic theory, the history of linguistics, acoustic phonetics. May be repeated for credit. Prerequisite: Linguistics 201, 202 or consent of instructor. Not offered every year. *Staff*

410a/b. A Critical Introduction to Semiotics (3-0-3).

Exploration of the linguistic origins of semiotics and its influence on anthropology, philosophy, and psychoanalysis. Application methods of semiotics to the study of literary texts and other art forms. Also offered as Spanish 402. Offered spring 1980.
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; and pathologies of speech and language associated with brain damage. Also offered as Anthropology 411. Not offered every year. *Staff*

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 316. Also offered as Computer Science 416. (Distribution category III,5) Offered spring 1980. *Ms. Blattner*

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. Offered fall 1979.
Mr. Urrutibéheity

424a/b. Studies in Hispanic Linguistics (3-0-3).

Topic changes from year to year. May be repeated for credit. Topic for spring 1980: the history of the Spanish language. Not offered every year. *Mr. Urrutibéheity*

508a/b. Linguistic Anthropology (3-0-3).

Application of linguistic theory and method to the analysis of cultural materials. Also offered as Anthropology 508. Offered spring 1980. *Mr. Tyler*

521a/b. Artificial Intelligence (3-0-3).

Techniques for simulating intelligent behavior by machine: problem solving, game playing, pattern perceiving, theorem proving, semantic information processing, and automatic programming. Programming laboratory projects. Prerequisite: Computer Science 420 and Mathematical Sciences 381. Also offered as Computer Science 521. (Distribution category III, 6) Offered spring 1980. *Ms. Blattner*

Mathematical Sciences

Professor Tapia, *Chairman*

**Professors Bowen, S. H. Davis, de Figueiredo,
Dennis, Kilpatrick, Michel, Miele, Pfeiffer, Rachford, Schum,
Thrall, J. R. Thompson, Wang, Wilhoit, and Young
Adjunct Professors B. W. Brown, Cardus, Downs, Frankowski,
Gehan, Gorry, Herson, Hsi, Jansson, Sperling,
Thames, and Zimmerman**

Associate Professors Kennedy, Lutes, and Wheeler

**Adjunct Associate Professors Forthofer,
Hacker, and Kapadia**

Assistant Professors Blattner (on leave 1979-80) and D. W. Scott

Adjunct Assistant Professor Johnston

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 undergraduate 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 game theory, 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 in PL/1 for students in computer science and engineering. Also offered as Computer Science 220 and Electrical Engineering 220.

221a,b. Digital Computing for the Humanities and Social Sciences (3-3-4).

A semi-self-paced introduction to programing in APL and PL/1 with emphasis on problems from the humanities and social sciences. Also offered as Computer Science 221 and Electrical Engineering 221.

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 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. Also offered as Accounting 376.

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 to 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.

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. Prerequisite: Mathematical Sciences 316, 320, 321. Also offered as Computer Science 421 and Electrical Engineering 421.

422b. Case Studies in Management Information Systems and Processing (3-0-3).

Semester project includes building a decision model and making computer runs to obtain recommended policy decisions. Also listed as Computer Science 422 and Electrical Engineering 422.

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 programming 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-in-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.

481a. Introduction to Mathematical Statistics (3-0-3).

Intended for students contemplating advanced study in statistical theory. Prerequisite: Mathematical Sciences 380 or 381.

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.

484b. Second-order Random Processes (3-0-3).

An introduction to second-order random processes. Covariance analysis; spectral representation; mean-square calculus; Hilbert space ideas and linear estimation. Prerequisites: Mathematics 211, 212, Mathematical Sciences 380 or 381.

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 nonnormal distributions.

488. Bayesian Foundations of Statistical Inference (3-0-3).

Bayes' 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 programming, debugging, verification, and documentation. Prerequisite: permission of instructor.

517. Topics in Automata Theory (3-0-3).

Topics may include algebraic structure of machines, Krohn-Rhodes decomposition, probabilistic automata, a-transducers, and tree automata. Prerequisite: Mathematical Sciences 416 or consent of instructor. Also listed as Computer Science 517 and Electrical Engineering 517. Not offered every year.

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. Prerequisites: 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. Prerequisites: 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 programming. Programming laboratory projects. Prerequisites: 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 programming language compilers, including parsing, run-time storage management, code generation and optimization, and error recovery. Prerequisites: 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. Prerequisites: 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 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 Programming (3-0-3).

Continuation of Mathematical Sciences 471. Advanced topics in mathematical structure of linear programming. 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 Programming (3-0-3).

Theory and computational methods for nonlinear programming, 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 Programming (3-0-3).

Applications theory and computational methods in pure and mixed integer programming. 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).

Concepts and criteria in estimation; theory and applications of linear and nonlinear estimation; Wiener and Kalman filtering; linear and nonlinear system identification. Prerequisite: Mathematical Sciences 481. Not offered every year.

582. Stochastic Processes (3-0-3).

Mathematical foundations for advanced study of applied random processes. Topics such as separability and measurability; analytic properties of sample functions; linear transformations; independent increments; stochastic integrals. Prerequisite: Mathematical Sciences 482. Not offered every year.

583b. Detection Theory and Pattern Recognition (3-0-3).

Decision theory; detection of stochastic signals in colored noise; parametric and nonparametric approaches to detection and pattern classification. Also offered as Electrical Engineering 538.

585a. Information Theory (3-0-3).

Introduction to information theory concepts. Measures of information. Noiseless coding. The discrete, memoryless channel. Error bounds. Techniques of coding and decoding. Convolutional codes. Source encoding. Also offered as Electrical Engineering 535.

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.

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 John C. Polking, *Chairman*
Professors Bochner, Curtis, Harvey, Hempel,
Jaco, B. F. Jones, Rachford, Taylor, Veech, and Wells
Associate Professor Shalen
Assistant Professor Stanton
Instructors Beatrous, Dadok, and Fegan

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 none 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 88-89). 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 88-90).

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.

Mr. Curtis, Mr. Dadok, Mr. Veech, Mr. Rachford, Mr. Stanton, Staff

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.

Mr. Pfeiffer

104b. Finite Mathematics (3-0-3).

Topics from elementary propositional calculus, partitions and counting, linear programming. Not open to mathematics majors.

Mr. Palmer

107, 108. The Role of Mathematics in Civilization (3-0-3 each semester).

Intended for students who are interested in the nature and impact of mathematics but do not need mathematics as a tool in their own field. Not offered 1980-81.

Mr. Beatrous

121a, 122b. Honors Analysis (4-0-4 each semester).

Covers the material of 101, 102 with emphasis on theoretical aspects. Registration by departmental permission.

Mr. Shalen

211a,b. Ordinary Differential Equations (4-0-4).

Mr. Jones, Mr. Harvey, Mr. Fegan, Staff

212b. Differential and Integral Calculus for Functions of Several Variables (4-0-4).

Mr. Beatrous, Mr. Jaco, Mr. Taylor

221a, 222b. Advanced Honors Analysis (3-0-3 each semester).

Covers the material of Mathematics 211, 212. Emphasis is on theoretical aspects. Curves, surfaces, and more general manifolds. Stokes' theorem in detail.

Mr. Polking

312b. Principles of Analysis (3-0-3).

A careful treatment of: the topology of \mathbb{R}^n , convergence of sequences and series of functions, the implicit function theorem, existence theorems for ODE's, and related topics.

Mr. Fegan

350b. Set Theory (3-0-3).

Ordinal and cardinal numbers and arithmetic, well ordering, the axiom of choice, and additional topics as time allows, e.g., Godel's axiom of constructibility, large cardinal numbers.

Mr. Beale

355a. Linear Algebra (3-0-3).

Linear transformations and matrices. Solution of linear equations. The eigenvalue problem and quadratic forms.

Mr. Stanton

356b. Abstract Algebra (3-0-3).

Groups: normal subgroups, factor groups, Abelian groups. Rings: ideals, Euclidean rings, unique factorization. Fields: algebraic extensions, finite fields. Note: Students may not take this course and Mathematics 463.

Mr. Fegan

365a. Elementary Number Theory (3-0-3).

Properties of numbers depending mainly on the notion of divisibility. Continued fractions.

Staff

366b. Projective Geometry (3-0-3).

Staff

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. *Mr. Polking*

382b. Complex Analysis and Applications (3-0-3).

Complex analysis: 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. *Staff*

401a, 402b. Differential Geometry (3-0-3 each semester).

Differential manifolds, Stokes' Theorem and deRham's Theorem, fundamental theorem of local Riemannian geometry, Lie groups, vector bundles, affine connections. *Mr. Harvey*

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. *Mr. Rachford*

425a. Real Analysis (3-0-3).

Lebesgue theory of measure and integration. *Staff*

426b. Topics in Real Analysis (3-0-3).

Continuation of Mathematics 425. *Mr. Stanton*

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. *Mr. Dadok*

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. *Mrs. Wheeler*

443a. General Topology (3-0-3).

Basic point set topology. Includes set theory, well ordering. Metrization. *Mr. Shalen*

444b. Geometrical Topology (3-0-3).

Introduction to algebraic methods in topology and differential topology. Elementary homotopy theory. Covering spaces. *Mr. Jaco*

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. *Mr. Jones*

466b. Topics in Algebra (3-0-3).

Introduction to the concepts of Lie group theory done at the concrete level of matrix groups. Not offered 1980-81. *Mr. Curtis*

490. Supervised Reading in Mathematics (Credit variable).

521a. Special Topics in Complex Analysis (3-0-3).

Several complex variables. *Mr. Beatrous*

523a. Functional Analysis (3-0-3).

Locally convex spaces, theory of distributions. Branch spaces. Hilbert spaces. *Mr. Veech*

525a, 526b. Advanced Topics in Analysis (3-0-3 each semester).

Nonlinear PDE. *Mr. Taylor*

537a. Algebraic Topology (3-0-3).

Singular homology and cohomology. *Mr. Jaco*

538b. Algebraic Topology (3-0-3).

Homotopy theory, Serre spectral sequence and applications. *Mr. Curtis*

601a, 602b. Thesis (Credit variable).

700c. Summer Research.

800b. Degree Candidate Only.

Military Science

Professor Coffman, *Chairman*
Assistant Professors T. M. Adams and Sawyer

The Department of Military Science is chaired by a U.S. Army officer, assisted by officers and noncommissioned officers of the U.S. Army. Training in military leadership is emphasized, with instruction given in subjects common to all branches of the army.

The four-year Army ROTC course consists of the basic course taken the first and second years and the advanced courses taken the third and fourth years. The Army ROTC also offers a two-year program to those students with two years of study remaining who did not participate in the normal basic course. In the two-year program, the student attends a six-week summer camp, which gives credit for the basic Army ROTC course, and enters the advanced course the next fall. The advanced course includes a six-week summer camp, normally between the junior and senior years, in practical military instruction.

One-, two-, and three-year scholarships are available on a competitive basis to students who participate in the Army ROTC program. Each scholarship student receives \$100 per month with all tuition, fees, books, and equipment paid by the army for the period of the scholarship. Nonscholarship students receive \$100 per month during the advanced course.

Graduates of this program are commissioned in the various branches of the army based upon the preference of the individual, academic major, demonstrated leadership and technical qualifications, and the needs of the service.

Military science students are permitted to enroll in a university course in lieu of the scheduled military science course according to the following semester schedule:

- MS I — second semester (spring)
- MS II — first semester (fall)
- MS III — first semester (fall)

Approval of the university course desired must be obtained from both the university and military science faculty advisers. Military science leadership laboratory requirements remain in effect, although the cadet is enrolled in a university course. See the *Schedule of Courses Offered* available from the Registrar's Office for registration data.

Military Science Courses

101a. The Defense Establishment in National Security I (1-2-1).

Organization of the Department of Defense, structure of ROTC, individual weapons design and characteristics, and marksmanship instruction. *Staff*

102b. The Defense Establishment in National Security II (1-2-1).

Study of national defense policy and worldwide implications requiring interdependence of the army, navy, and air force. *Staff*

201a. American Military History (3-2-3).

Analysis of American military history with emphasis on factors leading to organization and social patterns of the modern-day army. *Staff*

202b. Introduction to Tactics and Operations (3-2-3).

Study of principles involved in combined arms teams, map and aerial-photo readings, and the command of troops. *Mr. Adams*

301a. Leadership and Management, Fundamentals, and Dynamics of the Military Team I (3-2-3).

Study of leadership qualities, delegation of authority, and the psychological, physiological, and sociological factors affecting behavior while in the army. *Mr. Adams*

302b. Leadership and Management, Fundamentals, and Dynamics of the Military Team II (3-2-3).

Study of leadership principles and techniques, military instructional methodology, and the history and roles of the various army branches. *Mr. Sawyer*

401a. Leadership and Management, Fundamentals, and Dynamics of the Military Team III (3-2-3).

Examination of international affairs and U.S. alliances, command and staff procedures, and the military justice system. *Mr. Sawyer*

402b. Leadership and Management, Fundamentals, and Dynamics of the Military Team IV (3-2-3).

Modern-day warfare techniques are examined in terms of traditional warfare principles and technological advancements. *Mr. Sawyer*

The Shepherd School of Music

Professor Holloway, Acting Dean

Professors Cooper, S. Jones, Shapiro, and Tipton

Adjunct Professor Lert

Associate Professors Bible, Crouse, Fliegel, Kurtzman, Milburn,

Norris, Patterson, Pickar, Schnoebelen, and Trepel

Assistant Professors Bacon, R. S. Brown, Citron, Ellison, Ettelson,

Gottschalk, Koehler, and Rosenberg

Instructor Hanson

Lecturers Arbiter, Guderian, Holibaugh, Rose, and Waters

Adjunct Lecturer Visser

Degrees Offered: B. Mus./M. Mus. (simultaneously); M. Mus.

The Shepherd School of Music, committed to the professional training of musicians within a broad liberal arts curriculum, offers an integrated program of performance, creation, and academic study of music from a combined historical/theoretical/practical point of view.

Degrees Offered. A Master of Music degree is offered in the following areas: composition, conducting, music history, performance (orchestral instrument, harpsichord, organ, piano, voice), and theory. The master's degree is awarded after successful completion of the requirements, electives, apprenticeships, and recitals of a five-year program. Because of the accelerated programs in music history and theory and the high selectivity of performance majors and applied majors, the five-year program is comparable to other programs requiring a four-year bachelor's degree and a two-year professional degree. Six years may be required to complete the conducting major. Upon satisfactory completion of the requirements for the Master of Music degree, the five-year student is also awarded the Bachelor of Music degree.

Admission to these programs is based upon evaluation of a student's achievements in one or more of the degree areas. An audition, a theory evaluation, and a personal interview are required of each 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 may apply for admission. These applicants are evaluated in terms of prior preparation, which may reduce the required period of study at Rice.

Curriculum Design. Students must complete satisfactorily 102 semester hours in prescribed music courses, appropriate performance and/or thesis requirements, and apprenticeship.

They must also complete at least 48 semester hours outside the music school's requirements for a total program of at least 150 semester hours. Distribution requirements for music majors are discussed on the next page. All B.Mus/M.Mus programs include (1) the core curriculum and (2) an advanced curriculum.

1. The first five semesters consist of core curriculum courses and their application to a principal instrument. During each of the first five semesters, at least three semester hours are taken in each of the following areas of study: applied studies (ear-training, sight-singing, rhythm, intonation, phrasing, style, performance practice, ensemble techniques); historical studies; individual musicianship (principal instrument); theoretical studies; and academic distribution courses. The typical course of study for the core curriculum is:

First and second semesters:

Individual musicianship (major instrument); Music 211, 212; 221, 222; 231, 232; and academic electives (English)

Third and fourth semesters:

Individual musicianship; Music 311, 312; 321, 322; 331, 332; and academic electives

Fifth semester:

Individual musicianship; Music 411, 421, 431; academic electives

Sixth semester:

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.

2. 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.

Twelve university academic distribution courses in humanities, social sciences, and natural sciences are required for the combination bachelor's/master's degree. Music courses may not be used to satisfy the humanities requirement. Selection is made jointly by the student and faculty adviser and

may be taken consecutively or may be paired to allow for off-campus apprenticeships and research projects. Knowledge of at least one foreign language is strongly recommended.

Courses for Nonmajors. Nonmajors will find the following courses designed for the general student: Music 117, 118; 307, 308; 317, 318; 333; 334; 336; 414; 327, 328; 151, 152, 153, 154, 155, 156, 157, 158. 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.

Grades. The curriculum of the Shepherd School is a combination undergraduate honors and graduate curriculum. Any student who does not meet a correspondingly high level of achievement is subject to warning and music probation and possibly to dismissal as a music major.

Special Examinations:

1. At the end of each semester, an 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 by the election of sequential courses.
3. Sight-reading proficiency examinations on the major instrument are required at the end of the fourth semester. Students who do not pass this examination are required to take remedial work in sight-reading until the proficiency is attained.
4. Each student 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 administered to all music students 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 three full recitals. Frequent performance is expected of all students during the core curriculum. Composition majors are expected to present full recitals in the fourth and fifth years and conducting majors in the fifth and sixth years. 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 each semester during 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. Permission of instructor required.
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. Electronic Music Composition (1-6-3 each semester). *Mr. Gottschalk*

504. 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. 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 required. 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

511a, 512b. Graduate Theory Review I, II (3-0-2 each semester).

Not offered every year.

Staff

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

715a, 716b. History of Theory I, II (Credit variable).

Not offered every year.

Staff

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. Hanson*

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*

422b. Renaissance Music (3-0-3).

Not offered every year.

Mr. Kurtzman

423b. Chamber Music Literature (3-0-3).

Survey of chamber music literature from the early Baroque to the present. Not offered every year. *Ms. Schnoebelen*

424a, 425b. Organ Literature I, II (3-0-3 each semester).

Not offered every year.

Mr. Holloway

426a. Piano Literature (3-0-3).

Not offered every year.

Ms. Schnoebelen

427a. Song Literature (3-0-3).

Historical survey of solo vocal literature and its performance from the Middle Ages to the present. Not offered every year. *Ms. Hanson*

428. Symphonic Literature (3-0-3).

Historical development of the symphony and its literature from about 1740 to the present. Not offered every year. *Ms. Hanson*

429. Music of the Middle Ages (3-0-3).

Not offered every year.

Mr. Kurtzman

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

525b. Performance Practices Seminar (3-0-3).

Study of performance practices from treatises and music, problems in editing music. Not offered every year. *Ms. Schnoebelen*

528. History of Music Instruments (3-0-3).

Historical survey of the various families of musical instruments and their development to the present. Not offered every year. *Mr. Holibaugh*

529. History of Opera (3-0-3).

Not offered every year.

Staff

624. Beethoven (3-0-3).

Advanced study of Beethoven's music, sketchbooks, contemporaries, and historical setting. Not offered every year. *Ms. Schnoebelen*

721a,b. Selected Studies in Music History (3-0-3 each semester).

Permission of instructor required. Not offered every year.

Ms. Schnoebelen

723. Aesthetics in Music (3-0-3).

Not offered every year.

Mr. Kurtzman

724. Collegium Practicum (1-3-1).

Not offered every year.

Staff

725a,b; 726a,b. History of Notation I, II (3-0-3 each semester).

Permission of instructor required. Not offered every year.

Mr. Kurtzman

Applied Studies, Ensembles, Conducting

Music Courses

- 231a. Applied Studies I** (2-3-3).
Solfege, rhythmic studies, intonation, listening. *Mr. Tipton, Ms. Citron*
- 232b. Applied Studies II** (0-10-3).
Continuation of Music 231 plus string and wind ensembles. *Mr. Tipton, Ms. Citron*
- 331a, 332b. Applied Studies III, IV** (1-14-3 each semester).
Studies in solfege, rhythmic studies, intonation; phrasing, style, performance practice. Chamber ensembles, large ensemble (orchestra or chorus). Baroque, first semester; Classical/Romantic, second semester. *Mr. Tipton, Ms. Citron*
- 333a,b. Undergraduate Chorus for Nonmajors** (0-3-1 each semester).
Mr. Koehler
- 334a,b. Undergraduate Orchestra for Nonmajors** (0-9-1 each semester).
Mr. Ellison
- 335a,b. Undergraduate Chorus for Majors** (0-3-0 each semester). *Mr. Koehler*
- 336a,b. Undergraduate Chamber Music for Nonmajors** (0-6-1 each semester).
Mr. Pickar
- 337a,b. Undergraduate Orchestra for Majors** (0-9-0 each semester).
Mr. Ellison
- 338a,b. Undergraduate Chamber Music for Majors** (0-6-0 each semester).
Mr. Pickar
- 339a,b. Collegium** (Credit variable each semester).
Permission of instructor required. Not offered every year. *Mr. Holibaugh*
- 431a. Applied Studies V** (0-14-3).
Sight reading, phrasing, style, performance practice. Contemporary chamber ensembles, large ensembles (orchestra and chorus). *Mr. Tipton, Ms. Citron*
- 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** (0-12-2 each semester). *Mr. Ellison*
- 636a,b. Advanced Chamber Music** (0-7-2 each semester). *Mr. Pickar*
- 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). *Mr. Koehler*

Nonmajor Individual Instruction

Music Courses

151a,b-158a,b. Individual Musicianship for Nonmajors (1-5-1 each semester).

College-level study in any instrument or voice. Instructor assigned by the dean. Fee required. *Staff*

Woodwind Instruction

Music Courses

251a,b; 252a,b - 651a,b; 652a,b. Flute 1,2 - 9,10 (1-25-3 each semester).

Five-year sequence.

Mr. Tipton

253a,b; 254a,b - 653a,b; 654a,b. Oboe 1,2 - 9,10 (1-25-3 each semester).

Five-year sequence.

Mr. Rosenberg

255a,b; 256a,b - 655a,b; 656a,b. Clarinet 1,2 - 9,10 (1-25-3 each semester).

Five-year sequence.

Mr. Pickar

257a,b; 258a,b - 657a,b; 658a,b. Bassoon 1,2 - 9,10 (1-25-3 each semester).

Five-year sequence.

Mr. Arbiter

159a,b; 259a,b; 359a,b. Secondary Woodwind Instruction I, II, III (1-5-1 each semester).

Staff

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).

Staff

Brass Instruction

Music Courses

261a,b; 262a,b - 661a,b; 662a,b. Horn 1,2 - 9,10 (1-25-3 each semester).

Five-year sequence.

Mr. Bacon

263a,b; 264a,b - 663a,b; 664a,b. Trumpet 1,2 - 9,10 (1-25-3 each semester).

Five-year sequence.

Mr. Guderian

265a,b; 266a,b - 665a,b; 666a,b. Trombone 1,2 - 9,10 (1-25-3 each semester).

Five-year sequence.

Mr. Waters

267a,b; 268a,b - 667a,b; 668a,b. Tuba 1,2 - 9,10 (1-25-3 each semester).

Five-year sequence.

Mr. Deck

169a,b; 269a,b; 369a,b. Secondary Brass Instruction I, II, III (1-5-1 each semester).

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).

Staff

Percussion Instruction

Music Courses

271a,b; 272a,b - 671a,b; 672a,b. Percussion 1,2 - 9,10 (1-25-3 each semester).

Five-year sequence.

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).

Mr. Brown

Voice Instruction

Music Courses

- 273a,b; 274a,b - 673a,b; 674a,b. Voice 1,2 - 9,10** (1-20-3 each semester).
Five-year sequence. *Ms. Bible*
- 179a,b; 279a,b; 379a,b. Secondary Voice Instruction I, II, III** (1-5-1 each semester). *Staff*
- 475. Theory of Vocal Performance Techniques** (1-3-1 each semester).
Not offered every year. *Mr. Koehler*
- 549a,b. Voice Pedagogy** (1-3-2 each semester). *Staff*
- 575a, 576b; 675a, 676b. Voice Repertoire I, II, III, IV** (1-3-1 each semester). *Staff*
- 577a, 578b; 677a, 678b. Diction I, II, III, IV** (1-3-1 each semester). *Staff*

Keyboard and Harp Instruction

Music Courses

- 281a,b; 282a,b - 681a,b; 682a,b. Piano 1,2 - 9,10** (1-25-3 each semester).
Five-year sequence. *Ms. Norris*
- 283a,b; 284a,b - 683a,b; 684a,b. Organ 1,2 - 9,10** (1-25-3 each semester).
Five-year sequence. *Mr. Holloway*
- 285a,b; 286a,b - 685a,b; 686a,b. Harpischord 1,2 - 9,10** (1-25-3 each semester).
Five-year sequence. *Mr. Holloway*
- 287a,b; 288a,b - 687a,b; 688a,b. Harp 1,2 - 9,10** (1-25-3 each semester).
Five-year sequence. *Ms. Rose*
- 189a,b. Secondary Piano I** (1-5-1 each semester).
May be taken two times. Required of all majors if piano proficiency not passed. *Ms. Ettelson*
- 289a,b. Secondary Piano II** (1-5-1 each semester).
May be taken three times. Required of all majors if piano proficiency not passed. *Ms. Ettelson*
- 389a,b. Secondary Piano III** (1-5-1). *Ms. Ettelson*
- 489a,b. Secondary Piano IV** (1-5-1). *Ms. Ettelson*
- 190a,b - 490a,b. Secondary Organ I, II, III IV** (1-5-1 each semester).
Mr. Holloway
- 445a, 446b; 545a, 546b. Keyboard Proficiency I, II, III, IV** (Credit variable each semester).
Not offered every year. *Mr. Holloway*
- 589a,b. Keyboard Pedagogy** (1-3-2). *Staff*
- 645a,b. Organ Construction** (Credit variable).
Not offered every year. *Staff*

String Instruction

Music Courses

- 291a,b; 292a,b - 691a,b; 692a,b. Violin 1,2 - 9,10** (1-25-3 each semester).
Five-year sequence. *Ms. Shapiro, Mr. Fliegel, Mr. Patterson*
- 293a,b; 294a,b - 693a,b; 694a,b. Viola 1,2 - 9,10** (1-25-3 each semester).
Five-year sequence. *Mr. Crouse*

- 295a,b; 296a,b - 695a,b; 696a,b. Violoncello 1,2 - 9,10** (1-25-3 each semester).
Five-year sequence. *Ms. Trepel*
- 297a,b; 298a,b - 697a,b; 698a,b. Double Bass 1,2 - 9,10** (1-25-3 each semester).
Five-year sequence. *Mr. Ellison*
- 199a,b. Secondary String Instruction** (1-5-1 each semester).
Violin, viola, cello, or bass. *Staff*
- 299a,b. Secondary String Instruction II** (1-5-1 each semester).
Continuation of Music 199. Prerequisite: three semesters of Music 199 or five semesters of major string instruction. *Staff*
- 399a,b. Secondary String Instruction III** (1-5-1 each semester).
Continuation of Music 299. Prerequisite: three semesters of Music 299 or five semesters of major string instruction. *Staff*
- 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). *Staff*

Courses Applicable to All Specializations

Music Courses

- 441a,b. Qualifying Recital** (0-0-0 each semester).
- 449a,b. Undergraduate Independent Study** (Credit variable).
- 547. Prethesis in Composition, Theory, History and Literature, or Conducting** (Credit variable).
Not offered every year.
- 641a,b. Advanced Recital** (0-0-0 each semester).
- 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).

Naval Science

Professor Melton, *Chairman*
Associate Professor D. B. Cox
Assistant Professors Blanchard and Peeler

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) non-scholarship.

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 (2-2-2).

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. *Staff*

201a. Naval Ships Systems II — Naval Weapons (3-2-3).

An introduction to naval weapons systems with emphasis on linear analysis of ballistics and control system dynamics. *Staff*

202b. Sea Power and Maritime Affairs (3-2-3).

Readings, discussions, and research on selected topics related to the history, importance, and impact of sea power on modern civilization. *Mr. Melton*

301a. Navigation (3-2-4).

A comprehensive study of coastal piloting, celestial and electronic ship navigation; involves nautical astronomy, navigational aids, satellite and inertial systems. *Mr. Blanchard*

302b. Naval Operations (3-2-4).

An analysis of ship movements, formations, and fleet operations; includes Rules of the Road, maneuvering board, tactical publications and communications. *Mr. Blanchard*

401a, 402b. Principles of Leadership and Management (3-2-3 each semester).

An introduction to the principles and concepts of management, organization, leadership, military law and discipline, information systems, and decision making. *Mr. Cox*

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** (3-2-3).

Historical survey of the evolution of the conduct of warfare. Strategy, tactics, weapons, organization, and military leaders/thinkers are studied. *Staff*

403b. Amphibious Warfare (3-2-3).

Study of the history of amphibious warfare. Case studies examine doctrine, tactics, and the factors necessary for successful operations. *Staff*

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*

Professor Kolenda

Associate Professor Giannoni

Assistant Professors Kulstad, Loevinsohn, Modrak, and Rawlinson

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. Satisfactory performance during the early part of the second semester on a preliminary examination based on specific reading chosen from among major philosophical works

2. Completion with high standing of courses approved by the department and of work in the area of logic
3. 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.
4. Satisfactory performance on examinations in history of philosophy, metaphysics and epistemology, value theory, and philosophy of science and language
5. Completion of a written thesis on a subject approved by the department; at least one year of thesis research must be spent in residence
6. Satisfactory performance in limited teaching duties assigned by the department
7. 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. Brody*

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. *Ms. Rawlinson*

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. Giannoni*

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. 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. *Mr. Loevinsohn*

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. *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 Mr. Kolenda*

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 or Mr. Kulstad*

305a. Mathematical Logic (3-0-3).

Natural deduction, axiomatic, and semantical treatment of first order logic. Also, Godel's Incompleteness Theorem for arithmetic. *Mr. Giannoni*

306b. Ethics (3-0-3).

Philosophical analysis of traditional and contemporary theories of ethics. *Mr. Loevinsohn or Mr. Kolenda*

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. Loevinsohn*

308a. Continental Philosophy from Kant to Heidegger (3-0-3).

Selected readings from Kant, Hegel, Nietzsche, and Heidegger. *Ms. Rawlinson*

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. Rawlinson

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*

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. *Mr. Giannoni*

314b. Philosophy of Medicine (3-0-3).

Examination of ethical, epistemological, and ontological questions arising in the practice of medicine. *Ms. Rawlinson*

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*

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. *Mr. Giannoni*

322b. American Philosophy (3-0-3).

Offered alternate years.

Mr. Kolenda

401a, 402b. Independent Reading I, II (3-0-3 each semester).

By 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. *Staff*

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.

Staff

501a. Seminar in Modern Philosophy (3-0-3).

Offered alternate years.

Mr. Kulstad or Mr. Kolenda

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.

Mr. Giannoni

507a. Seminar in Ethics (3-0-3).

Offered alternate years.

Mr. Loevinsohn

508b. Seminar in Social and Political Philosophy (3-0-3).

Offered alternate years.

Mr. Loevinsohn or Mr. Brody

509b. Seminar in Philosophy of Science (3-0-3).

Offered alternate years.

Mr. Giannoni

510a. Seminar in Philosophy of Language (3-0-3).

Offered alternate years.

Staff

511a. Seminar in Philosophy of Logic (3-0-3).

Offered alternate years.

Staff

512b. Seminar in Philosophy of Mind (3-0-3).

Offered alternate years.

Ms. Modrak

513a. Pragmatism (3-0-3).

Offered alternate years.

Mr. Kolenda

514b. Kant and Hegel (3-0-3).

Offered alternate years.

Ms. Rawlinson

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 or Mr. Loevinsohn

518b. Husserl and Heidegger (3-0-3).

Offered alternate years.

Ms. Rawlinson

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* (on leave 1979-80)
Professors S. D. Baker, Class, Clayton, Duck, Estle, Michel, Phillips, Risser, Rorschach, Stebbings, Trammell, Walters, and Wolf
Adjunct Professors Hazlewood and Valkovic
Associate Professors Dunning, Hannon, Huang, Mutchler, and J. B. Roberts
Adjunct Associate Professor Rundel
Assistant Professor Dodds
Visiting Assistant Professor 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 pages 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 471 or 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 101, 102, 103, 104

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, 461, 462

Electrical Engineering 220

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, solid-state and low temperature 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 or by equivalent research publication. 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 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.
- 412b. Modern Physics II: Solid-State Physics** (3-0-3).
Continuation of Physics 411. Foundation course in solid-state physics.
- 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. Departmental approval required.
- 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.
- 495a, 496b. Physics Teaching I, II** (Credit variable).
A combination of in-service teaching and a weekly seminar. Departmental approval required.
- 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 1980-81.
- 552. Stellar and Galactic Evolution** (3-0-3).
Application of Space Physics and Astronomy 551 to stellar and galactic evolution. Not offered 1980-81.
- 563a. Introduction to Solid-State Physics** (3-0-3).
Fundamental concepts about crystalline solids and basic preparation for further courses in the sequence Physics 564-567. Also offered as Electrical Engineering 563 and Materials Science 563.
- 564b. Electron Transport and Superconductivity** (3-0-3).
Not offered every year.

565. Dielectric and Optical Properties of Matter (3-0-3).

A survey of the optical and dielectric properties of solids. Interband transitions, excitons, lattice vibrations, and nonlinear optical properties. Not offered every year.

566. Imperfections and Mechanical Properties of Crystalline Solids (3-0-3).

The effect of lattice imperfections upon the physical and mechanical properties of crystals. Also offered as Electrical Engineering 566 and Materials Science 566. Not offered every year.

567b. Magnetism and Magnetic Resonance (3-0-3).

Not offered every year.

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.**

Political Science

Professor Ambler, *Chairman*

**Professors J. Cooper, Cuthbertson, Dix,
and von der Mehden (on leave fall 1979)**

Visiting Professor D. W. Brady

**Assistant Professors Gow, Harris (on leave fall 1979), and Sanders
Lecturer 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 or managerial studies 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 | (4) International relations |
| (2) Comparative government | (5) Normative political theory |
| (3) Law | (6) Empirical theory and methodology |

Political Science 209, 210, 210H, 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 (or 210H) 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.

Program in Managerial Studies. The Department of Political Science participates in the interdepartmental program in managerial studies. More information on the program may be obtained from the program description given on pages 55-56 and 108. The departmental adviser for this program is Mr. Cuthbertson.

Graduate Program. The Department of Political Science offers a graduate program leading to the Ph.D. The 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 course and one other seminar or course in American government, comparative government, and international relations, plus a two-semester course in scope and methods. The student is also expected to have some background in statistical analysis and in traditional political theory prior to candidacy. The student is expected to take comprehensive written examinations in two of the three major fields (American government, comparative government, and international relations) after the completion of (1) course work in the department, (2) two courses in a minor field outside political science, and (3) the language requirement. The language requirement may be fulfilled through (a) satisfactory language skills in two foreign languages, (b) one language and advanced course in statistics, or (c) high level of skill in one language sufficient to use in advanced research. The language program and minor of the individual student should be decided on consultation with the faculty adviser. A limited master's program is also offered by the department.

Political Science Courses

209b. 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 or 210H meets state professional requirements for teachers.

Mr. Cuthbertson, Staff

210a. Introduction to American Government and Politics (3-0-3).

Major topics in American politics; public opinion, group politics, political parties, elections, congressional-presidential-bureaucratic politics, 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. Harris

212a. Introduction to Comparative Government (3-0-3).

A comparison of political patterns in selected "developed" and "developing" political systems, including democratic and communist examples.

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 consent 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. Hudspeth, Staff

315a. President and Congress in American Politics (3-0-3).

Examination of the two major policy-making institutions in the United States: the Congress and the President.

Mr. Cooper

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

326. 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. Not offered 1979-80.
Mr. Gow

331a. 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

333b. Southern Politics (3-0-3).

An historical and contemporary overview of Southern politics.
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.
Staff

339b. 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.
Staff

340. 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. Not offered 1979-80.
Mr. Cuthbertson

344. Contemporary Political Ideology (3-0-3).

Elements of major ideologies including nationalism, democracy, socialism, and revolution and their spokespeople in Afro-Asia and the West. Not offered 1979-80.
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 1979-80.
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 1979-80.
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 particular 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 Soviet Union.
Mr. Harris

372a. 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.
Staff

375b. International Organizations (3-0-3).

Survey of political processes in regional and global intergovernmental organizations and policy problems created by conditions of global interdependence.
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 1979-80. *Mr. Harris*

379. Problems in International Relations (3-0-3).

This course 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 1979-80. *Staff*

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*

410. 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: consent of the instructor. Not offered 1979-80. *Mr. Hudspeth*

430b. Seminar in Texas Politics (3-0-3).

Research seminar in the history of Texas politics. Enrollment limited. Permission of instructor required. Not open to students who have taken Political Science 490 on the same subject. *Mr. Cuthbertson*

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 1979-80. *Mr. Dix*

457. The Conditions of Democracy (3-0-3).

Seminar on social, economic, psychological, historical, cultural, and political roots of democracy and of its principal modern antithesis: communism and facism. Not offered 1979-80. *Mr. Doo*

460b. Seminar in Comparative Government (3-0-3).

Topic for 1979-80: ideology, development, and stability in Third World countries. *Mr. von der Mehden*

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 1979-80. *Staff*

472b. Seminar in American Foreign Policy (3-0-3).

The content of American foreign policy, its sources, and the process of policy formulation. *Mr. Harris*

475. Seminar in Transnational Organizations and Processes (3-0-3).

Selected topics in the analysis of transnational politics and processes, such as the role of multinational corporations, the functioning of international organizations, transnational movements, and global policy problems. Not offered 1979-80. *Mr. Harris*

486. Topics in American Politics (3-0-3).

Seminar topic for 1979-80: American political parties and electoral behavior. *Ms. Sanders*

490a. 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. *Mr. Cuthbertson*

495a. Introduction to Statistics (3-0-3).

Investigation of the basic concepts and techniques in probability theory and statistical inference. Begins with a review of selected mathematical topics. *Mr. Gow*

503. Special Topics in Research Methods and Data Analysis (3-0-3).

Applications of least squares and general linear model. Not offered 1979-80. *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 1979-80. *Staff*

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*

520a. 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. Not offered 1979-80. *Mr. Dix*

527b. Organization Theory (3-0-3).

Examination of the development of organization theory, of current approaches to the study of complex organizations, and of the operation of major types of complex organizations in both the private and public sectors. Prerequisite: graduate standing. Also offered as Administrative Science 512. *Mr. Cooper*

530a. Approaches to American Government (3-0-3).

Core graduate course analyzing basic approaches to study of American politics. *Ms. Sanders*

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. *Staff*

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 1979-80. *Staff*

570. Seminar in Comparative Government (3-0-3).

Readings and original research on selected topics. Not offered 1979-80. *Mr. Dix*

571b. 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 576. *Mr. von der Mehden*

580a. Seminar in American Politics (3-0-3).

Congress and the presidency; the relevance and contribution of organization theory to the study of these institutions. *Mr. Cooper*

590. Scope and Method of Current Research in International Relations

(3-0-3).

Critical survey of empirical research of diverse topics in international relations: research design, data acquisition, and hypothesis testing. Not offered 1979-80. *Staff*

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 and Schum
Adjunct Professor R. L. Bell
Visiting Professor Nunnally
Associate Professor Dipboye
Assistant Professors Burnett, D. M. Lane, Rathjen,
and Schuberth

Degrees Offered: B.A., M.A., Ph.D.

Undergraduate Program. Twenty-seven semester hours are required for a major in psychology. This includes Psychology 201, which is required, and either of two methods courses (325 or 339), which is strongly recommended. Seven specific programs are now available: (1) standard, (2) business and management emphasis, (3) health-related career emphasis, (4) law and politics emphasis, (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, Staff

303a. Industrial and Organizational Psychology (3-0-3).

An overview of the principles, techniques, and theories of psychology applied in the industrial setting.
Mr. Dipboye

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.
Ms. Rathjen, Staff

307a. Learning (3-0-3).

Introductory survey of issues, theories, research, and applications in learning and memory. Prerequisite: Psychology 201. *Ms. Burnett*

308b. Human Learning and Cognition (3-0-3).

Emphasis upon current status of research and theory in such topics as verbal learning, memory and forgetting, and mnemonics. Prerequisite: Psychology 201, 307. *Ms. Burnett*

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 consent of instructor. *Mr. Schubert*

325a. Basic Statistics: A Programed Course (3-0-3).

Self-paced course in elementary statistical methods, inferential as well as descriptive, organized around examples from the behavioral sciences. *Mr. Brelsford*

329a. Differential Psychology (3-0-3).

Techniques for measuring individual differences and critical review of theories of individual differences in intelligence and personality. Prerequisite: Psychology 201. *Mr. Nunnally, Staff*

330b. 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. Rathjen*

339a. Statistical Methods in Experimental Psychology (3-3-4).

Introduction to the quantitative methods applicable to the analysis of experimental data. Preferable to 325 for the graduate-oriented student. *Mr. Lane*

340b. Experimental Research in Psychology (3-3-4).

A continuation of Psychology 339 with a stronger emphasis on individual student experiments and the writing of research reports. Prerequisite: Psychology 339 or Mathematical Sciences 280 and permission of instructor. *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. Schubert, Staff*

362a. Physiological Psychology — A Keller Method Course (3-0-3).

An overview of the neurophysiological correlates of behavior. *Mr. Howell*

404b. Advanced Learning and Memory (3-0-3).

An examination of method, theory, and research in the study of cognitive processes. May be repeated for credit. Prerequisite: Psychology 308 and permission of instructor. *Ms. Burnett*

413a,b. Advanced Social Psychology (3-0-3).

Selected topics in the experimental and theoretical content of modern social psychology. Topics announced each year. Prerequisite: Psychology 201, 305, and permission of instructor. Not offered every year. *Ms. Rathjen*

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 Research Topics in Cognitive Psychology (3-0-3).

Prerequisite: permission of instructor. May be repeated for credit with instructor's approval. *Staff*

- 435a, 436b. Advanced Research 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 Research Topics in General Psychology** (3-0-3 each semester).
Prerequisite: 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, programming, permission of the instructor. *Mr. Lane, Mr. Brelsford*
- 444b. Evidentiary Processes in Jurisprudence** (3-0-3).
Study of the inferential behavior of the factfinder (judge/juror) in legal proceedings. Prerequisite: permission of instructor. Not offered every year. *Mr. Schum*
- 462a. Advanced Managerial Psychology** (3-0-3).
Close examination of major concepts, research, and theories of psychology applied to the managerial role. Prerequisite: 201 or 303 plus some statistics (or instructor's permission). *Staff*
- 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.
- 512b. Research Methods in Social Psychology** (3-0-3).
Comprehensive survey of experimental and quasiexperimental research methodology in social psychology, with special attention to research design. Prerequisite: permission of the instructor. *Mr. Dipboye*
- 514b. Topics in Quantitative Methods and Research Design** (3-0-3).
Mr. Schum
- 515a. Topics in Cognitive Psychology** (3-0-3). *Staff*
- 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. Brelsford, Ms. Burnett*
- 522b. Topics in Learning and Memory** (3-0-3). *Mr. Brelsford, Ms. Burnett*
- 530a. Topics in Industrial-Organizational Psychology** (3-0-3). *Staff*
- 532b. Topics in Industrial-Organizational Psychology** (3-0-3). *Staff*
- 551a, 552b. Graduate Research in Psychology** (3-0-3 each semester).
Supervised literature, laboratory, and field research projects. *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*

Professor Sellers

Adjunct Professor S. E. Karff

Visiting Professor Trocmé

Associate Professor Kelber (on leave spring 1980)

Visiting Associate Professor Haugh

Adjunct Assistant Professor Shaper

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.

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-I. 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-II. Religious alternatives. The secular versus the sacred. Competing world views, East and West.

Staff

117a. American Religion (3-0-3).

A survey of religion in the United States and Canada from the colonial to the contemporary period. Attention to continuing problems and issues, internal and external to organized religion.

Mr. Nielsen, Staff

202b. Atheism (3-0-3).

Readings in Marx, Feuerbach, Nietzsche, Sartre, Ernest, Bloch, as well as classical theistic arguments.

Mrs. Shaper, 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. Deity, 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

221a, 222b. First-Year Hebrew (3-0-3 each semester).

Mr. Benjamin, Staff

301a. Mysticism and Existentialism (3-0-3).

Examination of these two approaches to life in Christian and non-Christian literature, ancient and modern.

Ms. Dunne

304b. Modern Jewish Thought (3-0-3).

Readings in contemporary Jewish thought with attention to Borowitz, Buber, Kaplan, and Rosenzweig.

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 courses.

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 into the religious world views of Mark, Matthew, and Luke in the light of redaction criticism.

Mr. Kelber

310b. Pauline Theology (3-0-3).

Introduction to the theological controversies between Paul and anti-Pauline Christians. Not offered 1979-80. *Mr. Kelber*

311a. History of Religion: The Far Eastern Tradition (3-0-3).

Readings in the holy books of Indian, China, and Japan. Study of Hinduism, Buddhism, Confucianism, Taoism, and Shinto. *Mrs. Shaper*

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*

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. *Staff*

331a. Psychology of Religion (3-0-3).

Study of the primary developments in the field, with particular emphasis on changing issues and methods. *Staff*

334b. Problems in Psychology of Religion (3-0-3).

Significant contemporary problems examined from a clinical standpoint, e.g., idea 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. *Mr. 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. *Ms. Dunne*

345a. Ethics and the Life Cycle (3-0-3).

Birth, death, and life's "stages": an overview. Readings from Erikson, Kierkegaard, Skinner, mythology, and theology. Not open to first-year students. Not offered 1979-80. *Mr. Sellers*

346b. Ethics and the Life Cycle II (3-0-3).

Concrete problems of the life cycle, including the quest for identity, sex ethics, medical ethics, aging, death, and dying. Not open to first-year students. *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*

362b. Myth, Evil, and Immortality (3-0-3).

Special attention to the thought of Mircea Eliade and Paul Ricoeur. *Staff*

375a. Man in the Cosmos (3-0-3).

Fundamental questions on the nature of humanity and its place in the universe. *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 and discussion of humanity's relation to the state, the just war, political ethics, poverty, civil rights dissent, and ecology. Not offered 1979-80. *Mr. Sellers*

443b. Moral Conflicts in America (3-0-3).

Discussion of controversial moral issues such as abortion, capital punishment, world famine, racism, euthanasia, with an ethical critique from the perspective of Judaic and Christian traditions. *Mr. Karff, Mr. Sellers*

444a. American Manners and Morals (3-0-3).

An ethical critique of American culture, with analysis of comics, mass media, folklore, customs, etiquette, and "civil religion." Not offered 1980-81. *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*

462b. Recent Christian Theology and Ethics (3-0-3).

Major trends from the turn of the century, with emphasis on Barth, Tillich, the Niebuhrs, Moltmann, Marcel, Vatican II, and Hans Keung. *Mr. Sellers*

501a, 502b. Research and Thesis (3-0-3 each semester).*Staff***506a. Seminar in the Synoptic Gospels (3-0-3).**

Not offered 1980-81.

*Mr. Trocmé***507a. Pauline Theology (3-0-3).**

Not offered 1979-80.

*Mr. Kelber***508b. The Gospel of John (3-0-3).**

Not offered 1979-80.

*Mr. Kelber***509a. New Testament and Culture (3-0-3).**

Not offered 1979-80.

*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 1980-81. *Staff*

522a. Seminar in Philosophical Theology (3-0-3).

Not offered 1979-80.

*Staff***523a, 524b. Independent Study (3-0-3 each semester).***Staff***525a. Seminar in the Problem of Religious Knowledge (3-0-3).**

Not offered 1980-81.

*Staff***526a. Seminar in Contemporary Theology (3-0-3).**

Not offered 1979-80.

*Mr. Nielsen***528. Ecumenical Theology Seminar (3-0-3).**

Not offered 1980-81.

*Mr. Nielsen***529b. Religious Knowledge in Historical Perspective (3-0-3).**

Not offered 1980-81.

*Staff***530b. Seminar in Historical Theology (3-0-3).**

Not offered 1980-81.

*Staff***533a. Methodology in Historical Theology (3-0-3).**

Not offered 1979-80.

*Staff***541a. Seminar in Ethics (3-0-3).**

Not offered 1979-80.

*Mr. Sellers***543a. Seminar in Social Ethics (3-0-3).**

Not offered 1980-81.

*Mr. Sellers***544b. Seminar in Theology and Ethics (3-0-3).***Mr. Sellers*

552b. Seminar in History of Religion (3-0-3).

Not offered 1979-80.

Mr. Nielsen

553a, 554b. Departmental Colloquium.

Staff

700c. Summer Graduate Research (3-0-3).

800b. Degree Candidate Only.

Sociology

Associate Professor Davidson, *Chairman*

Professors C. Gordon and W. C. Martin (on leave spring 1980)

Associate Professor Klineberg (on leave 1979-80)

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 316 or 353; (3) Sociology 421 and 423; 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 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 and 423 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 American Society (3-0-3).

Distinctive organizational and structural characteristics of modern American society considered in relation to cultural norms and values. Review and critique of leading social analysts.
Ms. Long

231a. Race and Ethnic Relations (3-0-3).

Topics include discrimination and the law; the "IQ controversy"; ethnic cultures; political and economic aspects of ethnicity; theories of prejudice. Occasional field trips.
Mr. Davidson

300b. Social Stratification (3-0-3).

Social inequality in human societies, comparing American stratification to other systems. Theories of inequality and experiments in abolishing stratification are discussed.
Mr. Davidson

305a. Sociology of Sex Roles (3-0-3).

Relationship between gender and social role. Development of the contemporary sexual division of labor and processes of socialization with reference to family, education, media, and occupations.
Ms. Long

311a. Collective Behavior (3-0-3).

Consideration of relatively noninstitutionalized conduct: crowds, mobs, publics, social movements; conditions and consequences of social unrest, excitement, panic, and protest.
Mr. Gordon

316b. Basic Trends in Sociological Theory (3-0-3).

Conflict/integration theory, symbolic interactionism, structural-functionalism, and exchange theory as influenced by Marx, Weber, and Durkheim, as well as Parsons, Mills, and Merton.
Mr. Gordon

319. The Sociology of Occupations (3-0-3).

The influence of occupation upon life style, values, social and economic status, and world views. Field work by the student is encouraged. Not offered 1979-80. *Mr. Davidson*

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.
Mr. Martin

326. Sociology of Situational Interaction (3-0-3).

Interpretation and normative regulation of face-to-face interaction. Presentation of self and allocation of involvement in different social situations. Field observations included. Not offered 1979-80.
Mr. Gordon

330b. Politics and Society in Texas (3-0-3).

Impact of racial and class conflict on twentieth-century Texas politics. Special emphasis on research.
Mr. Davidson

336. 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 1979-80.
Mr. Gordon

348b. Sociology of Law (3-0-3).

Relationship of the law — as system, process, and profession — to its social context, with emphasis on its role as cause and consequence of social change.
Ms. Long

353. Personality, Social Structure, and Culture I (3-0-3).

Interrelations between personality and social systems as seen by psychoanalysis, behaviorism, the work of Piaget, and symbolic interactionism; the changing conceptions of humanity in the behavioral sciences. Not offered 1979-80.
Mr. Klineberg

354. Personality, Social Structure, and Culture II (3-0-3).

Attitudes, conformity and deviance, psychological dimensions of social change. Relation of psychology, sociology, and anthropology to individual behavior and the persistence of social systems. Prerequisite: Sociology 353 or permission of instructor. Not offered 1979-80.
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

381a. Small Groups (3-0-3).

Analysis of individual-group conflict, group development, communication between members, and small groups as the carriers of culture, based in part on experience in a self-study group.
Staff

390. Sociology of Leisure (3-0-3).

Leisure activity (relaxation, diversion, personal development, creativity, and sensual transcendence) in relation to work, family, education, income, socioeconomic status, and life-cycle stage. Not offered 1979-80.
Mr. Gordon

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. Approval of the department required.
Staff

412. Social Change (3-0-3).

Processes of social change from the perspectives of leading theorists and recent research; individual and collective responses to the transformations in modern societies. Not offered 1979-80.
Mr. Klineberg

421a. Introduction to Research Methods (3-0-3).

Examination of the major objectives, strategies, and tactics of social science research combined with practical experience in conducting an empirical project. Laboratory (Sociology 423) required.
Mr. Gordon, Ms. Long

423a. Introduction to Research Methods Laboratory (0-3-1).

A three-hour laboratory devoted to a class project, including literature review, hypothesis formulation, research design, data collection, and analysis.
Mr. Gordon, Ms. Long

425. Political Sociology (3-0-3).

Examination of the distribution of power in American society. Particular attention is given to the relation of class and ethnicity to politics. Not offered 1979-80.
Mr. Davidson

426. The Sociology of Marx (3-0-3).

Sociological aspects of Marx's theory: class, alienation, ideology, and historical materialism. Marx's predictions in light of twentieth-century developments. Sociological critiques and revisions of Marxism. Not offered 1979-80. *Mr. Davidson*

430. 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. Not offered 1979-80. *Mr. Martin*

431a. Sociology of the Life Cycle I (3-0-3).

Seminar analyzing socialization, interaction patterns, self-conception development, and aspirations during infancy, childhood, and adolescence. Effects of sex role, family structure, social class, and ethnicity. Not offered 1979-80. *Mr. Gordon*

432b. Sociology of the Life Cycle II (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. *Mr. Gordon*

434. Family Structures and Processes (3-0-3).

Analysis of role structure, sexuality, and interaction patterns in the "standard" American nuclear family and its alternatives in diverse social settings. Not offered 1979-80. *Mr. Gordon*

436. Sociology and Literature (3-0-3).

Interconnections between literature and society considered from a range of theoretical perspectives. The use of literary materials as "evidence" in sociological analysis. Not offered 1979-80. *Ms. Long*

446b. Urban Sociology (3-0-3).

Urban growth and physical structure, the quality of human relations and of cultural and individual survival in an urbanized society, and strategies of response. *Staff*

471. Popular Culture (3-0-3).

Analysis of social origins, significance, and implications of various types of media, arts, and popular entertainment. Enrollment limited. Permission of instructor required. Not offered 1979-80. *Mr. Martin*

480. Sociology of the Future (3-0-3).

Processes underlying the transformation of American society; educational and occupational changes, social movements, and personal values as they interact to shape the future. Not offered 1979-80. *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*

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

Visiting Professor D. P. Cox (1979-80)

Associate Professors Dunning, Few, and Talbot

Adjunct Associate Professor Rundel

Assistant Professors Dufour, Hill, and Reiff

Adjunct Assistant Professor Ride

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):

<i>First Year:</i>	Physics 101, 102 or 111, 112 (132) Mathematics 101, 102 Chemistry 101, 102 (107)
<i>Second Year:</i>	Space Physics and Astronomy 251, 252 (261, 262) Physics 201, 202 or 211, 212 (231) Mathematics 211, 212
<i>Third Year:</i>	Physics 301, 302 (331, 332) Physics 311, 312 Mathematics or Mathematical Sciences elective (300 or above)
<i>Fourth Year:</i>	Space Physics and Astronomy 471 or 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.

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 space environment, design and construction of large space structures, economic justification (power generation, specialized manufacturing), and evolution of social and political framework. (Formerly offered as Space Physics and Astronomy 301) Not offered 1980-81. *Mr. Freeman*

241a,b. Astronomy: Exploring the Universe (3-0-3).

A self-paced introductory course intended for students in academic programs. *Ms. Reiff*

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. Dufour*

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. Haymes, Mr. Talbot*

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. Departmental approval required. *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 1980-81. *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 1980-81. *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. Chamberlain, Mr. Dufour*

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. Chamberlain, Mr. Anderson*

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 301. Not offered 1979-80. *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 1979-80. *Mr. Chamberlain*

512b. Planetary Atmospheres: Aeronomy (3-0-3).

Physics and chemistry of planetary atmospheres. Not offered 1979-80. *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 1980-81. *Mr. Freeman*

537b. Cosmochemistry II (3-0-3).

Chemistry of interstellar media. Not offered 1980-81. *Mr. Heymann*

538b. Cosmochemistry I (3-0-3).

Chemical evolution of the solar system. Not offered 1979-80. *Mr. Heymann*

544b. Mathematical Methods in Space Physics (3-0-3).

Selected mathematical techniques and methods useful in physics and space physics. Prerequisite: Physics 301, 302 or equivalent. Mathematical Sciences 440 recommended. Also offered as Mathematical Sciences 544. Not offered 1979-80. *Mr. Hill*

545a, 546b. Cosmology (3-0-3 each semester).

Structure and evolution of the universe. Not offered 1979-80. *Mr. Clayton*

551. Stellar Evolution and Nuclear Astrophysics (3-0-3).

Physical principles governing structure and evolution of stars. Not offered 1980-81. *Mr. Talbot*

552. Stellar and Galactic Evolution (3-0-3).

Application of Space Physics and Astronomy 551 to stellar and galactic evolution. Not offered 1980-81. *Mr. Talbot*

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
- 615a. Experimental Methods of Space Physics and Astronomy** (3-0-3).
Methods of laboratory experimentation, data analysis, and computer graphics. Not offered 1980-81.
Staff
- 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 1979-80.
Staff
- 700c. Summer Graduate Research** (0-0-6).
- 800b. Degree Candidate Only.**

Spanish, Portuguese, and Classics

Associate Professor Leal de Martinez, *Chairman*
Professors Castañeda and Levin
Associate Professors Boorman, Callahan,
Urrutibéheity, and Wallace
Instructor Kauffmann
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 and Madrid.

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 syntax, 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. *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. Urrutibehety, 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. *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 consent 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 consent 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 alternate years. Offered 1980-81. *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 1980-81. *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. *Ms. Leal de Martinez*

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 1980-81. *Ms. Callahan, Ms. Boorman*

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. Callahan*

341a, 342b. Spanish Literature from 1800 to the Present (3-0-3 each semester).

Not offered 1979-81.

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 1980-81. *Staff*

361a, 362b. Golden Age of 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 1979-80. *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 1979-80. *Mr. Castañeda*

402b. Introduction to Semiotics (3-0-3).

Explores the linguistic origins of semiotics and its influence on anthropology, philosophy, and psychoanalysis. Applies methods of semiotics to the study of literary texts and other art forms. Readings and lectures in English; some readings in Spanish for majors. Also offered as Linguistics 410. Offered 1979-80. *Mr. Kauffmann*

405a, 406b. Spanish-American Literature (3-0-3 each semester).

Topics for 1979-80: contemporary Mexican literature, contemporary Spanish-American novel. Offered alternate years. Offered 1979-80. *Ms. Boorman*

411a, 412b. Medieval and Renaissance Spanish Literature (3-0-3 each semester).

Not offered 1979-81.

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 upperclass students who are particularly interested in a topic not covered in other courses. Permission of the department required. *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. Urrutibéheity

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. Urrutibéheity

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

515a/516b. Studies in Hispanic Linguistics (3-0-3).

Topics for 1979-80: history of the Spanish language, Old Spanish, applied Spanish linguistics, and Spanish-American dialectology. May be repeated for credit when topics vary. Offered spring 1980.
Mr. Urrutibéheity

517a/518b. Studies in Medieval Spanish Literature (3-0-3 each semester).

Topic for fall 1979: *La Celestina*.

*Ms. Leal de Martínez***523a, 524b. Studies in Spanish Golden Age Theater (3-0-3 each semester).**

The cycles of Lope de Vega and Calderón de la Barca. Given alternate years. Offered 1979-80.
Mr. Castañeda

525a, 526b. Studies in Spanish Golden Age Prose and Lyric Poetry (3-0-3 each semester).

Offered alternate years. Offered 1980-81.

*Mr. Castañeda***535a/536b. Studies in the Spanish Literature of the Nineteenth Century**

(3-0-3 each semester).

Offered fall 1979.

*Staff***541a/542b. Studies in the Spanish Literature of the Twentieth Century (3-0-3 each semester).**

Not offered 1979-81.

555a. Studies in Spanish-American Literature from the Colonial Period to the Present Day (3-0-3).

Topic for 1979-80: contemporary Argentinian, Uruguayan, and Chilean literature. May be repeated for credit when topics vary.
Ms. Callahan

556b. Studies in Spanish-American Literature from the Colonial Period to the Present Day (3-0-3).

Topic for 1979-80: contemporary Peruvian, Colombian, Mexican, and Cuban literature. May be repeated for credit when topics vary.
Ms. Boorman

566b. Studies in the Culture and Civilization of Spain and Latin America (3-0-3).

Not offered 1979-81.

575a/576b. Romance Linguistics (3-0-3 each semester).

Not offered 1979-81.

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 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 de Martinez

201a, 202b. Second-Year Portuguese (3-0-3 each semester).

Not offered 1979-81.

311a, 312b. Advanced Portuguese (3-0-3 each semester).

Not offered 1979-81.

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. Permission of the department required.

Classics

Undergraduate Program. A major in classical studies is presently offered with the cooperation of the Departments of History and Fine Arts. The overall major requirement is distributed between classical languages and literature, at least thirty semester hours (ten courses) of which eighteen semester hours (six courses) must be at the 300 level or above, and relevant courses in fine arts, history, humanities, and philosophy. Preparation to insure an adequate reading and speaking knowledge of at least one modern foreign language is very strongly urged. All prospective programs for individuals majoring in classical studies are to be drawn up in consultation with the 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

214a,b. 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.

Ms. Wallace, 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

412b. Roman Historians (3-0-3).

Study of Roman historiography, with emphasis upon Sallust, Livy, and Tacitus, including comparison with Greek historians and the ancient biographical tradition. Prerequisite: Classics 211 or 212, History 201 or 202, or permission of instructor. Offered in alternate years. Offered 1979-80. Also offered as Latin 412. *Ms. Wallace*

*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: Classical (3-0-3 each semester).

Designed to broaden previously acquired skills through close study of readings which may include a dialogue of Plato, a tragedy, or selections from Homer. Prerequisite: Greek 101, 102 or equivalent. *Mr. Levin, Staff*

211a. Intermediate Greek: New Testament (3-0-3).

Experience and facility in reading New Testament Greek. The Gospel of Mark and selected letters of Paul are read. Prerequisite: Greek 101, 102 or equivalent. *Ms. Eaker*

491a, 492b. Special Topics in Greek Literature (0-0-3 each semester).

Independent work for qualified upperclass students 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. Open to students with no previous study of Latin or who need a refresher course. *Ms. Eaker*

102b. First-Year Latin (3-0-3).

A first reading course in Latin. Selections of prose and poetry from the classical and medieval periods are read. *Ms. Wallace*

201a. Intermediate Latin (3-0-3).

Rapid review of forms and syntax followed by reading of representative prose selections. For students who have two or three years of high school Latin or who have successfully completed Latin 101, 102. *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. Prerequisites: 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 are considered. Offered in alternate years. Offered 1979-80. *Mr. Levin*

412b. Roman Historians (3-0-3).

Also offered as Classics 412.

Ms. Wallace

421a. Virgil (3-0-3).

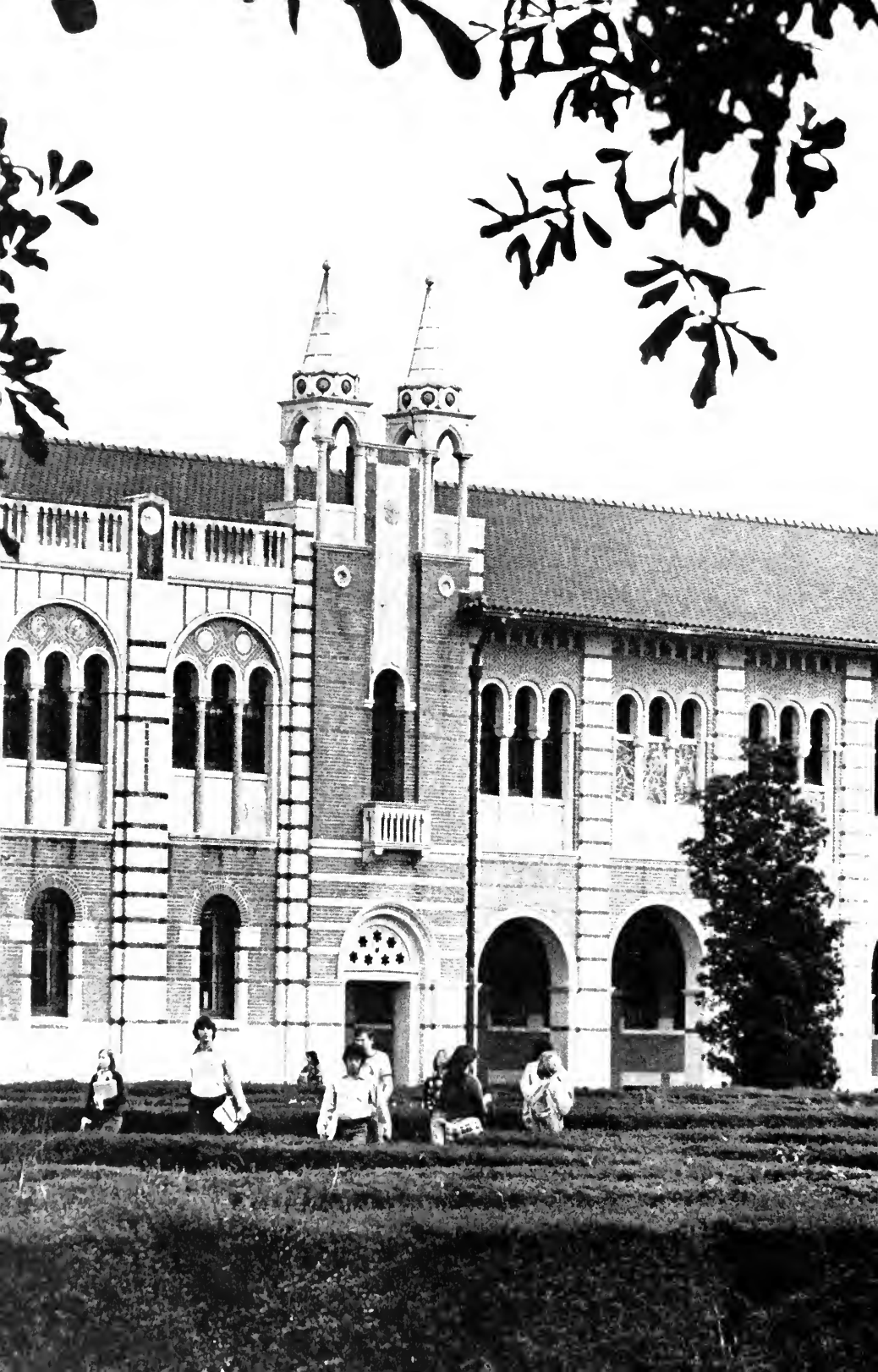
Study of the poet's works (*Bucolics, Georgics, Aeneid*), with special emphasis on the *Aeneid*. Offered alternate years. Offered 1980-81. *Mr. Levin*

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 1980-81. *Mr. Levin*

491a, 492b. Special Topics in Roman Literature (0-0-3 each semester).

Independent work for qualified upperclass students in genres or authors not presented in other upper level courses. May be repeated for credit. Prerequisite: Latin 301, 302 or equivalent. *Staff*



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NOTES

NOTES

Academic Calendar 1980-81

First Semester

<i>Monday, August 11</i>	Last day for payment of fees for continuing students
<i>Monday, August 18-</i> <i>Saturday, August 23</i>	Arrival and orientation week for new students and new transfers
<i>Saturday & Sunday,</i> <i>August 23 & 24</i>	Arrival of continuing students
<i>Monday, August 25</i>	First day of classes
<i>Monday, September 1</i>	Labor Day holiday
<i>Friday, September 5</i>	Final registration for undergraduates and candidates for B.Arch. and B.F.A. degrees, fall semester, 5 P.M.
<i>Friday, September 19</i>	Deadline for adding courses to schedule and designating Pass/Fail, 5 P.M.
<i>Friday, September 26</i>	Deadline for removal of Incompletes, 5 P.M.
<i>Monday, October 6-</i> <i>Tuesday, October 7</i>	Midterm recess
<i>Wednesday, October 8</i>	All classes normally held on Monday meet; all Wednesday classes are canceled to equalize holidays by days of the week during the semester
<i>Thursday, October 9</i>	Last day to file college course plans with the dean of undergraduate affairs
<i>Wednesday, October 29</i>	Deadline for doctoral candidacy petitions, Office of the Dean of Advanced Studies and Research, 5 P.M.
<i>Friday, October 31</i>	Deadline for dropping courses or converting Pass/Fail to number grade, 5 P.M.
<i>Thursday, November 27-</i> <i>Sunday, November 30</i>	Thanksgiving recess
<i>Friday, December 5</i>	Last day of classes
<i>Wednesday, December 10</i>	First day of final examinations
<i>Wednesday, December 17</i>	Last day of final examinations
<i>Tuesday, December 23</i>	All grades due, Office of the Registrar, 12 noon

Second Semester

<i>Monday, January 5</i>	First day of classes
<i>Friday, January 16</i>	Final registration for undergraduates and candidates for B.Arch. and B.F.A. degrees, spring semester, 5 P.M.
<i>Friday, January 30</i>	Deadline for adding courses to schedule and designating Pass/Fail, 5 P.M.
<i>Friday, February 6</i>	Deadline for removal of Incompletes, 5 P.M.
<i>Tuesday, February 10</i>	Majors Day for first- and second-year students
<i>Friday, February 20</i>	Last day to file college course plans with the dean of undergraduate affairs
<i>Monday, February 23-</i> <i>Sunday, March 1</i>	Midterm recess
<i>Thursday, February 26</i>	Deadline for master's degree petitions, Office of the Dean of Advanced Studies and Research, 5 P.M.
<i>Saturday, March 14</i>	Parents Day
<i>Friday, March 20</i>	Deadline for dropping courses and for converting Pass/Fail to number grade, 5 P.M.
<i>Thursday, April 2-</i> <i>Sunday, April 5</i>	Spring recess
<i>Friday, April 24</i>	Last day of classes
<i>Saturday, April 25-</i> <i>Thursday, April 30</i>	Final examinations for graduating seniors and fifth-year degree candidates
<i>Wednesday, April 29</i>	First day of finals for remaining students
<i>Friday, May 1</i>	Deadline for submission of theses for spring graduation, Office of the Dean of Advanced Studies and Research, 12 noon
<i>Monday, May 4</i>	Grades of all degree candidates due in Office of the Registrar, 9 A.M.
<i>Wednesday, May 6</i>	Last day of final examinations
<i>Saturday, May 9</i>	Sixty-eighth commencement
<i>Tuesday, May 12</i>	Deadline for filing undergraduate degree plans
<i>Wednesday, May 13</i>	Remaining grades due, Office of the Registrar, 5 P.M.

Summer 1981

<i>May-June-July</i>	Rice Summer Program for college students
<i>June-July</i>	Teaching Apprentice Session

