# Student Calendar For 1978-79

## Winter Quarter, 1978

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 3-4 (T-W)</td>
<td>Registration</td>
</tr>
<tr>
<td>January 5 (T)</td>
<td>Classes Begin</td>
</tr>
<tr>
<td>February 8 (T)</td>
<td>Change of Registration Deadline</td>
</tr>
<tr>
<td>March 15 (W)</td>
<td>Classes End</td>
</tr>
<tr>
<td>March 17 (F)</td>
<td>Commencement</td>
</tr>
</tbody>
</table>

## Spring Quarter, 1978

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 26</td>
<td>Easter</td>
</tr>
<tr>
<td>March 27-28 (M-T)</td>
<td>Registration</td>
</tr>
<tr>
<td>March 29 (W)</td>
<td>Classes Begin</td>
</tr>
<tr>
<td>May 2 (T)</td>
<td>Change of Registration Deadline</td>
</tr>
<tr>
<td>June 6 (T)</td>
<td>Classes End</td>
</tr>
<tr>
<td>June 9 (F)</td>
<td>Commencement</td>
</tr>
</tbody>
</table>

## Summer Quarter, 1978

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 15-16 (T-F)</td>
<td>Registration, First or Both Terms</td>
</tr>
<tr>
<td>June 19 (M)</td>
<td>Classes Begin</td>
</tr>
<tr>
<td>July 4 (T)</td>
<td>Independence Day (No Classes)</td>
</tr>
<tr>
<td>July 6 (T)</td>
<td>Change of Registration Deadline, First Term</td>
</tr>
<tr>
<td>July 20 (T)</td>
<td>Classes End, First Term</td>
</tr>
<tr>
<td>July 21 (F)</td>
<td>Registration, Second Term</td>
</tr>
<tr>
<td>July 24 (M)</td>
<td>Change of Registration Deadline, Full Term</td>
</tr>
<tr>
<td>July 24 (M)</td>
<td>Change of Registration Deadline, Second Term</td>
</tr>
<tr>
<td>August 10 (T)</td>
<td>Classes End</td>
</tr>
<tr>
<td>August 23 (W)</td>
<td>Commencement</td>
</tr>
<tr>
<td>August 25 (F)</td>
<td></td>
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</tbody>
</table>

## Fall Quarter, 1978

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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</thead>
<tbody>
<tr>
<td>September 18-20 (M-W)</td>
<td>Registration</td>
</tr>
<tr>
<td>September 21 (W)</td>
<td>Classes Begin</td>
</tr>
<tr>
<td>October 25 (W)</td>
<td>Change of Registration Deadline</td>
</tr>
<tr>
<td>October 27 (F)</td>
<td>East. Tenn. Educ. Assoc. (No Classes)</td>
</tr>
<tr>
<td>November 18 (S)</td>
<td>Homecoming (No Classes)</td>
</tr>
<tr>
<td>November 23-25 (T-S)</td>
<td>Thanksgiving (No Classes)</td>
</tr>
<tr>
<td>December 5 (T)</td>
<td>Classes End</td>
</tr>
<tr>
<td>December 8 (F)</td>
<td>Commencement</td>
</tr>
</tbody>
</table>

## Winter Quarter, 1979

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 3-4 (W-T)</td>
<td>Registration</td>
</tr>
<tr>
<td>January 5 (F)</td>
<td>Classes Begin</td>
</tr>
<tr>
<td>February 8 (T)</td>
<td>Change of Registration Deadline</td>
</tr>
<tr>
<td>March 15 (T)</td>
<td>Classes End</td>
</tr>
<tr>
<td>March 19 (M)</td>
<td>Commencement</td>
</tr>
</tbody>
</table>
Correspondence Directory

Graduate Study
L. Evans Roth, Vice Chancellor for Graduate Studies and Research
Margaret N. Perry, Dean for Graduate Studies
Diana C. Lopez, Director of Graduate Admissions
Clea J. Greenawalt, Assistant Director of Graduate Admissions

Assistantships
Head of department in which you plan to major

Loans
- Work Study
- Part-time Employment
- Student Loans

Carolyn Cuddy, Director, Financial Aid, 301 Student Services Bldg.

Housing
Married students—Office of Rental Properties, Stadium
Single students—Office of Residence Halls, 405 Student Services Bldg.

International Student Advisor
Dixon Johnson, Alumni Hall

Scholarships and Fellowships
Clea J. Greenawalt, The Graduate School

Thesis Consultant
Georgia Bunn, The Graduate School

Timetable of Classes
Supervisor of Registration, Registrar's Office

Transcripts
Bob L. Cochran, Registrar

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<table>
<thead>
<tr>
<th>Building Name</th>
<th>Location/Description</th>
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</thead>
<tbody>
<tr>
<td>Ayres Hall</td>
<td>MAIN CAMPUS: 1 Ayres Hall</td>
</tr>
<tr>
<td>South College</td>
<td></td>
</tr>
<tr>
<td>Dabney Hall &amp; Buehler Hall</td>
<td></td>
</tr>
<tr>
<td>UTK Personnel Office</td>
<td></td>
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<tr>
<td>UTK Employment Office</td>
<td></td>
</tr>
<tr>
<td>Geology and Geography Building</td>
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</tr>
<tr>
<td>Physics Building</td>
<td></td>
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<tr>
<td>Hesler Biology Building</td>
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</tr>
<tr>
<td>Austin Peay Building</td>
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</tr>
<tr>
<td>Turner House</td>
<td></td>
</tr>
<tr>
<td>Alumni Memorial Auditorium-Gymnasium</td>
<td></td>
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<tr>
<td>Neyland Stadium, East &amp; South Stadium</td>
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<tr>
<td>Hall, Office of Rental Properties</td>
<td></td>
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<tr>
<td>Berry Hall</td>
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<tr>
<td>Estabrook Hall</td>
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<tr>
<td>Blount Hall</td>
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<tr>
<td>Perkins Hall</td>
<td></td>
</tr>
<tr>
<td>Ferris Hall</td>
<td></td>
</tr>
<tr>
<td>Dougherty Engineering Building</td>
<td></td>
</tr>
<tr>
<td>White Avenue Building</td>
<td></td>
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<tr>
<td>Nursery School</td>
<td></td>
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<tr>
<td>Family Life Center</td>
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<tr>
<td>Harris Home Economics Building</td>
<td></td>
</tr>
<tr>
<td>USDA Textile &amp; Clothing Lab</td>
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<tr>
<td>Hoskins Library (Main Library)</td>
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<tr>
<td>Estes Kefauver Memorial Wing</td>
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<tr>
<td>Craft House</td>
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<tr>
<td>Planning School Annex</td>
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<tr>
<td>Taylor Law Center</td>
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<tr>
<td>Planning School</td>
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<tr>
<td>Panhellenic Building</td>
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<tr>
<td>Alumni Hall</td>
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<tr>
<td>Temple Court</td>
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<tr>
<td>Student Affairs Building</td>
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<tr>
<td>Carolyn P. Brown Memorial University Center</td>
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<tr>
<td>Student Health Center</td>
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<tr>
<td>UT Credit Union</td>
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<tr>
<td>Walters Life Sciences Building</td>
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<tr>
<td>Glocker Business</td>
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<tr>
<td>Administration Building</td>
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<tr>
<td>Andrew Holt Tower</td>
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<tr>
<td>Claxton Education Building</td>
<td></td>
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<tr>
<td>Hearing and Speech Center</td>
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<tr>
<td>Communications and University</td>
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<tr>
<td>Extension Building</td>
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<tr>
<td>Student Services and Administration Building</td>
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<tr>
<td>Andrew Holt Tower Parking Garage</td>
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<tr>
<td>McClung Museum</td>
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<tr>
<td>Humanities Complex-McClung Tower</td>
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<tr>
<td>John C. Hodges</td>
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<tr>
<td>Undergraduate Library</td>
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<tr>
<td>Art Center</td>
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<tr>
<td>Dunford Hall</td>
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<tr>
<td>Greve Hall</td>
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<tr>
<td>Henson Hall</td>
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<tr>
<td>Pedestrian Overpass</td>
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<tr>
<td>Strong Hall-University Cafeteria</td>
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<tr>
<td>Clement Hall</td>
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<tr>
<td>Design House</td>
<td></td>
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<tr>
<td>Massey Hall</td>
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<tr>
<td>Religious Center(s)</td>
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<tr>
<td>Kappa Sigma</td>
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<tr>
<td>History Annex</td>
<td></td>
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<tr>
<td>Menlow Hall</td>
<td></td>
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<tr>
<td>Hess Hall</td>
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<tr>
<td>Clarence Brown Proscenium Theatre</td>
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<tr>
<td>Carousel Theatre</td>
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<tr>
<td>Gibbs Hall</td>
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<tr>
<td>Power Plant</td>
<td></td>
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<tr>
<td>Army Reserve Training Center</td>
<td></td>
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<tr>
<td>William B. Stokely Athletics Center</td>
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<tr>
<td>Music Building</td>
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<tr>
<td>University Architect's Office</td>
<td></td>
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<tr>
<td>Physical Education Building</td>
<td></td>
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<tr>
<td>Tom Black Track &amp; Recreation Area</td>
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<tr>
<td>Phi Sigma Kappa</td>
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</tr>
<tr>
<td>Kappa Alpha</td>
<td></td>
</tr>
<tr>
<td>Sigma Alpha Epsilon</td>
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<tr>
<td>Alpha Tau Omega</td>
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<tr>
<td>Sigma Chi</td>
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<tr>
<td>Pi Kappa Alpha</td>
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<tr>
<td>Sigma Nu</td>
<td></td>
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<tr>
<td>Pi Kappa Phi</td>
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<tr>
<td>Sigma Phi Epsilon</td>
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<td>Phi Gamma Delta</td>
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<td>Alpha Gamma Rho</td>
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<tr>
<td>Delta Tau Delta</td>
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<tr>
<td>Lambda Chi Alpha</td>
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<tr>
<td>Physical Plant</td>
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<tr>
<td>Transportation Service (Motor Pool)</td>
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<tr>
<td>Security Building</td>
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<tr>
<td>Purchasing Agent</td>
<td></td>
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<tr>
<td>Student Aquatic Center</td>
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</tbody>
</table>
Graduate School Office Hours

Monday - Friday 8:00 A.M.-5:00 P.M. (All Year) / 115 Student Services and Administration Building
Telephone - (615) 974-3251

The Graduate School Administration
L. Evans Roth, A.B., M.S., Ph.D., Vice Chancellor for Graduate Studies and Research
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Marvin Goodman, B.S., M.S., Director, Kingsport Graduate Program
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Margaret N. Perry, Dean

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School of Social Work Dr. Edward J. Pawlak Dec. 31, 1980
UT Space Institute Dr. James Wu Dec. 31, 1979

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Don O. Shadow June 1, 1979

From Davidson County
TERM EXPIRES
Mrs. Elaine McReynolds June 1, 1984

From Hamilton County
TERM EXPIRES
Paul J. Kinser June 1, 1978

From Knox County
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Frank P. Bowyer June 1, 1980

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TERM EXPIRES
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Marcus J. Stewart July 1, 1981

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Sylvia E. Hart, B.S.N., M.S.N., Ph.D., Dean of the College of Nursing
Willis W. Armistead, M.S., D.V.M., Dean of the College of Veterinary Medicine
Joseph P. Goddard, B.S., M.S., Ed.D., Dean of the Division of Continuing Education
John J. McDow, B.S., M.S., Ph.D., Dean of Admissions (Undergraduate) and Records
## Majors and Degrees Available

<table>
<thead>
<tr>
<th>College of Agriculture</th>
<th>DEGREE</th>
<th>ADMISSION TEST REQUIRED</th>
<th>LETTERS OF RECOMMENDATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural Biology</td>
<td>M.S.</td>
<td>X</td>
<td>3-Departmental Rating Forms</td>
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<tr>
<td>Agricultural Economics</td>
<td>M.S., PH.D.</td>
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<tr>
<td>Agricultural Engineering</td>
<td>M.S.</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Agricultural Extension</td>
<td>M.S.</td>
<td>X</td>
<td>or X</td>
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<tr>
<td>Agricultural Mechanization</td>
<td>M.S.</td>
<td>X</td>
<td>or X</td>
</tr>
<tr>
<td>Animal Science</td>
<td>M.S., PH.D.</td>
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<td>X</td>
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<tr>
<td>Food Technology and Science</td>
<td>M.S.</td>
<td>X</td>
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<tr>
<td>Forestry</td>
<td>M.S.</td>
<td>X</td>
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</tr>
<tr>
<td>Ornamental Horticulture and Landscape Design</td>
<td>M.S.</td>
<td>X</td>
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</tr>
<tr>
<td>Plant and Soil Science</td>
<td>M.S., PH.D.</td>
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<tr>
<td>Wildlife and Fisheries Science</td>
<td>M.S.</td>
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<table>
<thead>
<tr>
<th>College of Business Administration</th>
<th>M.B.A., D.B.A.</th>
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<th>4-Obtain Forms from Department</th>
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<tbody>
<tr>
<td>* Business Administration</td>
<td>M.S., PH.D.</td>
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<tr>
<td>Economics</td>
<td>M.S., PH.D.</td>
<td>X</td>
<td>or X</td>
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<tr>
<td>Management Science</td>
<td>PH.D.</td>
<td>X</td>
<td>or X</td>
</tr>
<tr>
<td>Statistics</td>
<td>M.S.</td>
<td>X</td>
<td>or X</td>
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</table>

<table>
<thead>
<tr>
<th>College of Communications</th>
<th>M.S., PH.D.</th>
<th>X</th>
<th>Obtain Forms from Department</th>
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<tbody>
<tr>
<td>Communications</td>
<td>M.S., PH.D.</td>
<td>X</td>
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<table>
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<tr>
<th>College of Education</th>
<th>M.S.</th>
<th>X</th>
<th>5-All Ed.S., Ph.D. and Ed.D. applicants obtain special forms from the Graduate School</th>
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<td>Adult Education</td>
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<td>Distributive Education</td>
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<td>Educational Administration and Supervision</td>
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<td>English Education</td>
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<td>Foreign Language Education</td>
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<td>Guidance</td>
<td>M.S.</td>
<td>X*</td>
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<tr>
<td>Health Education</td>
<td>ED.D., PH.D.</td>
<td>X</td>
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<tr>
<td>* Industrial Education</td>
<td>M.S.</td>
<td>X</td>
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<td>Instructional Materials</td>
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<td>M.S.</td>
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<td>Music Education</td>
<td>M.S.</td>
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<tr>
<td>Physical Education</td>
<td>M.S., ED.D.</td>
<td>X*</td>
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<td>Public Health</td>
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<td>Recreation</td>
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<td>Safety Education and Service</td>
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<tr>
<td>Vocational-Technical Education</td>
<td>M.S., ED.S., ED.D</td>
<td>X*</td>
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<p>| College of Engineering                   | M.S., PH.D.   | X*                       |                               |
| * Aerospace Engineering                  | M.E., M.S., PH.D. | X*                     |                               |
| * Chemical Engineering                   | M.S., PH.D.   | X*                       |                               |
| * Civil Engineering                      | M.E., M.S., PH.D. | X*                     |                               |
| * Electrical Engineering                 | M.E., M.S., PH.D. | X*                     |                               |
| * Engineering Administration             | M.S.          | X*                       |                               |
| * Engineering Science                    | M.S., PH.D.   | X*                       |                               |
| * Environmental Engineering              | M.E., M.S.    | X*                       |                               |
| * Industrial Engineering                 | M.E., M.S.    | X                        |                               |
| * Mechanical Engineering                 | M.E., M.S., PH.D. | X*                     |                               |
| * Metallurgical Engineering              | M.S., PH.D.   | X*                       |                               |
| * Nuclear Engineering                    | M.E., M.S., PH.D. | X*                     |                               |
| * Polymer Engineering                    | M.S., PH.D.   | X*                       |                               |</p>
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<tr>
<th>College of Home Economics</th>
<th>DEGREE</th>
<th>ADMISSION TEST REQUIRED</th>
<th>LETTERS OF RECOMMENDATION</th>
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<td>9 Food Science</td>
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<td>3-Former Professors</td>
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<td>3-Former Professors</td>
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<tr>
<td>(Memphis, Nashville and Knoxville)</td>
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</tr>
</tbody>
</table>

1 Offered only at UT Space Institute.
2 Offered also at off-campus locations.
3 Departmental doctoral option offered under the major of Home Economics.
4 Interdisciplinary option offered in each department.
5 Ph.D. applicants only.
6 American applicants only.
7 Ed.D. applicants only.
8 Ed.S. applicants only.
9 International applicants only.
10 Interdisciplinary Ph.D. applicants only.
The Graduate School

The mission of The University of Tennessee, Knoxville is to offer instruction in all levels of higher education, engage in and train for research, and provide extended services of great variety. The obligations of this mission are reinforced by the fact that The University of Tennessee is both the State University and the official Land-Grant Institution of Tennessee.

Advanced Graduate Work and Research

The University of Tennessee has some obligations not shared in the same degree by other public colleges and universities of the state, although these specialized functions are common to most major state universities and land-grant institutions. For instance, the University must develop and maintain advanced instruction and research in the basic arts and sciences and in professional and occupational areas dependent upon the fundamental fields of learning, especially (but not exclusively) those of substantial importance to the state. It is the business of such a state university to advance the frontiers of knowledge in all areas of human concern, to discover facts previously unknown, to present new theories and test those previously not established, and thereby augment the intellectual heritage of the human race. The major basic research in America is conducted in American universities.

So far as publicly-supported higher education is concerned, The University of Tennessee, Knoxville is the center of advanced graduate training and research. As of 1977 the University provides Master's level work in over 100 fields of knowledge and doctoral work in 47, enrolling more than 6,800 graduate students.

The search for new knowledge and its application to the changing needs of society is a major aim of The University of Tennessee. In graduate instruction, through research programs, and by public service, the University and its faculty constitute a major resource for contributions to state, national, and international problems. In addition to typical departmental units of administration, numerous interdisciplinary programs, institutes, and centers have been developed in the locations and the scholarly areas needed. Beyond those described below, numerous other organizations exist and are described within the appropriate department or college descriptions.

Environment Center

J. H. Gibbons, Director, Ph.D. Duke
R. A. Bohm, Associate Director, Ph.D. Washington (Missouri)

The Environment Center was created to encourage and support UT faculty and students to become involved in interdisciplinary studies to provide alternative solutions to problems related to energy and the environment. The Center provides assistance to faculty interested in developing research and public service projects, manages research and development projects that involve several disciplines, and assists Tennessee government and industry in specific problems related to energy and environment. It also participates in the Statewide Consumer Education Program, especially in developing material.

Projects include the following: environmental and human costs of coal production, solar energy utilization in buildings, energy conservation in buildings and industry, and regional solid waste management and resource recovery.

The Center is operated by UT, Knoxville through the Office of the Vice Chancellor for Graduate Studies and Research.

Transportation Center

K. W. Heathington, Director, Ph.D. Northwestern
R. A. Mundy, Associate Director, Ph.D. Pennsylvania State
D. H. Jones, M.S. Tennessee; R. L. Perry, M.S. Tennessee; P. R. Tutt, M.S. Texas, Assistant Directors

The Transportation Center performs four main functions: (1) managing interdisciplinary transportation projects for the University, (2) managing transportation projects for the Tennessee Department of Transportation, (3) managing highway safety projects for the Governor's Highway Safety Program, and (4) providing public service activities in transportation throughout the state. In performing these functions, the Transportation Center works extensively with various colleges and departments, organizations, and campuses of The University of Tennessee system.

The Center does research in all modes of transportation, including transportation management, railroad and waterways, urban goods movement, airport ground transportation, transportation brokerage, social service transportation, ridesharing, transit, legislation, diagnostic vehicle inspection, highway safety, tunnel construction and ventilation, archaeological exploration, highway construction, and environmental impacts.

The Center is operated by UT, Knoxville through the Office for Graduate Studies and Research. The Center's main office is at UT, Knoxville with a satellite office in Nashville and a special project office in Chattanooga.

The University of Tennessee Space Institute

C. H. Weaver, Dean, Ph.D. Wisconsin
R. L. Young, Associate Dean, Ph.D. Northwestern
A. S. Mason, Assistant Dean, Ph.D. Tennessee
The Space Institute was originated to interface University faculty research with the Arnold Engineering Development Center of the United States Air Force, Located at Tullahoma, Tennessee. The Space Institute offers graduate degree programs with majors in Aerospace Engineering, Aviation Systems, Computer Science, Electrical Engineering, Engineering Science, Mathematics, Mechanical Engineering, and Physics. In addition to the fundamental academic work characteristic of each discipline, research opportunities and supporting interdisciplinary course work are available to permit specialization in many aspects of atmospheric and space flight such as subsonic to hypersonic aerodynamics, aerospace vehicle design, control and guidance, modern materials and structures, propulsion systems, aircraft noise and sonic boom, flight simulation, avionics, plasmadynamics, flow diagnostics including spectroscopic and electrooptic means, systems management and cybernetics. Work is also in progress in remote sensing and the magnetohydrodynamics of coal utilization. Course and research work in related areas of environmental pollution control, earth resources, energy conversion, materials and systems simulation are also available. The research personnel and facilities of the Institute and those available at the Arnold Center through appropriate contractual arrangements provide an outstanding opportunity for meaningful research in these and other areas. Students who enroll at UTSI must be admitted to the Graduate School, University of Tennessee, Knoxville. Further information concerning the Institute may be obtained from the Dean, The University of Tennessee Space Institute, Tullahoma, Tennessee 37388.

The Institute is operated by The University of Tennessee in close cooperation with various departments at The University of Tennessee, Knoxville and the office of the Vice Chancellor for Graduate Studies and Research.

**Water Resources Research Center**

F. C. Larson, Director, M.S. Virginia Polytechnic

The Water Resources Research Center is the federally-designated organization for water research for the state. In addition to research carried out by its staff, it coordinates and promotes water research of all kinds in the state and supports projects by dispensing competitive funding and by facilitating the applications of researchers from all institutions in the state for federal and private funds.

The Center also has a mission in graduate education through the M.S. degree program in Water Resources Development described elsewhere.

The Center is operated by The University of Tennessee, Knoxville through the office of the Vice Chancellor for Graduate Studies and Research.

**Off-campus Graduate Centers**

**Kingsport University Center:** The University of Tennessee offers graduate programs in science, engineering, and business at both the Master's and Doctoral level. The program is operated within the policies set by the Graduate Council of The University of Tennessee and is administered by the Vice Chancellor for Graduate Studies and Research. It is coordinated with the graduate and undergraduate offerings of East Tennessee State University.

Students who enroll in this program must be admitted to the Graduate School of The University of Tennessee, Knoxville.

Information and appropriate application forms may be obtained from the Director, Kingsport University Center, The University of Tennessee, University Boulevard, Kingsport, Tennessee 37660.

**Oak Ridge Resident Graduate Program:**

The University of Tennessee offers graduate study programs at Oak Ridge, with work leading to Master's and Doctoral degrees in Industrial Management, Industrial Education, and Statistics; the Master's and Doctoral degrees are available in Engineering, Mathematics, and Physical and Biological Sciences. Courses are given in the late afternoons, evenings and Saturdays, with research facilities provided by and used in cooperation with the Oak Ridge Associated Universities and the Union Carbide Corporation Nuclear Division.

This program is supported under a subcontract with Oak Ridge Associated Universities with principal support coming from Union Carbide Nuclear Division. The University of Tennessee is one of the forty-three colleges and universities which sponsors ORAU, a nonprofit education and research management corporation.

Information and applications to the Graduate School may be obtained by writing the Director, UT-Oak Ridge Graduate School, Post Office Box 117, Oak Ridge, Tennessee 37830.

**Chattanooga Graduate Engineering Program:**

The University of Tennessee offers a program of graduate work leading to the Master's degree in the areas of engineering. Courses are given at The University of Tennessee at Chattanooga in the late afternoons and evenings. Students who enroll in this program must be admitted to the Graduate School of The University of Tennessee, Knoxville.

Information concerning this program may be obtained from the Director, Chattanooga Engineering Graduate Program, The University of Tennessee at Chattanooga, Chattanooga, Tennessee 37401.

**The University of Tennessee at Nashville:**

Opportunities for graduate study leading to the degree of Master of Science in Civil Engineering, Engineering Management, and Industrial Engineering are offered by The University of Tennessee, Knoxville and are administered by the Vice Chancellor for Graduate Studies and Research.

Students who enroll in these programs must be admitted to The University of Tennessee, Knoxville Graduate School. Information and appropriate forms may be obtained from the Registrar, The University of Tennessee, Tenth and Charlotte, Nashville, Tennessee 37203.

**The University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences:**

The University provides programs leading to the M.S. and Ph.D. degrees in various areas of biomedical sciences. Graduate students have the opportunity to study and to do research in conjunction with the Biology Division of the Oak Ridge National Laboratory.

For complete information concerning the program, see page 149.

**School of Social Work:**

The University of Tennessee offers a fully accredited two-year program leading to the degree of Master of Science in Social Work through the School of Social Work, with programs in Nashville, Knoxville, and Memphis.

For complete information concerning the program, see page 158.

**Admission and Registration**

Admission to the Graduate School requires a Bachelor's degree, or its equivalent, with a satisfactory grade point average from an accredited college or university. A minimum grade point average of 2.5 out of a possible 4.0, or 3.0 for the senior year, is considered a satisfactory grade point average. Meeting the minimum admission requirement does not insure acceptance into a degree program since other factors may prevent admission in some areas.

An application cannot be processed without the $10 fee (payable to The University of Tennessee).

If permission to enter The University of Tennessee Graduate School is given prior to graduation, this admission is automatically withdrawn if the Bachelor's degree is not awarded before the date of registration.

If an applicant does not enter Graduate School the quarter in which admission is requested, the file is destroyed after one year unless permission is requested and granted to enter in a future quarter. Applicants who reapply must submit a new application and fee.

Admission to the Graduate School does not imply admission to candidacy for the degree desired; admission to candidacy must be obtained after entry but at least one full quarter prior to receipt of the Master's degree and three quarters prior to receipt of the Doctorate.
Types of Admissions

Admission to a Graduate Degree Program: Master's degree—Admission to a degree program requires a minimum grade point average of 2.5 out of a possible 4.0 or 3.0 during the senior year. However, many departments require a higher average. (Refer to pages 8-9 for items required for admission.)

Doctoral degree—In addition to meeting the minimum requirements for admission to the Graduate School, applicants at the doctoral level must have demonstrated a potential for superior academic performance. To be considered are such criteria as performance in prior undergraduate and/or Master's level studies, achievement on aptitude tests for graduate studies, letters of recommendation from professors familiar with the applicant's capabilities, and similar evidences of scholarly achievement. (Refer to description of doctoral programs for specific requirements for admission.)

Non-degree Graduate Students: No more than 18 hours of course work completed by a student while in the non-degree status may be included in a Master's degree program. The applicant must have a satisfactory grade average (2.5 out of a possible 4.0 or 3.0 during the senior year). Non-degree students may take courses for graduate credit, providing the department approves the registration, but cannot be admitted to candidacy for a degree without first gaining admission to a graduate degree program.

Some departments will not permit non-degree students to register for graduate credit. Please contact the head of the department in which a major is planned concerning registration for graduate credit. No international student may enroll as a non-degree graduate student.

Transient Graduate Students: A student who has been admitted to a degree program at another institution and who wishes to take courses for transfer to that institution may be admitted on receipt of the Transient Form which may be obtained from the Graduate School. This form must be completed prior to registration. A student may not take more than 6 quarter hours of advanced undergraduate courses (3000-4000 level). If the student completes these with a B average, the student automatically becomes a non-degree student.

Eligibility of Seniors: A senior in The University of Tennessee, Knoxville, who has at least a B average (3.0) in final examinations and extension positions; c. any member of The University of Tennessee system administration holding the rank of assistant professor and above or equivalent status, except in the case of The Institute of Agriculture personnel as specified in "b" above.

Any exceptions to this policy shall be made by petition to the Graduate Council. The University of Tennessee, Knoxville. Evaluation of these restrictions through temporary resignation, acceptance of a lower rank, or leave of absence is not allowable. A faculty member may, however, do graduate work on a non-degree basis.

Admission of International Students: The Graduate School can accept only students with high records. A student from China must possess a Bachelor's degree with a grade point average of 80.0 or above for the last two years of a four-year program. A student from India must be First Class the last two years of a four-year Bachelor's degree program after completion of the twelfth grade. All students with a Master's degree must be First Class. Applicants from other countries will be evaluated upon receipt of transcripts. An applicant must present: (1) a complete and accurate chronological outline of all previous university-level education; (2) authorized school or university records, with official translations if the records are in a language other than English; (3) evidence of financial resources sufficient to provide him/her with at least $4900 (U.S.) per academic year during the period of registration as a student; and (4) certification of English language proficiency. Every international student must either submit a score of at least 525 on the Test of English as a Foreign Language (TOEFL) or an equivalent English program until English proficiency is gained.

Written and Oral English for Foreign Students (or a course assigned by the English Department) for undergraduate credit and pass with a grade of C or better. (No student can audit this course.) A student may not take more than 6 additional hours while enrolled for English 1221. (Any student not passing this examination at a specified level will be sent away from the University to an intensive English program until English proficiency is gained.)

Post-baccalaureate: When an applicant who has a Bachelor's degree from an accredited institution is ineligible for regular admission to the Graduate School, but feels that eligibility can be shown if given the opportunity, the student may request admission as a post-baccalaureate student. A student and the proposed major department must outline a course of study and the student for 12 to 15 quarter hours of advanced undergraduate courses (3000-4000 level). If the student completes these with a B average, the student automatically becomes a non-degree student.

Action will be taken after 9 hours of course work is completed, provided that the student has been employed full-time and has registered for only one course per quarter. (Some departments will not permit a non-degree student to register for graduate credit. Please contact the head of the department in which a major is planned concerning registration for graduate credit.)

If the student does not earn a B average at the end of 15 hours, admission to the Graduate School will be denied and further registration prohibited. A post-baccalaureate student cannot receive graduate credit for any course work when taken or at a later date. No international applicant may enroll as a post-baccalaureate student.

Admission Procedures

Procedures for admission are as follows: (1) complete the “Application for Admission” form (first page of the catalog); select a major from those listed on pages 8-9; (2) return the completed application form along with a $10 application fee as soon as possible; (3) request the registrar of all colleges and universities attended to send two original transcripts to the Graduate School (all documents including transcripts, submitted for admission become the property of the University and will not be returned); (4) if required, submit scores from the Graduate Record Examination or Graduate Management Admission Test; and (5) request that any reference or rating forms required as part of the application file be sent to the Graduate Office or where indicated.

Anyone with a Bachelor's degree wishing to take courses for graduate credit, whether or not he or she desires to become a candidate for a degree, must make formal application for admission to the Graduate School or submit the Transient
Examinations

Applicants for admission to many of the degree programs are required to submit scores from the Graduate Record Examination or the Graduate Management Admission Test. (Refer to pages 8-9 for majors requiring these examinations.) Each applicant is individually responsible for arrangements for the examination and for transmission of these scores directly from Educational Testing Service to the Vice Chancellor for Graduate Studies and Research. Application forms may be obtained from Educational Testing Service, Princeton, New Jersey 08450, or from the UT Graduate School Office.

The completed application form and examination fee must reach the proper office at the Educational Testing Service approximately one month in advance of the test date (tests are given four to five times each year). Approximately six weeks should be allowed for the examination results to reach the University. The University of Tennessee is an approved testing center for both examinations.

Registration Procedures

Dates of registration are listed in the University Calendar (front of catalog). Students should report to the Graduate School to obtain registration materials (scan form and timetable of classes giving details concerning registration procedures) and then should see a department advisor to obtain a signature.

Registration requires two days. The University holds advanced registration each quarter (approximately four to six weeks after each quarter begins). Information may be obtained from the Graduate Office. If a student participates in advanced registration, the student should obtain the class schedule and pay fees on the first day of registration.

All graduate students, including graduate and teaching assistants, research assistants, and scholarship or fellowship holders, should complete the registering procedure at registration (in Stokely Athletic Center) or afterwards at the Treasurer's Office, where the assessment of their tuition and fees will be determined. Those who do not report to the Treasurer's Office before the established deadline for paying fees will be charged the late registration fee. Retroactive registration is not permitted.

Fees, Financial Aid, and Fee Classification

University Fees

University fees are determined by the Board of Trustees and are subject to change without notice. The general fees in effect for graduate and post-baccalaureate students are as follows:

**APPLICATION FEE:**
- Each graduate application for admission must be accompanied by a fee of $10 before it will be processed. (Fee not required if: (1) former UTK graduate student or (2) graduate application fee previously paid to a UT systems school.)
- If a student applies but does not enter graduate school within twelve months after date of requested admission, it will be necessary for him or her to resubmit the $10 application fee and application. This fee is not refundable.

**MAINTENANCE FEE (all students):**
- PER QUARTER $160.00

**TUITION (additional for out-of-state students):**
- PER QUARTER $312.00
- NOTE: In lieu of the above charge for tuition and/or maintenance fee, part-time students may elect to pay fees computed by the quarter hour credit (or audit) as follows:
  - In-State: $22.00 per quarter hour or fraction thereof; minimum charge $66.00
  - Out-of-State: $55.00 per quarter hour or fraction thereof; minimum charge $156.00

**ADMISSION TEST:**
- The completed application form and examination fee must reach the proper office at the Educational Testing Service approximately one month in advance of the test date (tests are given four to five times each year). Approximately six weeks should be allowed for the examination results to reach the University. The University of Tennessee is an approved testing center for both examinations.

**Refund of Fees for Withdrawal:**

Upon receipt of a class schedule a student is responsible for payment of appropriate fees. Withdrawal from the University after receiving a class schedule, whether partial or complete, must be by official notification to the Withdrawal Office because space in a class section is reserved until released. The minimum of 20 percent of fees will be charged even if classes are not attended, unless the Withdrawal Office is notified before the first day of classes for the quarter. Failure to notify the Withdrawal Office promptly when withdrawing could result in a larger percentage fee assessment. The effective date of withdrawal is the date the Withdrawal Office is notified by completion of the official withdrawal request form.

For a regular academic quarter, withdrawal within 7 calendar days beginning with the first day following regular registration permits an 80 percent fee refund. Withdrawal between 8 and 14 calendar days following regular registration permits a 60 percent fee refund. Withdrawal between 15 and 21 calendar days following regular registration permits a 40 percent fee refund. Withdrawal between

**Music Fee:**
- PER QUARTER $20.00

**Deferral Payment Service Fee:**
- $3.00

**Deferred Payment Service Fee:**
- $3.00

**Deferred Payment Service Fee:**
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**Deferred Payment Service Fee:**
- $3.00
22 and 28 calendar days following regular registration permits a 20 percent fee refund. The above refund policy does not apply to the off-campus Graduate Centers. At the Centers, no refund is made after the first 14 days.

No refund is due on individual courses which are dropped unless the sum of the remaining hours calculated at the hourly rate plus the adjusted charge for the course(s) dropped is less than the total amount paid or the maximum quarterly tuition and/or maintenance fee. On the Knoxville campus for a regular quarter, no refund is made for courses dropped later than 14 calendar days after the regular registration day. A course for which a student has registered is not dropped until a drop/add slip is processed and recorded by the Records Office. Refunds resulting from dropped courses will be made after the final audit at the end of the quarter.

Rental charges and adjustments are determined by the Office of Residence Halls in accordance with the terms of the housing agreement or contract. Note: All charges and refunds will be made to the nearest even dollar.

The University is authorized by statute to withhold diplomas, grades, transcripts, and registration privileges until student debts and obligations (other than Student Loan Fund notes) owed to the University are satisfied.

SUMMER QUARTER FEES AND EXPENSES:

Fees and expenses for the summer quarter are the same as for the other quarters during the academic year with the exception of the university programs and services fee as noted above.

Although the summer quarter is divided into terms of varying lengths, tuition and fees are assessed at the regular quarter-hour rate up to the maximum charge for a complete regular quarter.

The refund policy covering withdrawals and dropped courses for the summer quarter is based on the length of the term for the course(s) dropped. No refund is applicable to term courses dropped later than 14 calendar days after the regular registration day for the course(s) involved.

WAIVER OF FEES:

Graduate assistants, teaching assistants and others whose fees are billed, prepaid or waived must complete their registration with the Bursar's Office, where they should have their fee receipts validated and supply necessary details concerning fee payment waiver.

Fee Classification for the Purpose of Paying University Fees

Shortly after a student applies to the Graduate School, notification of the receipt of the application, application fee, and residency classification for fee purposes is sent.

If a student has any questions concerning the residency status, he/she should contact the Residency Clerk at the Graduate School Office.

If a student is classified as out-of-state and is a full-time employee in the state of Tennessee or at Fort Campbell, Kentucky, and elects to attend the University on a part-time basis, he/she must apply for reclassification of the out-of-state portion of the fees prior to the date of registration each quarter. Forms are available from the Residency Clerk at the Graduate School Office.

Rules for Determination of Status. (1) Every person having domicile in this state shall be entitled to classification as an in-state student for fee and tuition purposes. No person having domicile elsewhere in this state shall be eligible as an in-state student for tuition purposes.

(2) The domicile of an unemancipated person is that of the parent.

(3) Upon moving to this state, an emancipated person who provides persuasive evidence of domicile may apply for in-state classification for said person's unemancipated children: and provided that said person is not in this state primarily as a full-time student, the unemancipated children may be so classified, and may continue to be so classified so long as said person remains domiciled in this state.

(4) Any person who removes in the state when the parent, having therefore been domiciled in this state, removes from this state, shall be entitled to classification as an in-state student so long as attendance at a school or schools in this state shall be continuous.

(5) An unemancipated person whose parent is a member of the armed forces and stationed in this state or at Fort Campbell, Kentucky, pursuant to military orders and who would be classified as an out-of-state student but shall not be required to pay out-of-state tuition. The student, while in continuous attendance toward the degree for which he/she is currently enrolled, shall not lose his/her residence when the parent theretofore was transferred on military orders.

(6) Part-time students who reside in Tennessee and are employed full-time in the state or at Fort Campbell, Kentucky, pursuant to military orders and who would be classified as out-of-state in accordance with other provisions of these regulations, will be classified out-of-state, but will not be required to pay out-of-state tuition while enrolled as part-time students. (Student must apply for this status each quarter).

Presumption. Unless the contrary appears from clear and convincing evidence, it shall be presumed that:

(1) No emancipated person shall be deemed to have gained residence while attending any educational institution in this state as a full-time student, as such status is defined by the governing board of such institution.

(2) The domicile of a married person shall be determined by the provisions of these regulations independent of the residence of the spouse.

(3) A person does not gain or lose in-state status for reason of his/her presence in any state or country while a member of the Armed Forces of the United States, provided that a member of the armed forces may obtain in-state status for the member and dependents by establishing domicile in this state.

Establishment of Domicile. If a student asserts that he/she has established domicile in Tennessee, the student has the burden of proving such assertion.

Appeal. The student who wishes to appeal his/her initial residency classification should contact the Residency Clerk in the Graduate Office.

Effective Date for Reclassification. If a student classified nonresident applies for in-state residency classification at the beginning of a quarter or semester and is subsequently so classified, the in-state residency classification shall be effective at the beginning of the quarter or semester in which application for reclassification was submitted.

Student Financial Aid

The University of Tennessee offers a comprehensive program of financial aid for full-time students who otherwise would not be able to attend the University. Through this financial aid program an eligible student may receive one or more types of assistance to help pay college expenses.

Financial need is defined as the difference between a family's resources and the total expenses of attending the University. If there is a deficit, the student is considered to be in need of financial assistance. To assist in determining the need for financial aid, The University of Tennessee utilizes the need analysis system of the College Scholarship Service (CSS). Through the use of the CSS form and the Financial Aid Form (FAP), the Financial Aid Office determines the amount the parents and students could generally be expected to contribute toward meeting educational expenses. For more detailed information on the determination of need, please refer to the section entitled "Financial Assistance for Students."

The University of Tennessee has two basic types of financial aid for graduate students—loans and part-time employment. These may be awarded individually or in combination according to the needs of the student.

Assistantships and Fellowships

Non-service fellowships supported by the University are awarded on the basis of ability and without regard to the field of study of the candidate. Successful applicants need more than an overall 3.0 grade point average and high scores from the Graduate Record Examination or the Graduate Management Admission Test. The normal deadline for completed applications is mid-February. Application packets can be obtained from the Graduate Office.

Information concerning many national competitions for fellowships and scholarships supported by non-University
sources can also be obtained from the Graduate Office.

Graduate assistantships and additional fellowships are offered through many departments of the university. The stipends usually provide for payment of tuition and fees by the university. Information concerning these opportunities, and appropriate application forms, may be secured by writing to the head of the department in which the student expects to study.

Student Loans

National Direct Student Loans. Long-term loans are available primarily through the National Direct Student Loan. Proven need for financial assistance determines eligibility.

Loan repayment and interest payments on National Direct Student Loans are deferred until after graduation or as long as the individual remains in half-time attendance at an accredited institution of higher education in the United States. Repayment may also be deferred for a period of 3 years while the borrower is serving in the Armed Forces, Peace Corps, or Vista. Interest is 3 percent per year on the unpaid balance. The maximum repayment period is 10 years.

The Student Employment Service administers the Federal Work-Study Program, which is a financial aid program offered to eligible part-time students. Employment is available to students who then bring them to the Office for a certificate of eligibility. This program is a means of providing employment opportunities for students who need financial assistance in order to continue their education.

Student Employment

Two employment programs are administered in the Financial Aid Office to help students find part-time employment. The College Work-Study Program is a federal work program which provides jobs for students who have financial need and who are enrolled in an undergraduate program. Eligible students are paid in jobs on- or off-campus where they work approximately 15 hours per week. The Student Employment Service operates as a central referral agency. It coordinates listings of part-time employment from both University and private employers with the requests of students seeking part-time employment. Referrals are made in accordance with the student’s skills and qualifications. Part-time jobs average from 15 to 20 hours per week.

Spouses of full-time students or students not enrolled part-time in the University who must earn a part of their educational expenses may be assigned to any residence hall. Some students are provided excellent accommodations in both traditional and modern facilities which are conducive to academic achievement and personal development. Single graduate students have the same priorities as other single students and may be assigned to any residence hall. Some

General Information

Housing

Single Men and Women: Single graduate students are provided excellent accommodations in both traditional and modern facilities which are conducive to academic achievement and personal development. Single graduate students have the same priorities as other single students and may be assigned to any residence hall.
units of the residence halls and of the student apartment building have been designed specifically for single graduate students. In Melrose Hall the graduate section offers community living units for groups of six to ten students with personal responsibility emphasized. The Holt Avenue Apartment Residence Hall accommodates, on a graduate floor, students in groups of three. It is the responsibility of each resident to maintain the apartment by University standards. Further information can be obtained from the Office of Residence Halls, 405 Student Services Building.

Assistant Head Resident positions are available for single graduate students. The Assistant Head Resident is responsible to and assists the Head Resident in coordinating and supervising assigned aspects of the operation of the hall to which the assignment is made. The position is a part-time live-in position, with appointment on a 9 1/2-month basis. Summer employment is possible. Further information can be obtained from the Office of Residence Halls, 405 Student Services Building.

Married Students: The University has provided excellent apartment facilities in several locations for married students. Information and application for these facilities may be secured from the Office of Rental Properties, Stadium Hall.

Vehicle Operation And Parking

The University of Tennessee endeavors to provide adequate facilities for the increasing number of vehicles being operated by students and staff. However, because of the constant need to expand the teaching and research facilities for an ever-growing student body, the areas available for parking are necessarily limited. In an effort to provide parking facilities and to reduce traffic congestion within the campus area, large student parking areas are located on the perimeter of the campus. The University provides an intracampus bus system connecting these parking areas with the main campus at no cost to the student. Staff parking areas are located throughout the campus.

Each person who operates a motor vehicle in connection with attendance or employment at the University must register that vehicle with the Traffic Section of the Security Department. A University Traffic and Parking Authority determines the parking policy, traffic regulations, and fees, and this information is published each year in the "University Traffic and Parking Regulations."

The large volume of vehicles operated in and around the University campus necessitates strict adherence to the "University Traffic and Parking Regulations;" consequently, a system of fees for violations of these regulations is established by the University. The importance of compliance with these parking and traffic regulations is indicated by the following policy of the UTK Traffic and Parking Authority:

Any staff member or student who has failed to pay traffic citations is subject to disciplinary action up to and including termination or dismissal from the University.

Students with unpaid traffic citations will not be permitted to register at the beginning of the quarter until indebtedness is cleared.

A staff member with unpaid traffic citations will not be allowed to register the vehicle or purchase a parking permit. If a traffic citation is appealed or amended within five days after issuance, a penalty of 30 percent of fee will be assessed. A different penalty applies to fire lane violations.

Computing Center

The University of Tennessee Computing Center (UTCC), the largest computing facility in the University of Tennessee System, provides computing facilities and services for the needs of the University's teaching, research, public service, and administrative activities. In particular, UTCC maintains close contact with the University's academic administrative offices in support of research and instructional users with professional computer staff.

UTCC is principally located in the Stokely Management Center and in Andy Holt Tower. From the Stokely location, UTCC supplies computing services to all campuses in the UT System through job entry facilities located on each campus. At UTK, UTCC maintains five job entry stations for batch work and six sites for interactive computer work.

UTCC's equipment consists of an IBM 360/65 and a DEC system-10 which are used for research, instruction and administrative computing work. UTCC also maintains an IBM 360/40 which is used exclusively for administrative work.

UTCC publishes a User's Guide which describes the use of the IBM 360/65 and policies and procedures and the DEC system-10 Programmer's Guide, which is a general compilation of the use of the DEC system-10. The two guides are available at the UT Book and Supply Store. UTCC also publishes a monthly Newsletter which announces systems, equipment and procedural changes and contains other items of interest to the user community. Program writeups and special user guides are also published.

UTCC periodically offers intensive training seminars of several days duration in computer utilization on the IBM 360/65 and the DEC system-10. These seminars are planned primarily for faculty, staff and graduate students who use or plan to use UTCC facilities. UTCC offers non-credit short courses each quarter in topics such as programming languages and special purpose programs. These courses are announced in the Newsletter and in the "UT Notes" section of the UT Daily Beacon.

Computing services can be requested via the Request for Services form available from the business office in Stokely Management Center. All users of UTCC facilities are assigned a consultant to provide user assistance.

Office of International Student Affairs

This office, located at 201 Alumni Hall, assists students from other countries with the many matters that are of particular concern to them during their stay in the United States. The International Student Affairs serves as the official University representative in all matters involving immigration authorities, international educational organizations, and foreign governments.

The office maintains the student's official immigration records and handles questions regarding immigration regulations. It coordinates such projects as a community volunteer program for International students and activities for student spouses. To aid the international student's understanding of American life, the Center's staff serves as advisors on personal and related problems.

Orientation programs are held at the beginning of each term, and International students are urged to attend them.

International students applying for admission should write to: The Vice Chancellor for Graduate Studies and Research, The University of Tennessee, Knoxville.

University International House

The International House is located approximately two blocks from the heart of the campus, at 1601 West Clinch Avenue. Provided by The University of Tennessee, and operated by the staff of the Office of International Student Affairs, the House provides an activity center where domestic and International students may come together to relax and discuss matters of mutual interest. The small library at "I" House contains books and periodicals from all over the world.

The University Library

The University of Tennessee, Knoxville Library owns approximately 1,332,800 volumes, 1,332,000 microfilm reels, 49,000 microfiche, and 1,000,000 items of other microtext, plus recordings, tapes, United States and United Nations documents, and more than 20,000 periodicals and other serial titles, which are received annually. The library's membership in the Association of Research Libraries indicates the University's emphasis on research and graduate instruction at the doctoral level and the support of large, comprehensive collections of library materials on a permanent basis.

Interlibrary loan service augments the UTK library research holdings for faculty and graduate students. This service includes borrowing monographs, obtaining copies of needed materials, providing access to bibliographic services offered by other institutions, such as computer-based data searches and information retrieval.

Library holdings in Knoxville are housed in the James D. Hoskins (Main) Library and its five branches: Agriculture, Law, Music, Science-Engineering, and the John C. Holopatz Undergraduate Library. Special Collections, located in the Main Library, is a repository of regional and local ma-
The libraries located on the statewide campuses in Chattanooga, Martin, Memphis, Nashville, and Tullahoma are individually administered; all libraries of The University of Tennessee are accessible to all students and faculty in the system.

General Regulations of the Graduate School
Responsibility
A graduate student must assume full responsibility for knowledge of rules and regulations of the Graduate School and departmental requirements concerning the individual degree program. A statement on Graduate Students’ Rights and Responsibilities is printed on the back of the student’s Admission Status Form. Additional copies are available at the Graduate Office.

Requirements
The Graduate School requirements are minimal, and, in many cases, they are exceeded by those of the individual departments. In some cases, departments have brochures describing in detail their programs and requirements.

Correspondence Study
No graduate credit is allowed for work done by correspondence study with this or any other university.

Graduate Credit
No student may receive graduate credit for a course unless properly admitted to the Graduate School. It is expected that students will be so admitted prior to registration for courses carrying graduate credit. In some instances, however, students who appear to meet the criteria for admission are allowed conditional registration for graduate credit after filing an application for admission to the Graduate School and paying the application fee. Transcripts (two official copies) and additional materials required must then be filed with the Graduate Office at once. If the student is admitted within seven weeks from the last day of registration, the student may receive graduate credit for the courses. Should the student not be so admitted, whether because of lack of qualifications or because of failure to furnish the necessary materials in ample time for a decision concerning admission, the courses being taken will be changed to undergraduate credit, and no future registration will be permitted until the student is properly admitted as a graduate student.

Change of Registration
A student’s permanent record card will show all courses for which registration has been completed except those from which the student withdraws during the first 5 calendar days after the beginning of classes.

Students who fail to attend the first class meeting without prior arrangement with the department may be dropped from the course to make their spaces available to other students. Students have the responsibility to assure that they have been dropped; otherwise, they are liable for a grade of F in the course.

The deadline for change of registration (from credit to audit, audit to credit, graduate to undergraduate, undergraduate to graduate, withdrawal, etc.) is set at mid-quarter, approximately 35 calendar days after the first day of classes each quarter. A student may change registration from a course at any time up to and including the date by executing a change of registration slip and submitting this to the Graduate Office. The advisor’s signature is required. The instructor’s signature is required to add a course two weeks after classes begin and/or to add a course that is closed. If withdrawal from a course or from the University occurs after the first 5 days of classes and before the withdrawal deadline, the grade of W will automatically be entered on the student’s record and on the final class roll sent to the instructor in the course.

A student withdrawing from a course, or from the University, after the withdrawal deadline will receive the grade of F unless the student can clearly demonstrate that the request for withdrawal is based on circumstances beyond the student’s control.

Examples of circumstances beyond the student’s control are:

a. Illness or injury of the student (verified by the Student Health Service or private physician);

b. Necessary change in work schedule occurring after the drop deadline (verified by the student’s employer).

Examples of causes which are within the student’s control and which would not be acceptable to grant withdrawal permission are:

a. Improper registration on the part of the student;

b. Failure to achieve academically.

A student wishing to withdraw from a course, or from the University, after the withdrawal deadline, or change his or her registration shall present the request, together with evidence of extenuating circumstances, to the Graduate Office. If the request is approved, the Graduate Office will notify the Office of Admissions and Records, which will enter the grade(s) of W or the appropriate change on the student’s permanent record.

Maximum Load
All graduate students are urged to register each quarter for only that number of hours which they can successfully complete. The maximum load for a graduate student is 15 hours, and 9 to 12 hours is considered a full load. Registration for more than 15 hours during any quarter including the summer quarter is not permissible without prior approval of the Vice Chancellor for Graduate Studies and Research, who may allow registration of up to 18 hours if the student has achieved an average of 3.0 or better in at least 9 hours of graduate work.

Graduate assistants or others who have part-time duties with the University are expected to enroll for no more than an appropriate fraction of the maximum load.

Advisors
The Vice Chancellor for Graduate Studies and Research is the general advisor for all graduate students, but so far as particular courses are concerned, a student is counseled by an advisor from the major department. A new student seeking an advisor should go to the department in which the student is major. At the time of each registration, the advisor must approve the program of study for a student. If the student is pursuing a collateral area of study, the advisor, in approving the student’s program, should secure the advice of the department representing the collateral area.

Auditors
Persons who wish to attend certain classes regularly, without taking examinations or receiving grades or credit, may do so by completing a graduate application, paying the application fee, registering as auditors, and paying regular fees. Auditors are not permitted to participate in class discussions and recitations, or use laboratory equipment and materials.

Grades
Grades in the Graduate School have the following meanings:

A — (4 quality points per quarter hour); indicates superior work;

B+ — (3.5 quality points per quarter hour); indicates above satisfactory work.

B — (3 quality points per quarter hour); indicates satisfactory work.

C+ — (2.5 quality points per quarter hour); indicates performance less than expected.

C — (2 quality points per quarter hour); indicates work of borderline quality.

D — (1 quality point per quarter hour); indicates clearly unsatisfactory work and cannot be used in a graduate program.

F — (no quality point value); indicates extremely unsatisfactory work and cannot be used in a graduate program.

I — (no quality point value); indicates that the student has done satisfactory work in the course, but because of circumstances beyond control—has been unable to finish all
Residence Requirements

There is no residence requirement for any Master's program.

The Specialist in Education Degree requires one quarter of full-time study after the student has a Master's degree. A student without a Master's degree is required to have two consecutive quarters of full-time residence.

The minimum residence for any Doctoral degree is one academic year or three consecutive quarters of full-time study (minimum of 9 hours) in the resident graduate program. A student in residence is devoting essentially all his/her energies to graduate study on the campus. A quarter of enrollment does not count toward this requirement.

Consecutive quarters include the summer quarter.

Revision of Program

A student who wishes to revise a major program of study must complete a "Request for Revision of Graduate Program" form which can be obtained from the Graduate Office. It is necessary to obtain the signature of the head of the department in which admission was previously granted. No signature is needed if a student is requesting a change from non-degree to a degree program or from one degree to another in the same department.

Time Limit

The time limit for the use of graduate credit toward a Master's degree is six years from the beginning date of the earliest course applied toward the degree. The last 45 hours of credit for an Educational Specialist Degree must also be earned within a period of six years prior to the award.

Normally, these time limits may not be extended. However, in exceptional cases, courses taken beyond these periods may be recognized after special examination or other action recommended by the department and given prior approval of the Vice Chancellor for Graduate Studies and Research.

The doctoral program must be completed within a period of five years after passage of preliminary examinations.

Graduate School News

The Graduate School News is published quarterly and is available to all graduate students. Calendars, schedules, and new requirements for degrees are published in order for students to have access to the latest information.

Proficiency Examination

A proficiency examination may be given in any academic course offered for graduate credit. To be eligible, a student must be regularly admitted to the Graduate School, and the examination must be recommended by the head of the department offering the course. Students applying for this privilege must present evidence that they have developed the knowledge and abilities expected of graduate students who have taken the same courses. Upon passing such an examination with a minimum grade of B, the student will receive regular graduate credit. A maximum of three graduate courses may be completed by this method. A fee must be paid before administration of such examination. Proficiency examinations may not be used to raise the grade or change the credit in a course previously completed, nor may such an examination be repeated.

Law Courses

A graduate student may be allowed to take up to 9 quarter hours of law courses and receive credit toward a degree upon approval of the College of Law and department committee chairman. DBA students may take a maximum of 12 hours.

Transfer Credits

A maximum of 9 quarter hours (6 semester hours) may be transferred into a student's Master's program. Transferred work must be taken at accredited institutions. (Extension courses at other universities are not applicable.)

One-half of a student's program may be transferred from within the University of Tennessee System. Such work must have been taken for graduate credit and passed with a grade of B or better, be part of an otherwise satisfactory graduate program (B average) but not used toward another degree, and be listed on the Admission to Candidacy Form approved by the committee members and the Vice Chancellor for Graduate Studies and Research. Ordinarily, course work from foreign institutions is not transferred since these institutions have not been accredited. This work must be completed within the six-year period prior to the receipt of the degree. The same rule applies also to the Specialist in Education Degree. Courses transferred into a student's Master's program may consist of a combination of University of Tennessee System courses and courses from other institutions so long as the total accepted does not exceed one-half the total program, and courses accepted from outside The University of Tennessee System do not exceed 9 quarter hours. Transfer credits will be placed on The University of Tennessee transcript record only after the student has been admitted to candidacy.

Courses taken for graduate credit at another institution and passed with a grade of B or better from a satisfactory graduate program (B average) may be accepted in a student's doctoral program. The number of hours a student may include will be determined by the doctoral committee. They must be listed on the Admission to Candidacy form and approved by the committee members. Although the hours may be used as part of the requirements for the degree, the courses will not appear on The University of Tennessee transcript record.

Official transcripts must be received by the Vice Chancellor for Graduate Studies and Research directly from appropriate institutions.
The Graduate School

Requirements for Advanced Degrees

Master's Degrees

Master's degree programs offered in the Graduate School are listed under "Majors and Degrees Available" on pages 8-9. See also chart, page 90 for summary of procedures for these degrees.

Non-Thesis Programs: Some departments offer optional non-thesis programs for the Master's degree. Departmental announcements indicate whether this option is available.

Course Requirements: A candidate for a Master's degree must present a total minimum of 45 quarter hours of approved graduate courses. These hours may be entirely in one major subject or may include one or two minors, if approved by the student's faculty advisory committee and the Vice Chancellor for Graduate Studies and Research. The major subject must include at least 18 quarter hours of credit of course work except in the MBA degree program. A minor shall consist of not less than 9 or more than 18 quarter hours of course work.

All courses for which a student registers must be completed (unless officially dropped) before graduation. At least one-half of these total hours in the graduate program must be of the 5000-level, of which no more than 9 may be thesis hours. These courses must be completed at The University of Tennessee. (5000- and 6000-numbered courses are open to graduate students only—3000- and 4000-numbered courses may be taken for graduate credit if listed in the Graduate School Catalog.)

Thesis: The thesis represents a culmination of the candidate's ability to integrate material in the major and related fields, and to make a significant contribution to the field. The thesis is subject to the approval of a committee of not fewer than three faculty members, with the student's major professor as chairman. (Members of the University faculty may attend the examination.)

Thesis Registration: A minimum of 9 quarter hours and, in some approved programs, a maximum of 18 quarter hours of credit (course number 5000 which is variable credit) in the major may be earned in the preparation of an acceptable thesis, represented at the final oral examination. A student must be registered for a thesis course each quarter work is being pursued on the thesis. If the thesis is not completed during the quarter in which the student registers for the last 3 hours of 5000, the candidate shall continue to register for a minimum of 3 hours of 5000 each quarter while actually working on the research and thesis through the quarter in which the thesis is accepted by the Graduate School. Similar rules apply when the problems are used in lieu of the thesis.

Non-Thesis Registration: All non-thesis students using University facilities or faculty time must be registered for course 5002 if not registered for other courses. Students taking the final examination but not otherwise registered must pay a fee of $50. Final exams will not be scheduled until one of the above is met.

Final Examination for Thesis Students: A candidate presenting a thesis must pass a final oral (or oral and written) examination on all work offered for the degree.

The examination is not merely a reexamination over course work, but it is a test of the candidate's ability to integrate material in the major and related fields, including the work completed in the thesis. This examination, which must be scheduled through the Graduate Office, shall be held at least ten days before the final date for submission of theses to the Graduate School. This examination, in a form approved by the major professor, shall be conducted by the committee of no fewer than three faculty members, with the student's major professor as chairman. (Members of the University faculty may attend the examination.) In case of failure of the final examination, the candidate may not appear for reexamination until the following quarter. The result of the second examination is final.

Final Examination for Non-Thesis Students: A non-thesis student must pass a final written examination on all work offered for the degree. The department may or may not follow this examination with an oral examination.

The examination is not merely a reexamination of course work, but it is a test of the candidate's ability to integrate material in the major and related fields. This examination must be scheduled through the Graduate Office in accordance with the Graduate School News deadlines. This examination will be conducted by a committee of no fewer than three faculty members, with the student's major professor as chairman. In case of failure of the final examination, the candidate may not appear for reexamination until the following quarter. The result of the second examination is final.
the next quarter (or later) without being registered if properly registered for three hours of 5000 the quarter the thesis was accepted. Each copy of the thesis must include an approval sheet, signed by the members of the committee, which certifies to the Vice Chancellor for Graduate Studies and Research that the committee has examined the final copy of the thesis and found its contents to be satisfactory. The student should check with the department head concerning additional required copies of the thesis. The thesis must be prepared according to the Graduate School Thesis and Dissertation Manual.

**Specialist in Education Degree**

The Specialist in Education (Ed.S.) degree is offered in Curriculum and Instruction, Educational Administration and Supervision, Educational Psychology and Guidance, Safety Education and Service, and Vocational-Technical Education. Students in the Graduate School who become candidates for the Ed.S. must have a minimum of one year of teaching experience or its equivalent. Admission to the Specialist in Education program requires formal application for admission to Graduate School, followed by processing and recommendation by the department or area in which the student is majoring, and is dependent upon final approval by the Vice Chancellor for Graduate Studies and Research.

The formulation of the student's program, supervision of program development, recommendation for admission to degree candidacy, direction of research, and qualifying and terminal examinations are executed by a committee of not fewer than three faculty members. This committee is appointed upon request from the department head by the Vice Chancellor for Graduate Studies and Research, and shall include a minimum of two members from the department or area of specialization. See chart, page 21 for summary of procedures for this degree.

**Course Requirements:** Each student's program involves a minimum of six quarters of study totaling not less than 90 quarter hours. A student with a Master's degree is required to have at least one quarter of full-time residence. A student without a Master's degree is required to have two consecutive quarters of full-time residence. A minimum of 12 quarter hours from collateral fields in professional education (outside the major department or area) and 12 quarter hours from fields outside of the College of Education is required for each individual program.

Credits earned in a Master's degree may meet course requirements in the student's Specialist in Education program to which they are specifically comparable. Nine hours of work beyond the Master's degree

**Summary of Procedures for Master's Degrees**

<table>
<thead>
<tr>
<th>PROCEDURE</th>
<th>UNDER DIRECTION OF</th>
<th>DATE</th>
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<tbody>
<tr>
<td>Admission as a potential candidate (if previously admitted non-degree)</td>
<td>Major departmental advisor and Vice Chancellor for Graduate Studies and Research</td>
<td>Prior to completing 18 hours of course work</td>
</tr>
<tr>
<td>Submission of application for admission to candidacy (forms at Graduate Office)</td>
<td>Major professor and student's committee</td>
<td>B average, completed prerequisites, at least one quarter prior to graduation*</td>
</tr>
<tr>
<td>Approval of admission to candidacy</td>
<td>Vice Chancellor for Graduate Studies and Research</td>
<td>Prior to Commencement</td>
</tr>
</tbody>
</table>

**GRADUATION REQUIREMENTS**

| Placement of name on graduation list                | Student                                   | Indicate on registration material         |
| Application for diploma                             | Vice Chancellor for Graduate Studies and Research | See deadline notice available at registration* |
| Scheduling of oral or written examination          | Major professor, student, and Vice Chancellor for Graduate Studies and Research | Not later than one week prior to oral or written examination* |
| Submission of thesis to faculty committee           | Faculty committee                         | At least one week prior to oral or written examination |
| Oral examination                                    | Major professor and committee             | Not later than ten days before thesis deadline* |
| Removal of Incompletes                              | Instructor of course                      | Not later than one week before Commencement* |
| Submission of final copy of thesis and thesis card  | Major professor, candidate's committee, and Vice Chancellor for Graduate Studies and Research | After oral examination and no later than two weeks before Commencement* |

* Dates are printed in Graduate School News quarterly.
may be transferred from approved institutions and may be used to meet the student's course requirements. (See Transfer Credits, Page 18.)

For a student admitted to the program with a Master's degree or appropriate work beyond the Master's degree, program requirements may be modified upon recommendation of the student's committee and approval of the Vice Chancellor for Graduate Studies and Research, except that no modifications shall be permitted with respect to the following: (1) examination requirements, research requirements, and the minimum of 24 quarter hours of course credit outside the department or area in which the student is doing the work are met; and (2) all graduate course work completed prior to admission accepted as part of the student's program must be appropriately related to the student's objectives.

Undergraduate courses required for certification at The University of Tennessee in the student's field of specialization may not be taken for graduate credit as part of the program. At least 22½ of the last 45 hours of course work, exclusive of the thesis or problems, must be in 5000- or 6000-level courses. The last 45 hours of a student's program (including thesis or problems) must be completed within six years.

Admission to Candidacy: Admission to candidacy is established by formal application to the Vice Chancellor for Graduate Studies and Research, normally during or immediately following the quarter in which the student's course credit totals or exceeds 45 hours and upon the recommendation of the student's committee. Approval of the Vice Chancellor for Graduate Studies and Research is required. The student must submit the Admission to Candidacy form, with appropriate signatures, to the Graduate Office no later than commencement day of the quarter preceding the quarter in which the student plans to graduate. A qualifying examination is required if the student's Master's degree was earned six or more years prior to admission to candidacy. The qualifying examination may be written, oral, or both written and oral.

Thesis: The thesis represents a culmination of an original research project completed by the student. The organization, method of presentation, and subject matter of the thesis are important in conveying to others the results of such research.

A minimum of 9 hours of research credit (5180, 5190, and 5200) is required. If the student does not complete the research during the first quarter registered for 5200, the student must continue to register for this course (minimum of 3 hours) each quarter as long as active work on the thesis continues or until the thesis is accepted by the Graduate School. The thesis is to be prepared according to the instructions in the Graduate School Thesis and Dissertation Manual. It should be approved by the committee prior to submission and must be submitted by the appropriate date the quarter the student wishes to graduate.

Final Examination: The final step in the program is an oral examination covering the student's research and course of study. This examination must be scheduled through the Graduate Office in accordance with the dates given in the Graduate School News. In case of failure, the student may not appear for reexamination until the following quarter. The result of the second examination is final.

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### Summary of Procedures for Specialist in Education Degrees

<table>
<thead>
<tr>
<th>PROCEDURE</th>
<th>UNDER DIRECTION OF</th>
<th>DATE</th>
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</thead>
<tbody>
<tr>
<td>Admission as a potential candidate (if previously</td>
<td>Major departmental advisor and Vice Chancellor for</td>
<td>After submission of Revision Form</td>
</tr>
<tr>
<td>admitted non-degree)</td>
<td>Graduate Studies and Research</td>
<td></td>
</tr>
<tr>
<td>Submission of application for admission to</td>
<td>Major professor and Vice Chancellor for Graduate</td>
<td>At least one quarter prior to</td>
</tr>
<tr>
<td>candidacy (obtain forms from the Graduate Office)</td>
<td>Studies and Research</td>
<td>graduation*</td>
</tr>
<tr>
<td>Approval of admission to candidacy</td>
<td>Vice Chancellor for Graduate Studies and Research</td>
<td>Prior to Commencement</td>
</tr>
<tr>
<td>GRADUATION REQUIREMENTS</td>
<td>Student</td>
<td>Indicate on registration material</td>
</tr>
<tr>
<td>Placement of name on graduation list</td>
<td>Vice Chancellor for Graduate Studies and Research</td>
<td>See deadline notice available at registration*</td>
</tr>
<tr>
<td>Application for diploma</td>
<td>Major professor, Vice Chancellor for Graduate Studies</td>
<td>Not later than one week prior to oral or written examination*</td>
</tr>
<tr>
<td>Scheduling of oral or written examination</td>
<td>Faculty committee</td>
<td>At least one week prior to oral examination</td>
</tr>
<tr>
<td>Submission of thesis or problems to faculty committee</td>
<td>Major professor and committee</td>
<td>Not later than ten days prior to thesis/problems deadline*</td>
</tr>
<tr>
<td>Oral examination</td>
<td>Instructor of course</td>
<td>Not later than one week before Commencement*</td>
</tr>
<tr>
<td>Removal of incompletes</td>
<td>Major professor, candidate's committee, and Vice</td>
<td>After oral examination and no</td>
</tr>
<tr>
<td></td>
<td>Chancellor for Graduate Studies</td>
<td>later than two weeks before Commencement*</td>
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</table>

* Dates are printed in Graduate School News quarterly.
Doctoral Degrees

Three Doctoral degree programs are available: Doctor of Philosophy, Doctor of Education, and Doctor of Business Administration. Doctoral programs are listed under "Majors and Degrees Available" (see pages 8-9). The Doctoral degree, the highest in-course degree, is awarded in recognition of distinctive scholarship and the completion of a research project which is a significant contribution to knowledge.

Doctoral programs include a field of specialization and often study in one or more collateral fields. The selection of specific courses will be determined by each student's faculty committee, subject to regulations of the Graduate School and approval by the Vice Chancellor for Graduate Studies and Research, usually at the beginning of the second year of graduate study. This committee shall consist of at least four members, with at least one member from outside the major department. Three of the four members, including the chairman, must be approved by the Graduate Council to direct doctoral research.

Continuous Registration: Registration for course 6000 is necessary whenever a student is working on the dissertation. A minimum registration of 36 quarter hours of course 6000 is required of all doctoral candidates before the dissertation will be accepted. The student will continuously register for course 6000 (minimum of 3 hours) from the time that the doctoral research proposal is approved, admission to candidacy is accepted, or registration for course 6000 is begun whichever comes first, including the quarter in which the dissertation is accepted by the Graduate School. (NOTE: Continuous registration is interpreted to include the summer quarter.) If a student must be away from the University during the doctoral study, the student may, upon recommendation of the department head and approval of the Vice Chancellor for Graduate Studies and Research, be granted a leave of absence from the requirement for periods not exceeding eight quarters.

Preliminary Examination: A comprehensive written preliminary examination which is an indication of the student's fitness for completing the program is required of each person working toward the doctorate. The nature and timing of this examination will be determined by the student's major department or faculty committee. The preliminary examination must be passed prior to admission to candidacy and at least three quarters in advance of conferment of the degree. The doctoral program must be completed within a period of five years after passage of preliminary examinations.

Language Requirements: Usually candidates for the Ph.D. degree must possess a reading knowledge of at least one foreign language in which there exists a significant body of literature relevant to their major field of study. Some programs require two languages and some none. Language requirements must be met at The University of Tennessee and cannot be transferred from another institution. Refer to the departmental descriptions of each Ph.D. program. The student's faculty committee will determine, with the approval of the Vice Chancellor for Graduate Studies and Research, the specific language (or languages) required. When the student feels adequately prepared to take a language examination, he or she should notify the language representative in the department. The appropriate forms to schedule the examination may be obtained from the Graduate Office. The dates and times of the examinations are printed in the Graduate School News.

Satisfactory completion (B grade or better) of an appropriate 3000 course in a language department may be substituted for the actual language examination. (The student cannot repeat this course if a grade of C or below is received when used in lieu of language examination.)

Admission to Candidacy: A student may be admitted to candidacy after passage of the preliminary examinations, fulfillment of the language requirements (for Ph.D.), and maintenance of at least a B average in the courses. (Each doctoral student must plan to take an appropriate number of 6000-level courses, usually a minimum or 9 quarter hours, which are designed expressly for doctoral students at The University of Tennessee.) Admissions to candidacy are also submitted at this time. The student should check with the department concerning any additional required copies of the dissertation.

Research Requirements: Research is an essential part of the program of every candidate for the Doctoral degree. For the Doctor of Philosophy and Doctor of Business Administration degrees, original research forms the basis of the dissertation. Research is open to all faculty members. The project for the Doctor of Education degree requires demonstration of proficiency in at least two types of research techniques. These techniques may include foreign languages, historical research methods, statistics, experimental design, sociological research methods, survey design and analysis, philosophical research methods, or machine data processing. The candidate's faculty committee shall determine the research techniques to be included in the candidate's program.

Final Examination: A final examination (oral, or oral and written) on the student's dissertation, special field, and such other fields as the student's faculty committee may specify, will be administered by the full approved committee after completion of the dissertation and all course requirements. This examination must be passed at least ten days before the date for submission of the dissertation to the Graduate Office. The examination must be scheduled through the Graduate Office and oral examinations not properly scheduled must be repeated. The dissertation, in the form approved by the major professor, must be distributed to the committee at least two weeks before the examination. The date of the examination is announced publicly and the examination is open to all faculty members.

Dissertation: The dissertation represents a culmination of an original major research project completed by the student. The organization, method of presentation, and subject matter of the dissertation are important in conveying to others the results of such major research.

A student should be registered for the number of dissertation hours representing the appropriate fraction of effort devoted to this phase of the candidate's program. A minimum registration of 36 quarter hours of course 6000 is required of all doctoral candidates before the dissertation will be accepted. The student shall continue to register for course 6000 (minimum of 3 hours) for the entire period during which the person is actually working on research and dissertation, including the quarter in which the dissertation is accepted by the Graduate School. Two copies of the dissertation (prepared according to the regulations given in the Graduate School Thesis and Dissertation Manual) must be submitted to and approved by the Graduate School.

These copies must include an approval sheet, signed by all members of the faculty committee, which certifies to the Vice Chancellor for Graduate Studies and Research that they have examined the final copy and found its contents to be satisfactory. Doctoral forms and a thesis card are also submitted at this time. The student should check with the department head concerning additional required copies of the dissertation.
### Summary of Procedures for Doctoral Degrees

<table>
<thead>
<tr>
<th>PROCEDURE</th>
<th>UNDER DIRECTION OF</th>
<th>DATE</th>
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<tbody>
<tr>
<td><em>Preliminary examination</em></td>
<td>Major department</td>
<td>Prior to admission to candidacy</td>
</tr>
<tr>
<td><em>Foreign language examination(s)</em>*</td>
<td>Major department and language department jointly</td>
<td>Prior to admission to candidacy</td>
</tr>
<tr>
<td><em>Appointment of faculty committee</em></td>
<td>Vice Chancellor for Graduate Studies and Research on recommendation of major department</td>
<td>Prior to admission to candidacy</td>
</tr>
<tr>
<td>Approval of admission to candidacy (obtain blanks from Graduate Office)</td>
<td>Faculty committee and Vice Chancellor for Graduate Studies and Research</td>
<td>At least three quarters prior to graduation</td>
</tr>
</tbody>
</table>

### GRADUATION REQUIREMENTS

<table>
<thead>
<tr>
<th>PROCEDURE</th>
<th>UNDER DIRECTION OF</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placement of name on graduation list</td>
<td>Student</td>
<td>Indicate on registration material</td>
</tr>
<tr>
<td>Application for diploma</td>
<td>Vice Chancellor for Graduate Studies and Research</td>
<td>See deadline notice available at registration**</td>
</tr>
<tr>
<td>Scheduling of oral examination</td>
<td>Faculty committee and Vice Chancellor for Graduate Studies and Research</td>
<td>When approved by faculty committee and at least one week prior to oral examination**</td>
</tr>
<tr>
<td>Submission of dissertation to faculty committee</td>
<td>Faculty committee</td>
<td>At least two weeks prior to oral examination</td>
</tr>
<tr>
<td>Oral examination</td>
<td>Faculty committee</td>
<td>Not later than ten days before dissertation deadline**</td>
</tr>
<tr>
<td>Removal of incompletes</td>
<td>Instructor of course</td>
<td>Not later than one week before Commencement**</td>
</tr>
<tr>
<td>Submission of final copy of dissertation, doctoral forms, and thesis card</td>
<td>Faculty committee and Vice Chancellor for Graduate Studies and Research</td>
<td>After oral examination and at least two weeks before Commencement**</td>
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</tbody>
</table>

* The order of these items varies with individual programs.  
** Dates are printed in Graduate School News quarterly.  
*** Not required in some programs.
Institute of Agriculture

Webster Pendergrass, Vice President
Bobby H. Pentecost, Assistant Vice President

The Institute of Agriculture traces its history to 1869 when the University was designated as Tennessee's Federal Land-Grant Institution. Under terms of the Federal Land-Grant Act, the University was enabled to offer instruction in agriculture and the mechanic arts for the first time. Since 1869, agricultural programs at the University have been expanded to include research for the development of new knowledge and extension for dissemination of such knowledge to rural people. Thus the Institute of Agriculture has come to include the work of three main divisions: College of Agriculture, Agricultural Experiment Station, and Agricultural Extension Service.

In March 1974 the College of Veterinary Medicine was established within the Institute. The college is developing research and graduate programs in veterinary medical sciences in addition to the professional curriculum leading to the degree, Doctor of Veterinary Medicine. The first students were admitted in the fall of 1976.

Agricultural Experiment Station

D. M. Gossett, Dean
Thomas J. Whatley, Associate Dean
John I. Sewell, Assistant Dean

The Agricultural Experiment Station was established by the University's Board of Trustees on June 8, 1882, five years before the passage of the Hatch Experiment Station Act by the U.S. Congress. The University was one of the first five institutions in the U.S. to establish an Agricultural Experiment Station. Since its beginning the Station has given first attention to investigations of concern to the agriculture of Tennessee. The investigations of the Station follow a systematic method of gaining and applying knowledge efficiently to the biological, physical, and economic phases of producing, processing, and distributing farm and forest products; to the social and economic aspects of rural living; and to consumer health and nutrition.

Both farm and urban populations gain from the accomplishments of the Agricultural Experiment Station. Examples of some of these accomplishments are new and improved varieties of crops, new and better methods of controlling crop and livestock pests, more efficient production of crops and pasture through improved fertilization and mechanization, and more efficient feeding and management of livestock.

The program is designed and administered through sixteen subject matter departments located at Knoxville. A number of the staff have teaching responsibilities in addition to their research. To assist in the research program the Station supports a large number of graduate students. To serve Tennessee's diverse agriculture, branch stations are operated at Jackson, Spring Hill, Springfield, Lewisburg, Crossville, Greeneville, and Martin. In addition, field stations are operated at Grand Junction, Milan, Wartburg, Tullahoma, and near Chattanooga. Professional and technical staff are in residence at these locations.

The UT-ERDA Comparative Animal Research Laboratory is located about twenty miles west of Knoxville near Oak Ridge, where a program of radiobiological research in the field of agriculture is carried out by the Agricultural Experiment Station under contract to the Energy Research and Development Administration. The program includes research with farm and laboratory animals, with soils, and in applied radiobiology and plant breeding.

Agricultural Extension Service

M. L. Downen, Dean
T. W. Hinton, Associate Dean
B. G. Hicks, Assistant to the Dean
Mildred F. Clarke, Assistant Dean

The Agricultural Extension Service was established in 1914. Its purpose is to extend through various educational means agricultural and home economics information to farm families and others in the state who do not have the opportunity to enroll in resident courses of instruction at colleges.

The educational program is carried on through offices in each of the ninety-five counties of the state. Education emphasis includes work in five major program areas: agricultural production, marketing of agricultural products, development and conservation of natural resources, home economics, and education of young people through 4-H Clubs. County Extension staff members working directly with local people are supported in the various information fields by a specialist staff, members of which are stationed either in Knoxville, Nashville or Jackson.

The Agricultural Extension Service operates administratively as one of three units of the Institute of Agriculture. For administration the state is divided into five districts with supervisors located in their respective districts. District headquarters are maintained in Knoxville, Chattanooga, Cookeville, Nashville, and Jackson.

The Agricultural Extension Service operates as a three-way partnership among county, state, and federal
Institute of Agriculture 25

College of Agriculture
O. Glen Hall, Dean

Graduate programs of the College of Agriculture are designed to prepare men and women for positions of leadership in industry, state and federal government, teaching, research, and extension. The graduate student is expected to demonstrate a thorough knowledge of the subject matter in his/her specialized field of study and its relationship to the sociological, economic, and environmental impact on society. The student must demonstrate the ability to plan, conduct, analyze, and report original research. More importantly, emphasis is given to intellectual growth and to the development of scholarly habits of study, reasoning and analysis to the end that the graduate will continue to grow and develop professionally throughout his/her career.

MASTER OF SCIENCE PROGRAMS

Programs of graduate study leading to the Master of Science degree are offered through all departments in the College of Agriculture. The general rules of the Graduate School apply to all graduate work in this college. The graduate program may be entirely in one major subject or may include one or two minors in any of the subject matter areas related to the major. Both majors and minors are available in Agricultural Biology, Agricultural Economics, Agricultural Engineering, Agricultural Extension Education, Agricultural Mechanization, Animal Science, Food Technology and Science, Ornamental Horticulture and Landscape Design, and Plant and Soil Science. Majors only are available in Forestry and Wildlife and Fisheries Science, and minors are available in General Agriculture and Rural Sociology. The minor in General Agriculture requires 18 hours of course work. A complete listing of majors is shown on pages 8-9.

For admission to a graduate degree program, the student must have a satisfactory academic average and have completed the substantial requirements for an undergraduate major in his/her field of study or have completed sufficient undergraduate work in related areas to satisfy the department that he/she can successfully pursue graduate study in the chosen field. Prerequisite courses may be required when the student’s preparation is deemed to be inadequate. Each program of course work and thesis research is planned by the major professor and Master’s committee in consultation with the student, and will depend upon the student’s background, interests, and professional objectives. For example, a student majoring in Agricultural Biology may pursue work with an emphasis either in the area of plant pathology or economic entomology. Normally, graduate programs will include the thesis requirement. There are, however, two exceptions.

In a program involving a major and two minors, or one involving a minor in General Agriculture, the research requirement may be met by three special problems in lieu of thesis. This program is provided to meet the needs of those working in fields of agriculture where general training is suitable rather than the more specialized subject-matter programs which usually characterize graduate study. The special problems in lieu of thesis must represent at least two of the fields of study selected. A student should have completed at least 6 hours of graduate work in a subject before pursuing a special problem in lieu of thesis in that field. Problems in lieu of thesis will be written to meet normal thesis standards of quality. A non-thesis option is offered in the Department of Agricultural Economics and Rural Sociology in addition to the thesis option and has the following minimum requirements:

- 48 hours of course work of which 24 hours must be at the 5000-level.
- 18 hours in agricultural economics.
- 9 hours of economic theory.
- 6 hours in quantitative methods in agricultural economics, statistics, or mathematical economics.
- Final comprehensive written and oral examination.

DOCTORAL PROGRAMS

Graduate study programs leading to the Doctor of Philosophy degree in Animal Science, Agricultural Economics, Agricultural Engineering, and Plant and Soil Science are offered in the College. General Graduate School requirements relative to admission, faculty advisory committees, residence, grades, research, and admission to candidacy for degree apply to all doctoral programs. Special departmental requirements are listed in the following paragraphs.

Agricultural Economics and Rural Sociology

Subject Area Requirements: All candidates pursuing the Doctor of Philosophy degree will be required to demonstrate their competence in examinations in the following areas:

A. A major area of concentration to be selected from the following:

1. General agriculture economics
2. Agricultural marketing and price analysis
3. Farm management and production economics
4. Economics of agricultural development

B. The Core Areas:

1. Agricultural economics
2. Economic theory
3. Mathematical and quantitative methods in agricultural economics

Course Requirements: A minimum of 108 quarter hours credit beyond the Bachelor’s degree, exclusive of credit for Master’s research, is required in the doctoral program. Of this total, 36 hours in doctoral research and dissertation are required. At least 30 hours of course work shall be in agricultural economics and 15 hours in economics. Excluding the dissertation, a minimum of 21 hours in agricultural economics and 36 hours in agricultural economics and economics combined must be in courses numbered 5000 and above.

Agricultural Engineering

Candidates pursuing the Doctor of Philosophy degree in Agricultural Engineering may specialize in one of the following areas:

1. Agricultural power and machinery
2. Soil and water conservation engineering
3. Agricultural structures
4. Electric power and processing

Supporting studies are required in related biological, physical, and engineering sciences and mathematics fundamental to the training of the candidate.

Additional course requirements for the degree are:

1. Minimum of 108 quarter hours credit beyond the Bachelor’s degree, exclusive of the credit for the Master’s thesis. Of this number, students are required to complete a minimum of 36 quarter hours in 6000 Doctoral Research and Dissertation.
2. A minimum of 30 quarter hours credit will be in courses numbered 5000 and 6000, exclusive of Doctoral Research and Dissertation.
3. The program of each candidate shall consist of a major and supporting studies in one or more additional areas. The major shall consist of a minimum of 24 quarter hours exclusive of research and dissertation. A minimum of 24 quarter hours shall be taken in departments outside of the Department of Agricultural Engineering.

The specific program of a candidate for the degree of Doctor of Philosophy in Agricultural Engineering will depend upon the interest and previous training of the candidate. Each candidate will be under the immediate supervision of a faculty advisory committee in planning his/her program. The major professor will serve as chairman of the faculty advisory committee and will direct the research and preparation of the dissertation.

Animal Science

The Department of Animal Science, with support from the Department of Food Technology and Science, offers programs leading to the Doctor of Philosophy degree in the following areas of specialization:

1. Animal nutrition
2. Animal breeding
3. Animal physiology
4. Animal products

Supporting studies are required in related biological and physical sciences fundamental to the training of the candidate.

Additional specific course requirements
for the degree of Doctor of Philosophy in Animal Science include:

1. Minimum of 108 quarter hours credit in courses beyond the Bachelor's degree, exclusive of credit for the Master's thesis. Of this number, students are required to complete a minimum of 36 quarter hours in 6000 Doctoral Research and Dissertation.
2. At least 35 quarter hours credit in courses numbered 5000 and 6000, exclusive of Doctoral Research and Dissertation.
3. A minimum of 24 quarter hours credit must be completed in related fields outside of animal science.

The specific program of a candidate for the degree of Doctor of Philosophy in Animal Science depends upon the interest and previous training of the candidate. Actual course content of the program is planned with each student in consultation with a faculty advisory committee to meet requirements in the various areas of concentration.

**Plant and Soil Science**

The Department of Plant and Soil Science offers programs leading to the Doctor of Philosophy degree in the following areas of specialization:

1. Soils
2. Plant breeding and genetics
3. Crop physiology and ecology

Supporting studies are required in related sciences fundamental to the training of the candidate.

Some of the specific requirements for the degree are:

1. Minimum of 108 quarter hours credit beyond the Bachelor's degree exclusive of Master's thesis. Of this number, students are required to complete a minimum of 36 quarter hours in Doctoral Research and Dissertation.
2. Minimum of 30 quarter hours credit in courses numbered 5000 and 6000 exclusive of Doctoral Research and Dissertation.

The specific program of a candidate for the degree of Doctor of Philosophy in Plant and Soil Science will depend upon the interest and previous training of the candidate. The program of courses and research will be planned with the student in consultation with a faculty advisory committee. The major professor will serve as chairman of the faculty advisory committee and will direct the research and the preparation of the dissertation.

**Departments of Instruction**

Numbers in parentheses following the course titles indicate quarter hours credit offered.

**Agricultural Biology**

**MAJOR**

Agricultural Biology

**DEGREE**

M.S.

**Professors:**

- C. J. Southard (Head), Ph.D. North Carolina State; J. W. Hilly, Ph.D. Ohio State; L. F. Johnson, Ph.D. Louisiana State.
- Associate Professor: R. Bernard, Ph.D. North Carolina State; C. D. Pleas, Ph.D. Clemson; H. E. Reed, Ph.D. Ohio State.
- Assistant Professors: P. L. Lambdin, Ph.D. Virginia Polytechnic Institute; E. C. Bernard, Ph.D. Georgia

**3130 Introductory Plant Pathology (4)** Principles of plant pathology illustrated by diseases of common agricultural crop plants. Prereq: Introductory botany or zoology. Graduate credit for winter term only. 3 hrs and 1 lab. (Same as Botany 3130.)

**3210 Economic Entomology (4)** Structure, life history, habits, and principles of control of important insect pests of farm, garden, orchard, and household. 3 hrs and 1 lab.

**3220 Apiculture (3)** Biology of the honey bee, with emphasis on beekeeping equipment and apiary management practices relative to pol- lination of crops and production of honey and beeswax. 2 hrs and 1 lab.

**4010 Biology of Soil Microorganisms (4)** A study of the morphology and physiology of soil organisms, decomposition of organic matter, chemical transformations, and interactions between soil organisms and higher plants. Prereq: Introductory microbiology or 3130. 3 hrs and 1 lab.

**4020 Forest and Shade Tree Entomology (3)** Identification, biology, ecology, and control of forest and shade tree pests. Prereq: 3210 or equivalent. 2 hrs and 1 lab.

**5000 Thesis**

**5010 Research Methods and Instrumentation in Plant Pathology and Entomology (3)** Techniques for laboratory, field and greenhouse research in plant pathology and entomology. 1 hr and 2 labs.

**5210 Plant Parasitic Nematodes (4)** Morphology, physiology, taxonomy, and ecology of plant parasitic nematodes with emphasis on host-parasite relationships. Prereq: 8 hrs biological science or consent of instructor. 2 hrs and 2 labs. (Same as Zoology 5210.)

**5220 Plant Disease Control (3)** Basic problems and principles involved in controlling plant diseases. Prereq: 3130.

**5230 Field Crop and Vegetable Insects (3)** Study of the taxonomy, biology and control of insects affecting field and vegetable crops. Prereq: 3210 or equivalent course in applied entomology, 2 hrs and 1 lab.

**5240 Insect Pests of Man and Animal (3)** A study of the taxonomy, biology and control of those insects parasitic on domestic animals and those found in human habitation. Prereq: 3210 or equivalent course in applied entomology, 2 hrs and 1 lab.

**5260 Insect Pest Management (4)** Principles and applications of biological, cultural, genetic, behavioral, and chemical methods of control to maintain pest populations below economic threshold levels. Prereq: 3210, Zoology 3110, or consent of instructor. 3 hrs and 1 lab.

**5310 Special Problems in Plant Pathology or Economic Entomology (1-6)** Comprehensive individual study of current problems in economic entomology or plant pathology. May be repeated. Maximum 9 hrs.

**5410 Seminar (1)** Review of literature and current research in plant pathology and economic entomology. May be repeated. Maximum 3 hrs.

**Agricultural Economics and Rural Sociology**

**MAJOR**

Agricultural Economics

**DEGREES**

M.S., Ph.D.

**Professors:**

- J. A. Martin (Head), Ph.D. Minnesota; M. B. Badashop, Ph.D. Purdue; D. W. Brown, Ph.D. Iowa State; C. L. Cleland, Ph.D. Wisconsin; R. E. Trowbridge, Ph.D. California (Berkeley); L. H. Keller, Ph.D. Kentucky; F. O. Leuthold, Ph.D. Wisconsin; B. H. Pentecost, J.D. Tennessee.

**Associate Professors:**

- R. H. Brooker, Ph.D. Florida; C. M. Cuskaden, Ph.D. Michigan State; B. J. Deeton, Ph.D. Wisconsin; T. H. Kindt, Ph.D. Kentucky; D. L. McLemore, Ph.D. Clemson; B. R. McManus, Ph.D. Purdue; S. D. Mundy, Ph.D. Tennessee; G. B. Sappington, Ph.D. Illinois; J. G. Snell, Ph.D. Michigan State; B. J. Trenava, Ph.D. Tennessee.

**Assistant Professor:**

- R. H. Orr, Ph.D. Illinois.

The department has programs for the Doctor of Philosophy degree and the Master of Science degree with a thesis or non-thesis option.

**Agricultural Economics**

**4100 Farm Management (3)** Principles of farm organization and operation. Allocating land, labor, and capital to meet changing technological, tenure arrangements and use of credit, risks, measures of success, use of records and analysis of performances. Practice in planning nearby farms. Field trips will be arranged. 2 hrs and 1 lab.

**4140 Introduction to Agricultural Production Economics (3)** Resource allocation, product selection, scale of operation of agricultural farms, aggregate economic decisions made by individual agricultural farms.

**4210 Problems in Agricultural Economics (3)** Supervised laboratory course in instruction, methods of collecting, analyzing information, and in writing a report. May be repeated. Maximum 9 hrs.

**4240 World Agriculture and Trade (3)** Economic bases of world agricultural production and trade patterns. Land tenure systems, international trade and commercial policies in determining agricultural production and trade patterns. Prereq: Consent of instructor.

**4250 Agricultural and Rural Program Planning (3)** Decision-making concepts applied to design and implementation of local-action programs. Case examples from the U.S. and other countries. Prereq: Introduction to Social Sciences in Agriculture and Introductory Economics or consent of instructor.

**4310 Agricultural Finance (3)** Agricultural credit; nature and source of capital, credit problems of farmers; sources of farm capital; kinds and sources of farm credit, Agricultural insurance and taxation; kinds of insurance, importance of types of taxes to farmers.

**4320 Agricultural Policies (3)** Agricultural policy in democratic society; relationship of farm groups to public policy; problems giving rise to policy; agricultural policy and appraisal of results; policy problems.

**4330 Land Economics (3)** Problems and policies of land use, resource value, development, taxation, and tenure; population growth and demand for land; principles and theories of rent, property, value, income.

**4510 Management of Farm Supply and Marketing Firms (3)** Operation of firms selling goods and services in agricultural production and marketing. Cost accounting, economic analysis, organization and management of firms.
farm supplies and merchandising agricultural products. Emphasis on accounting data and economic framework for managerial decision making.

4630 Advanced Agricultural Marketing (3) Theory and practice of competition and cooperation. Application of cost theory to the production organization of the marketing firm and problem areas in pricing, marketing strategy, organization, structures, and price policies. Application of imperfect competition theory to the market policies of agricultural processing and merchandising firms.

4710 Agricultural Law (4) Survey of law and application to the farmer, his family and the agricultural industry. Topics include land tenure, drainage and water rights, landlord-tenant relationship, taxation and insurance, forms of business organization, estate planning, regulatory laws and other selected topics.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

5011 Special Problems in Lieu of Thesis (3)

5120 Agricultural Price Analysis (3) Analysis and application of factors affecting agricultural prices; factors determining market behavior; application of economic theory and statistical techniques to agricultural price research. Prereq: 3120 and Statistics 4130 or equivalent.

5130 Advanced Agricultural Production Economics (3) The theory and empirical concepts of agricultural resource allocation problems under different conditions of uncertainty. Prereq: 4140 or equivalent.

5210 Seminar: Agricultural Policies (3)

5220 Seminar: Methodology of Research (3)

5230 Seminar: Adjustments to Industrialization (3)

5310 Research (3) Special research problems in agricultural economics and rural sociology. Gathering, tabulating and interpreting data and reporting writing. May be repeated. Maximum 9 hrs.

5410 Agricultural Marketing Analysis (3) Application of tools of economic analysis and measurement to problems at all levels of the marketing system for agricultural commodities. Prereq: 4530 or equivalent.

5420 Advanced Land Economics (3) Problems in land tenure, land use, and conservation in the United States and selected foreign countries. Prereq: 4530 or equivalent.

5440 The Economics of Agricultural Development (3) Role of agriculture in overall economic development; the economic nature of traditional agriculture, and the analysis of causal forces and structural interdependence of agricultural development under conditions of economic change. Prereq: 4240 or consent of instructor.

5510 Quantitative Methods in Agricultural Economics (3) Study of analytical techniques useful in estimation of functions—supply, demand and production—and prediction of economic variables. Emphasis on the application of multiple regression model specification, estimation technique using computer and characteristics of results. Prereq: Statistics 4310 or Economics 4510 or consent of instructor.

5710 Quantitative Methods in Agricultural Economics (3) Quantitative techniques of linear-programming technique with empirical applications, made to problems of maximizing profit, minimizing cost, finding equilibrium price and location. Other topics include input-output analysis, recursive programming, game theory, and nonlinear programming. Prereq: Economics 4180 or consent of instructor.

6100 Doctoral Research and Dissertation

6120-30 Seminars in Agricultural Economics (3, 3) Topics will be selected from the areas of economic theory, economic development, distribution in agriculture and related industries and public policies concerned with agriculture and related industries.

6210 Agricultural and Rural Transformation Problems (3) Systematic evaluation of policy and development proposals related to agricultural modernization, food supply, and rural living. The decision-making process and uses roles of social scientists. Analysis of current issues in U.S. and developing nations. Prereq: Consent of instructor.

6410 Agricultural Supply Analysis (3) Estimating agricultural supply relationships using aggregate time series regression, production functions, linear programming, simulation and firm growth models with emphasis on co-operation between theoretical concepts and model attributes. Prereq: 5130 or consent of instructor.

6420 Marketing and Resource Use (3) Situational maps, models and policy formulation. Analytical tools to measure efficiencies of marketing and resource use. Emergence of production as a marketing and resource use. Wastes management in the marketing systems to conserve resources and environment. Prereq: 5410 or consent of instructor.

Rural Sociology

3420 An Introduction to Rural Sociology (3) Nature of rural society; social systems concept; rural-urban differences; nature of social relations; problems of rural people; tenancy, farm labor, health, services, educational facilities, churches, local government; impact of industrialization.

4450 Diffusion of Agricultural Technology (3) Analysis of the diffusion process whereby new technology spreads from scientists to final adopters. Topics include adoption process, communication behavior, mass media, role of professional change agents, opinion leadership, and two-stamp flow hypothesis. Prereq: 3420 or consent of instructor.

5340 Special Problems (3) Special topics in rural sociology. Prereq: 3420 or consent of instructor. May be repeated. Maximum of 9 hrs.

5430 Seminar in Rural Sociology (3) Current rural sociological literature and research; relevance of general sociological theory and methodological techniques. Prereq: 3420 or equivalent.

5450 Advanced Rural Sociology (3) The application of sociological concepts to analyze the changing social structure and functions of rural life; rural social values, attitudes, and norms as they influence the family, formal and informal groups, population shifts and changing farm technology. Prereq: 3420 or equivalent.

5470 Research Problems in Rural Communities (3) Emphasis is given to problems that arise in rural areas. Problems arising from sampling procedures, questionnaire construction, interviewer selection, training, field work, and data analysis are covered. Prereq: Undergraduate course in statistics.

5490 Rural Population Analysis (3) Analysis of the U.S. and world population changes and the determinants of fertility, mortality, and migration with emphasis upon changes in the rural sector. Prereq: Sociology 4110 or equivalent.

Agricultural Engineering

4230 Selected Topics in Agricultural Engineering (3) Develop new topics as required by current trends and problems in agricultural engineering.

4610 Design of Water Control and Waste Utilization Systems (3) Design of water control and waste utilization systems including earth dams, irrigation, drainage, land grading, hydraulic transport of wastes, and application of wastes on agricultural land. Prereq: 3610 or consent of instructor. 1 hr and 2 labs.

4620 Design of Structures for Production, Processing and Environmental Control (3) Functional design of agricultural buildings; emphasis placed on complete design of agricultural structures. Prereq: include functional, structural and environmental aspects. Prereq: 3620. 1 hr and 2 labs.

4630 Design of Processing and Materials Handling Systems (3) Development of systems and components for integrated agricultural processing considering mass and energy balances. Product characteristics, equipment specifications, storage, handling and economic merit. Prereq: 3630. 1 hr and 2 labs.

4640 Design of Agricultural Machinery (3) Functional requirements of agricultural machinery. Elements of machine component design; synthesis of mechanisms, mechanical analysis of structures. Prereq: 3640 or consent of instructor. 1 hr and 2 labs.

5000 Thesis

5240 Environmental Control in Agricultural Structures (3) Engineering analysis of factors related to the life of man and his activities in different environments: basis for development and design of facilities and structures for confined housing of animals, controlled environment for plant growth, and storage facilities for plant and animal products. Prereq: Functional Design of Agricultural Structures; Applied Thermodynamics; or consent of instructor. 2 hrs and 1 lab.

5340 Hydrology of Agricultural and Forest Lands (3) Analytical approach to problems involving water surplus, deficiency and time distribution as related to agricultural and forest purposes. Prereq: Soil and Water Conservation Engineering; Introductory Hydrology; Forest Watershed Management; or consent of instructor. 2 hrs and 1 lab. (Same as Water Resources Systems Development)

5440 Instrumentation in Agricultural Systems (3) Analysis of specific instrumentation needs in agricultural industry and research problems; principles and design in utilizing specialized instrumentation. Prereq: Engineering Electronics or consent of instructor. 2 hrs and 1 lab.

5540 Engineering Properties of Agricultural Materials and Products (3) Fundamental engi-
neering properties of agricultural products and materials as related to their handling, processing, and utilization. Prereq: Processing and Materials Handling, Fluid Mechanics and Materials. 2 hrs and 1 lab.

5560 Research Problems in Agricultural Engineering (3) Theoretical and experimental studies relating to current problems in agricultural engineering. May be repeated. Maximum 9 hrs.

5710-20 Similitude in Design and Research (3, 3) Dimensional analysis in the development of theory and types of models, prediction equations; interpretation of data: applications to machinery, soil and water structures, agricultural buildings, and other agricultural engineering-related problems. Prereq: Fluid Mechanics and Mechanics of Materials. 2 hrs and 1 lab.

6000 Doctoral Research and Dissertation

6110 Seminar (1) Discussion of current research and literature related to engineering in agriculture. May be repeated. Maximum 3 hrs.

5310 Engineering Systems Analysis in Agriculture (3) Systems approach to the design of engineering experiments and applications to include computer programming, computer applications, statistical evaluations, and feedback control in agricultural problems. Prereq: 3 hrs of Vector Analysis or Partial Differential Equations. Coreq: 5710 or equivalent. 2 hrs and 1 lab.

6610 Selected Topics in Agricultural Engineering (3) Lecture, group discussion, and individual study on specialized developments in power and machinery, soil and water, structures, and processing. May be repeated. Maximum 9 hrs.

Agricultural Mechanization

4160 Agricultural Waste Utilization and Disposal (3) Techniques, equipment, and structures for utilizing, treating, and disposing of agricultural wastes by land spreading, lagoonizing, and processing. 2 hrs and 1 lab.

4170 Small Engines (3) Concepts and mechanics of small gasoline engines; selection, operation, maintenance, repair of single-cylinder engines. 2 hrs and 1 lab.

4180 Equipment and Techniques for Application of Agricultural Chemicals (3) Equipment for the application of herbicides, pesticides, and gas-phase chemicals; system components; operational characteristics; safety considerations; calibration. Techniques of effective placement and application. 2 hrs and 1 lab.

4210 Agricultural Machinery and Tractors (4) Agricultural machinery and power units; adaptation to agricultural practices; field efficiencies, capacities, adjustment and servicing. Prereq: Introduction to Agricultural Engineering; General Mathematics (9 hrs). 3 hrs and 1 lab.

5000 Thesis

5100 Selected Topics in Agricultural Mechanization (3) Lecture, group discussion, and individual study on specialized agricultural mechanical developments. May be repeated. Maximum 9 hrs.

Agricultural Extension Education

MAJOR

DEGREE

Agricultural Extension

Professor: R. S. Dottin (Head), Ph.D. Pennsylvania State.

Associate Professor: C. E. Carter, Jr., Ph.D. Ohio State.

3110 Introduction to Agricultural Extension (3) History, philosophy, organization, teaching methods; relationships with other educational agencies. Graduate credit for non-majors only.

4110-20 Field Studies (3, 3) Supervised work experience with county extension agents in a designated county. Prereq: 3110, and consent of instructor. Requires living off-campus for a specified time.

5000 Thesis

5011-21 Special Problems in Lieu of Thesis (3, 3)

5100 Special Problems in Agricultural Extension (1-6) May be repeated. Maximum 9 hrs.

5210 Long-range Extension Program Planning (3) Development of county extension program based on effective interpretation of physical, social, economic characteristics of areas. Prereq: 3110 or consent of instructor.

5220 Seminar (3) Review of literature and development of agricultural extension methods. Prereq: 3110 or consent of instructor.

5230 Evaluation in Programs of Agricultural Extension (3) Principles, instruments, and techniques of evaluating, gathering, analyzing and using data to appraise planning and teaching and to determine progress of clientele. Prereq: 5210 or consent of instructor.

5310 History, Philosophy and Objectives (3) Historical and philosophical foundation of informal Adult Education in American Agriculture from the Agricultural Societies (1785 to present) to attention to key figures, major movements and organizations and programs. Emphasis on Extension Science, its origin, legislation and growth and the nature and content day objectives and programs. Prereq: 3110 or consent of instructor.

5320 Volunteer Leadership in Agricultural Extension Programs (3) Theory, principles and procedures in development of volunteer leadership for small groups in rural communities through agricultural extension programs. Emphasis given to analysis of place and importance of volunteer leadership function, techniques of effective leadership of small groups and methods of developing volunteer leadership in agricultural extension work. Prereq: 3110 or consent of instructor.

5330 Supervision of Agricultural Extension Programs and Personnel (3) Theories of human effectiveness; principles of successful supervision applied to various parts of county, district and other extension programs; and planning for effective management. Prereq: 5210 or 5220 or consent of instructor.

Animal Science

MAJOR

DEGREE

Animal Science

Professors: R. R. Johnson (Head), Ph.D. Ohio State; M. C. Bell, Ph.D. Oklahoma State; C. C. Chamberlain, Ph.D. Iowa State; H. M. Jamison, Ph.D. Tennessee; J. B. McLaren, Ph.D. Purdue; G. A. Merriman, D.V.M. Michigan State; M. J. Montgomery, Ph.D. Wisconsin; R. L. Murphy, Ph.D. Wisconsin; D. R. Nichol andard, Ph.D. Purdue; H. V. Shirley, Ph.D. Illinois; R. R. Shrode, Ph.D. Iowa State; E. W. Swanson, Ph.D. Minnesota; R. L. Tugwell, Ph.D. Kansas State.


3210 Anatomy and Physiology of Farm Animals (4) Skeleton and joints, skeletal muscles, blood and microcirculation, and the nervous, cardiovascular, respiratory, digestive, renal and endocrine systems; demonstrations of physiological and pharmacological principles and their use. Prereq: General Biology or Animal Science for Agriculture, 3 hrs and 1 lab.

3220 Physiology of Reproduction (3) Comparative anatomy and physiology of the reproductive systems of higher vertebrates; gametogenesis, fertilization, implantation, prenatal growth, parturition and initiation of lactation; endocrine regulation of reproductive phenomena. Prereq: 3210 or consent of instructor. 2 hrs and 1 lab. (Same as Zoology 3220.)

3320 Animal Nutrition (3) Properties, functions, utilization and deficiency symptoms of essential nutrients; nutritive value determinations and their use. Prereq: Animal Science for Agriculture and one quarter of organic chemistry. 2 hrs and 1 lab.

3330 Feeds and Ration Formulation (3) Feedstuffs, additives, feeding standards; nutrient requirements and ration formulation for beef and dairy cattle, sheep, horses, swine, poultry and laboratory animals. Prereq: 3550. 2 hrs and 1 lab.

3410 Heredity in Animals (3) Basic chromosomal mechanism of heredity with emphasis on Mendelian principles and the use of organisms to these such as linkage and cytoplasmic inheritance. Introduction to the biochemical basis of heredity and to quantitative inheritance. Illustrations of principles and their application to species with which students in agriculture are familiar. Prereq: Animal Science for Agriculture. 2 hrs and 1 lab.

3420 Principles of Animal Breeding (3) Genetic principles in the breeding of economic species. Genetic basis of variation. Partitioning of genotypes according to various kinds of causative difference in genetic makeup and in environment. Selection and its consequences. Managing systems and methods for selection and the use of selection in animal and plant improvement. Selection and breeding programs. Prereq: 3410 or equivalent. 2 hrs and 1 lab.

3510 Animal Hygiene and Sanitation (4) Parasitic, viral and bacterial organisms in farm animals; immunization, types of immunities against disease; veterinary regulations and quarantine; herd health programs. Prereq: General Microbiology or consent of instructor. 3 hrs and 1 lab.

3520 Avian Diseases (3) Major avian diseases; characteristics, prevention and treatment; management. Princes and systems for domestic birds, upland game birds and waterfowl. 2 hrs and 1 lab.
3810 Nutrition and Management of Laboratory Animals (3) Principles of feeding, breeding and husbandry of scientific laboratory animals; specific species' requirements, peculiarities and research for which best fitted; laws governing use of laboratory animals. Prereq: Animal Science for Agriculture and consent of instructor. 2 hrs and 1 lab.

4210 Physiology of Lactation (3) Development, anatomy, and function of mammary glands; endocrine influences on mammary development and milk secretion; factors affecting yield and composition of milk. Prereq: 3210.

4220 Avian Physiology (3) Anatomy and physiology of poultry with emphasis on poultry. Prereq: 3210. 2 hrs and 1 lab.

4230 Applied Reproduction in Farm Animals (3) Methods and techniques in collecting, evaluating, processing and preserving semen; insemination of females; pregnancy determination; gestation and parturition. Male and female infertility. Prereq: 3220. 1 hr and 2 labs.

4310 Feeding Systems for Ruminants and Horses (3) Nutrition and feeding principles in the comparison of feeding systems utilized during the life cycle of cattle, horses and sheep. Prereq: 3330. 2 hrs and 1 lab.

4320 Feeding Systems for Poultry and Swine (3) Origin and feeding principles in the comparison of feeding systems utilized during the life cycle of poultry and swine. Laboratory feeding systems and basic nutrition concepts. Prereq: 3330. 2 hrs and 1 lab.

4410 Applied Animal Breeding (3) The principles studied in 3420 (breeding of important classes and species) are taught by specialists in the breeding of dairy cattle, meat animals and poultry. Prereq: 3420. 2 hrs and 1 lab.

4810 Beef Cattle Production and Management (4) Principles of nutrition, physiology, and breeding in a complete beef cattle management program. Structure of industry, enterprise establishment, systems of production, production practices and herd improvement programs. Alternatives will be evaluated in terms of production response and economic returns. Prereq: Completion of animal science sophomore and junior core courses or consent of instructor. 3 hrs and 1 lab.

4820 Dairy Cattle Production and Management (4) Principles of nutrition, physiology, and breeding in a complete dairy cattle management program. Topics will include the structure of industry, enterprise establishment, systems of production, production practices and herd improvement programs. Alternatives will be evaluated in terms of production response and economic returns. Prereq: Completion of animal science sophomore and junior core courses or consent of instructor. 3 hrs and 1 lab.

4830 Pork Production and Management (4) Principles of selection, nutrition, breeding, physiology and marketing in a complete pork production and management program. Structure of the industry, enterprise establishment, systems of production, production practices and herd improvement programs. Alternatives will be evaluated in terms of production response and economic returns. Prereq: Completion of animal science sophomore and junior core courses or consent of instructor. 3 hrs and 1 lab.

4840 Poultry Production and Management (4) Structure of the poultry industry, organization and management of poultry enterprises including rearing, housing, feeding, processing and marketing. Prereq: Completion of animal science sophomore and junior core courses or consent of instructor. 3 hrs and 1 lab.

4850 Light Horse Production and Management (3) Integration of principles of nutrition, physiology and breeding into a light horse management program. Structure of the industry; systems of production and production practices; individual animal and herd improvement programs; tack, equipment and facilities for both pleasure owners and commercial producers. Alternatives will be evaluated in terms of pleasure, recreation, and economic returns. Prereq: Completion of animal science sophomore and junior core courses or consent of instructor. 2 hrs and 1 lab.

4860 Lamb and Wool Production and Management (3) Integration of the principles of selection, nutrition, breeding, physiology and marketing into a complete lamb and wool production and management program. Structure of the industry, enterprise establishment, systems of production responses and economic returns. Prereq: Completion of animal science sophomore and junior core courses or consent of instructor. 2 hrs and 1 lab.

5000 Thesis
5101 Problems in Lieu of Thesis (1-6) May be repeated. Maximum 6 hrs.

5110 Special Problems in Animal Science (1-6) May be repeated. Maximum 9 hrs.

5210 Endocrine Relations in Animal Production (4) Endocrine glands related to growth and reproduction; hormone preparation for altering growth and reproduction of farm animals. Prereq: 3210 or consent of instructor. 2 hrs and 1 lab.

5230 Advances in Mammalian Reproduction (3) Germ cell development, maturation, transport, metabolism, and preservation; fertilization and embryonic mortality. Prereq: 3220 or 4230. 2 hrs and 1 lab.

5240 Advanced Studies of the Secretion of Milk (3) Effects of endocrine and nutritional factors on mammary gland development; initiation and maintenance of lactation. Prereq: 4210. 2 hrs and 1 lab.

5311 Analytical Techniques in Animal Nutrition (3) Physical and chemical analysis, feeds, ingredients, and biological fluids associated with nutrition research. 1 hr and 2 labs.

5321 Energy in Animal Nutrition (4) Energy sources in animal feeds; carbohydrate and lipid compounds; nutritional functions, metabolism, evaluation and requirements. Prereq: 3320 or consent of instructor. 3 hrs and 1 lab.

5331 Proteins in Animal Nutrition (3) Proteins in feeds, amino acids and non-protein nitrogen; and their application to animal nutrition, nutritional functions, metabolism, evaluation and requirements. Prereq: 3320 or consent of instructor.

5341 Vitamins and Minerals in Animal Nutrition (3) Nutritional history, identification, chemical properties, mode of action, determination, nutritional deficiency syndrome, sources and requirements. Prereq: 3350 or consent of instructor.

5410 Genetics of Animal Populations (3) The population and the individual, gene and zygotic frequencies; statistical descriptions of populations; forces influencing genetic changes; application to animal breeding. Prereq: 3420 or consent of instructor. 2 hrs and 1 lab.

5710 Methods of Evaluating Experimental Data in Animal Science (3) Interpretation of data from experiments in animal science based upon such statistical procedures as analysis of variance, covariance, linear regression and correlation, and multiple regression. Prereq: Statistics 5211 or equivalent. 2 hrs and 1 lab.

5720 Design and Interpretation of Experiments in Animal Science (3) Review of principles of experimental design and statistical theory and research in animal science analyzing data from experiments employing unbalanced and disproportionate subclass frequencies; situations and procedures for use of computers in statistical analyses. Prereq: 5710. 2 hrs and 1 lab.

5910 Seminar (1) Current developments and literature in animal sciences. May be repeated. Maximum 3 hrs.

6000 Doctoral Research and Dissertation

6150 Topics in Milk Constituents (3) Properties of milk constituents and their relationship to cheese and dairy products. Prereq: Food Technology and Science 4050.

6170 Topics in Dairy Microbiology (3) Microbiological problems related to various phases of the dairy industry.

6211 Advanced Topics in Animal Physiology (1-6) Recent advances and concepts, research techniques, current problems. May be repeated. Maximum 6 hrs.

6220 Environmental Physiology of Farm Animals (3) Environmental factors and their measurement; physiological mechanisms of response to environmental factors and their measurement; relationships of animals and environment to terms of productivity and health. Prereq: Consent of instructor. 2 hrs and 1 lab.

6230 Animal Growth and Development (3) Physiological and nutritional aspects of growth of farm animals; effects of growth rates on physiological and productive functions. Prereq: 5231 and 5331 or consent of instructor.

6311 Advanced Topics in Animal Nutrition (1-6) Recent advances and concepts, research techniques, current problems. May be repeated. Maximum 6 hrs.

6411 Advanced Topics in Animal Breeding (1-6) Recent advances and concepts, research techniques, current problems. May be repeated. Maximum 6 hours.

6420 Animal Breeding Research Methods and Interpretation (3) Obtaining valid estimates of genetic parameters in animal breeding studies; least squares adjustment of data; the partition of variance; phenotypic, genetic, and environmental correlations; repeatability; heritability; and selection Indexes. Prereq: 5410 and 5710.

6811 Advanced Topics in Animal Products (1-6) Recent advances and concepts, research techniques, current problems. May be repeated. Maximum 6 hours.

6910 Seminar (1) Seminars in animal nutrition, breeding, physiology and products. May be repeated. Maximum 6 hrs.

Food Technology and Science

MAJOR

DEGREE

M.S. Food Technology and Science

Professors:
J. T. Miles (Head), Ph.D. Wisconsin;
J. L. Collins, Ph.D. Maryland; W. W. Overcast, Ph.D. Iowa State.

Associate Professors:
B. J. DeMott, Ph.D. Michigan State;
H. O. Jaynes, Ph.D. Illinois; C. C. Melton, Ph.D. Kansas State; S. L. Melton, Ph.D. Tennessee.

Assistant Professors:
S. D. Cunningham, Ph.D. Texas A & M.;
G. W. Davis, Ph.D. Texas A & M.

3020 Dairy Products I (4) Procurement, processing and distribution of fluid milk. Manufacture of frozen and condensed dairy products. 3 hrs and 1 lab.

3210 Food Composition (3) Determination and study of major constituents of fresh and processed foods; attention to changes and interactions occurring during processing and storage. Prereq: General Chemistry. 2 hrs and 1 lab.

Institute of Agriculture
3220 Food Preservation (4) Survey of food industry; principles in the prevention of deterioration of food. Prereq: General Microbiology. 3 hrs and 1 lab.

3840 Meat Science (3) Processing methods, carcass characteristics of meat animals; slaughtering, cutting, selection, curing, freezing and cookery. 2 hrs and 1 lab.

4010 Food Technology and Science Seminar (1-3) Review of literature, oral and written reports. May be repeated. Maximum 3 hrs.

4050 Advanced Food Composition (3) Intensive study of food constituents and changes affected by processing and storage. Prereq: 4210 and Food Analysis or equivalent. 2 hrs and 1 lab.

4110 Food Plant Sanitation (3) Environment for manufacturing and preserving foods. 2 hrs and 1 lab.

4120 Food Quality Assurance (3) Systems for quality assurance in food industries. Various methods including statistics used by food industry. Prereq: Food Industry. 3 hrs and 1 lab.

4210 Food Additives (2) Substances used in food manufacturing with emphasis on properties and functions. Prereq: Food Analysis or equivalent. 3 hrs and 1 lab.

4310 Food Packaging (3) Characteristics and application of materials and containers to packaging requirements of food. Prereq: 3220. 2 hrs and 1 lab.

4410 Food Crop Products (3) Food products from crops with emphasis on types, manufacturing systems, quality attributes and utility.

4510 Microbiology in Food Manufacturing (3) Relationship of growth of common food microorganisms in fermentative and enzymatic characteristics to the occurrence during processing and manufacture of foods. Prereq: General Microbiology or equivalent. 1 hr and 2 labs.

4820 Fermented Foods (3) Role of microorganisms in preparing foods with emphasis on development of certain desirable characteristics, flavor, aroma, texture, and keeping quality. Prereq: Food Microbiology. 2 hrs and 1 lab.

4840 Meat Products Manufacturing (3) Prepared meat products with emphasis on sausage making and information relating to cost control, inspection and meat science. Prereq: 3840 or consent of instructor, 1 hr and 2 labs.

4920 Physical Phenomena of Foods (4) Physical states of food materials, foams, emulsions, colloidal soils, hydrates, crystals, gels. Effects of manufacturing practices on these properties. Prereq: Consent of instructor. 3 hrs and 1 lab.

5000 Thesis

5100 Seminar (1) Reports and discussions of selected topics from research literature. May be repeated. Maximum 3 hrs.

5120 Food Color (3) Chemistry of natural food pigments and their measurement, notation, and preservation in food. Prereq: Food Analysis. 2 hrs and 1 lab.

5130 Food Enzymology (3) Commercial and native enzymes in manufacturing, processing, and spoilage of food. Prereq: Physiological Chemistry.

5140 Food Flavors (3) Food flavor manufacture and formulation. Natural and synthetic compounds in the manufacture of foods with predictable consumer acceptance. Technology of flavor manufacture, quality assurance, and marketing. Prereq: 4510. 2 hrs and 1 lab.

5150 Fats and Oils (3) The application of scientific principles to the technology of fats and oils. Prereq: 3210. 2 hrs and 1 lab.

5200 Research (5) Research in selected areas. Consent of department head. Credits and hours to be arranged. May be repeated. Maximum 10 hrs.

5310 Food Products Development (3) Fundamentals of the art, science and technology applied to the research, development and marketing of new food processes and products. Prereq: 4210 or 4310. 2 hrs and 1 lab.

5320 Food Thermobiology (3) Fundamentals of heat transfer as related to the rate of destruction of microorganisms and to the rate of loss of food quality through the calculation of minimum safe thermal processes for hermetically-sealed packages of foods. Prereq: 3220. 2 hrs and 1 lab.

5420 Advanced Food Quality Assurance (3) Applications of current instrumental methods used to control food manufacturing processes. Prereq: 4150. 2 hrs and 1 lab.

5510 Meat Technology (3) Physical and chemical changes that occur during the conversion of muscle to meat and the ultimate influence these changes have on quality and composition; meat inspection and quality control. Prereq: 3840. 2 hrs and 1 lab.

5530 Microorganisms Common in Food Products (3) Identification of desirable and undesirable microorganisms in food products and their relationship to manufacturing operations. Isolation and characterization of microorganisms from food products and plant equipment. Prereq: 4810 or Microbiology 3810. 3 labs.

5540 Microbial Cultures in Foods (3) Physical and chemical environment and metabolism of microorganisms as related to cultured food products. Prereq: 4810 and Microbiology 3810. 2 hrs and 1 lab.

Forestry, Wildlife, and Fisheries

MAJORS

M.B. Wildlife and Fisheries Science


Assistant Professor: B. L. Dearden, Ph.D. Colorado State.

Forestry

*3020 Forest Environments and Ecology (3) Environments and ecology of forests and associated lands; emphasis on the application of ecological principles to contemporary problems. Prereq: 8 hrs of biology, botany, or zoology.

*3040 Dendrology and Silvics of Woody Angiosperms (3) Classification, nomenclature, identification, and silvicultural characteristics of the more common woody angiosperms native to North America. Prereq: Any 2 of 3810, 3840, and 3850. 3 hrs and 1 lab.

*3050 Dendrology and Silvics of Gynoecperms (3) Classification, nomenclature, identification, and silvicultural characteristics of the major North American conifers. Distribution, growth, habitat, and community relationships including classification, life history, regeneration requirements, place in successional; ecological significance and commercial importance. Weekly field trips may be required. Prereq: 5 hrs basic biology or botany. 2 hrs and 1 lab.

*3110 Forest Measurements and Biometry (4) Measurements of individuals in animal and plant populations; linear regression; sampling of forest populations; growth and potential production. Prereq: Plant and Soil Science 3610 and Computer Programming, business-oriented or equivalent. 3 hrs and 1 lab.

*3120 Wood Technology (4) Wood properties; identification of commercial woods by macro and micro characteristics. Prereq: 3040, 3050. (3050 may be taken concurrently) 2 hrs and 2 labs.

*3210 Forest Resource Economics (4) Allocation of forest resources via market and institutional systems. Application of economics to resource decision making in private and public sector. Prereq: Principles of Economics.

*3220 Forest Products and Utilization (3) Harvesting, processing; marketing factors in stand conversion, intermediate and harvest cuts. Prereq: 3120.

*3230 Wildlife Management (3) Important game species in the U.S.; factors influencing wildlife populations. (Same as Wildlife and Fisheries Science 3230.)

*3320 Principles of Silviculture (3) Influence of site factors on reproduction, growth, development, and harvest; classification of forest structure; silvicultural laws. Prereq: 3020 or General Ecology; 3810; Biology 3003.

*3730 Conservation (3) Forest resources of state, nation, and world; forests in soil and water conservation; wildlife management and recreation; conservation programs.

4002 Utilization (3) Wood-using industries; processing forest products-sawmills, tree-loggers, lumber grading; pulpwood operations, flooring plants, pesting plants; plant layout, flow diagrams, site evaluation, field problems. Prereq: 3110.

4004 Forest Practice (3) Management of forest lands by public and private organizations; the "multiple-use" concept as it influences management decisions; impact of public pressure for outdoor recreation on management decisions; management prescriptions. Prereq: 4006. S/N/NC only.

4006 Silvicultural Methods (4) Methods and application of intermediate and regeneration cuttings; site preparation; soil preparation; selection of cutting methods to obtain desired goals and benefits. Prereq: 4002, 4003.

4020 Forest Watershed Management (3) Water resources role of forests in the hydrologic cycle; control of water quantity, quality, and regimen; watershed planning. Prereq: 3120. 3 hrs and consent of instructor. Two overnight field trips.

* Graduate credit for non-forestry majors only.

* Emeritus
4210 Forestry Organization and Administration (3) Problem analysis and decision making in forest resources management. Prereq: Senior standing in Forestry or Wildlife and Fisheries Science or consent of instructor. 2 hrs and 1 lab.

4220 Forest-Resource Management (4) The forest as an integration of resource uses; a review of forest management and organizations in the public and private sectors. Prereq: 4210. 2 hrs and 1 lab.

4230 Forest-Resource Management Plans (4) Field problems and case studies in forest resource management; the forest as a system; management of forest enterprises as a producer of timber, recreational services, watershed services, and wildlife; producing multiple services; preparation of a complete plan based on optimizing forest uses. Prereq: 4210. 1 lab.

4240 Interpreting Forest Resources (3) Principles and techniques of interpreting forest resources; the study of natural interrelationships of forest resources with respect to management and recreation; the role of the forest resource manager in the public and private sectors. Prereq: 4200.

4300 Seminar in Forest Management (3) Planning process for recreation development on forests and related lands; analysis and critique of specific contemporary plans. Overnight field trips may be required. 2 hrs and 1 lab.

4560 Industrial Forestry (3) Structure and analysis of wood-using firms and industries. Forest taxation, land tenure and wood procurement. Alternative development and application of forestry planning models. Prereq: 4230 or consent of instructor.

5270 Topics in Forest Industries Management (3) Current problems in industrial forestry are discussed and analyzed. Executives from both the public and private business sector (concerned with forest industry) are invited to conduct seminars. Prereq: 4250 or consent of instructor.

Wildlife and Fisheries Science

**5230 Wildlife Management (3)** (Same as Forestry 3330)

4450 Game Mammals (4) The classification, identification, distribution, natural history, and management principles of game mammals in North America. Prereq: 3230 or 1 year of zoology. 2 hrs and 2 labs.

4460 Game Birds (4) The biology, classification, identification, distribution, and management of the more important species. Prereq: 3230 or 1 yr of zoology. 2 hrs and 2 labs.

4510 Freshwater Fishery Biology (4) Principles and methods of fish population dynamics; sampling techniques and equipment; warm and cold-water environments as commercial and sport fisheries. Prereq: 1 yr biology and 8 hrs mathematics or consent of instructor. 3 hrs and 1 lab or field period.

4520 Management of Lakes and Ponds (4) Principles and methods of lake and pond management for commercial and sport fisheries; diagnosis, evaluation, and stocking procedures; biology and culture of managed species. Prereq: 4510 or consent of instructor. 3 hrs and 1 lab or field period.

5000 Thesis

5110 Special Problems in Wildlife and Fisheries Science (1-6) May be repeated. Maximum 9 hrs.

5210 Seminar in Wildlife Conservation (3) Current studies, problems and issues in wildlife conservation; wildlife agencies and organizations. Prereq: 3230 or consent of instructor.

5310 Seminar (1) Current developments in wildlife and fisheries science. May be repeated. Maximum 3 hrs. S/NC only.

5400 Predator Ecology (3) The dynamics of terrestrial vertebrate predator populations in managed and unmanaged environments. Principles of predator biology and management. Prereq: 4450 and 4460 or equivalent and 4540 or equivalent.

5500 Advanced Topics in Fishery Science (3) Recent advances and concepts, research techniques and analysis of current problems. Prereq: 4250 or consent of instructor. May be repeated. Maximum 6 hrs.

Ornamental Horticulture and Landscape Design

MAJOR

**Ornamental Horticulture and Landscape Design**

DEGREE

M.S.

Institute of Agriculture

Professor: D. B. Williams (Head), Ph.D. Pennsylvania State.

Associate Professors: L. M. Callahan, Ph.D.; G. L. McDaniel, Ph.D. Iowa State.


3030 Plant Propagation (3) Physiology, methodology, and environmental requirements for propagation. Prereq: 8 hrs of biological science. 1 hr and 2 labs.

3110 Greenhouse Management (3) Factors involved in management of greenhouses for production and research. Structures, soils, pest control measures, heating, ventilating, lighting, water supply, crop succession. Prereq: Consent of instructor. 2 hrs and 1 lab.

4120 Landscape Design (4) Design and development of properties; planning, organization, structure, selection, and use of plant and structural materials, methods of presentation, specification. Prereq: Consent of Instructor. 2 hrs and 2 labs.

4140 Landscape Design II (4) Advanced theory of design. Pictorial and abstract approach to landscape design. Emphasis on design, analysis of current problems. Prereq: 4120 or equivalent. 2 hrs and 2 labs.

4150 Wholesale Nursery Management (3) Production, labor and sales management; location, layout, culture, equipment and facilities. Prereq: 3320 or equivalent. 2 hrs and 1 lab.

4160 Retail Nursery Management (3) Essentials of good nursery management; location, layout and operation of landscape nurseries, garden centers and chain store outlets. 2 hrs and 1 lab.

4180 Park Design (4) Design criteria for parks and outdoor recreation systems. Park site selection, analysis, planning and management as related to needs and natural and economic resources. Evaluation of aesthetic and functional quality of parks and their impact on environmental quality of rural and suburban communities. Prereq: 4120. Recommended: 4440. 2 hrs and 2 labs.

4540 Grass Management (4) Principles and scientific basis of turfgrass culture: adaptation, ecology, physiology, soil fertility, grass varieties, disease complexes, and influences on turf quality and growth. Prereq: Turfgrass Management. 3 hrs and 1 lab.
3620 Crop Ecology (3) Crops and environment; geographic location; site, heat, light, water, and interplant relationships as a basis for judging cultural practices used to modify environmental factors. Prereq: 8 hrs biological sciences, 2 hrs and 1 lab.

3640 Crop Physiology (3) Physiology of crop plants, relationship of light and dark to crop production; use of general theories of physiology; effects of season, growth regulating substances, functions of light and air on plant form. Prereq: 8 hrs biological sciences, 2 hrs and 1 lab.

3110 Soil Fertility and Fertilizers (4) Properties of soils in relation to plant nutrient availability and uptake. Methods of soil fertility evaluation and principles of fertilizer use; manufacture and properties of fertilizers. 3 hrs and 1 lab.

3120 Grain and Oil Crops (3) Distribution, improvement, morphology, culture, harvesting, and utilization of corn, small grains, grain sorghum, soybeans, and related crops. Prereq: Soils, 8 hrs biological science. 2 hrs and 1 lab.

3140 Forage Crops (4) Characteristics, adaptation, improvement, management, and utilization of grasses and legumes for pastures, hay, and silage crops. Prereq: Soils, 8 hrs biological science. 3 hrs and 1 lab.

3150 Cotton and Tobacco (4) Characteristics, adaptation, improvement, culture, harvesting, and marketing of cotton and tobacco. Prereq: Soils, 8 hrs biological science. 3 hrs and 1 lab.

3180 Fruit Crops Management (4) Soils, plant cultivation, development of fruit crops, pest control, harvesting, packing, storage, and pruning. Prereq: Agricultural Biology 3130 and 3150. 3 hrs and 1 lab.

3220 Soil Management (4) Soil management for crop production including cropping systems, fertilizer use, and tillage operations for specified soil and farming conditions. Prereq: Soils and Forestry 3320, 3 hrs and 1 lab.

3250 Soils in Forestry (3) Soil as a medium for tree growth; relation of physical, chemical, and biological properties of soils to tree growth; and management of forest stands. Soil properties of importance in road location, recreational development and watershed management. Prereq: Soils. 2 hrs and 1 lab.

3510 Commercial Production of Cool Season Vegetables (3) Characteristics, economic importance, adaptability, and production for fresh and processing markets; emphasis on greens, salad, cole, root, bulb crops, perennials and Irish potatoes. Prereq: 8 hrs biological science. 2 hrs and 1 lab.

3520 Commercial Production of Warm Season Vegetables (3) Characteristics, economic importance, adaptability, and production for fresh and processing markets; emphasis on sweet potatoes, beans, tomatoes, pepper, cucurbits, sweet corn and okra. Need not have 3510 as prereq. Prereq: 8 hrs of biological science. 2 hrs and 1 lab.

3810 Interpretation of Agricultural Research (3) Statistics as applied to agriculture. Statistical methods in interpretation of research results. Prereq: Introductory Calculus-General Mathematics.

3710 Principles of Weed Science (4) Basic principles of weed science; history, ecology, economic importance, methods of control, types of herbicides, and specific recommendations for various crop and pasture weeds. Prereq: 8 hrs biological sciences. 3 hrs and 1 lab.

4110 Soil Chemistry (4) Collodial soils, properties and behavior of colloidal soil materials, reactions of chemical properties to plant nutrition, analysis of soils and Introductory Physics. 3 hrs and 1 lab.

4120 Principles of Crop Breeding (4) Genetic principles and techniques. Prereq: 8 hrs biological science or permission of instructor. 3 hrs and 1 lab.

4320 Soil Analysis (3) Analytical techniques used in soil chemistry and soil fertility studies. Prereq: 4110 or concurrent, 2-3 hrs.

4250 Agricultural Chemicals and the Environment (4) Characteristics, use, mode of soil degradation and environmental impact of chemicals used in agriculture, forestry and related areas with emphasis on agricultural pesticides; environmental safeguards imposed by federal and state regulations on chemical development and use. Prereq: 8 hrs biological sciences and 1 yr chemistry. 3 hrs and 1 lab.

4320 Soil Formation, Morphology, and Classification (4) Soil formation; properties, distribution, and classification of soils; interpretation of morphology; use of soil surveys. Prereq: Soils, 3 hrs and 1 lab.

4400 Problems in Plant and Soil Science (1-6) May be repeated. Maximum 9 hrs.

5000 Thesis

5011-21 Special Problems in Lieu of Thesis (1-6, 2-6)

5100 Special Problems in Plant and Soil Science (3-6) May be repeated. Maximum 9 hrs.

5200 Soil Crop Relationships (3-6) May be repeated. Maximum 6 hrs.

5240 Soil Productivity and Management (3) Concepts of soil productivity and management, quantitative evaluation of factors and their interaction affecting soil management decisions, cropping systems, water control and management, tillage and fertility management. Planning and evaluation of specific soil management programs. Prereq: 3220 and 4110 or consent of instructor.

5250 Pedology (4) Factors and processes of formation as related to the physical, chemical, and mineralogical properties of soils in an ecosystem; classification of soils. Prereq: 4220 or consent of instructor. 3 hrs and 1 lab.

5310 Design and Interpretation of Experiments (3) Experimental design and procedures; effect of different variables on precision of experiments; problems dealing with the analysis of data. Prereq: 3610 or equivalent.

5340 Soil Physics (3) Chemical and physical relationships among the solid, liquid, and gaseous phases of the soil mass; their relation to plant growth and soil management. Prereq: 2 hrs and 1 lab.

5370 Advanced Soil Fertility (3) Fundamental concepts and soil chemistry as they relate to nutrient absorption by plant roots; interrelation of these concepts in soil fertility and soil management. Prereq: 4110.

5390 Soil Physical Chemistry (3) Structural properties of soil minerals determining their physiochemical reactions, ion exchange, Donnan equilibrium, double layer theory. Prereq: 4110; Chemistry 4110 or concurrent registration.

5600 Seminar (1) May be repeated. Maximum 3 hrs.

5710 Advanced Plant Genetics (3) Importance of polyploidy in plants; detailed study of genome relationships, genetic recombination, mutation, heterosis, quantitative inheritance, heritability selection and self-incompatibility systems in relation to genetic principles. Prereq: Basic Genetics or consent of instructor.

5720 Quantitative Genetics (3) The genetic constitution of populations and changes in gene frequency; recognition and measurement of
Institute of Agriculture

5750 Advanced Plant Breeding (4) Historical development of plant breeding concepts and methods, effects of heterosis, inbreeding, hybridization and selection. Improvement of self- and cross-pollinated crops. Prereq: Basic Genetics or consent of instructor.

5810 Crop Climatology (4) Meteorological factors affecting crop plants; crop distribution and centers of origin; general and specific climatic, weather, and vegetative systems; microclimatic influences on plant growth. Prereq: 3020, 3040; or Botany 3210, 4310 or consent of instructor. 3 hrs and 1 lab.

5820 Advanced Crop Physiology and Ecology (4) Historical development of research in crop physiology and ecology. Interrelationships between physiologic processes and environmental factors. Crop adaptation to specific environmental conditions. Prereq: 3020, 3040; or Botany 3210, 4310 or consent of instructor. 3 hrs and 1 lab.

5850 Mechanisms of Herbicide Action (3) Principles of the uptake, translocation, mode of action and basis of selectivity of herbicides. The effects of herbicides on plant morphology, metabolic systems and enzymatic activities will be discussed. Prereq: Botany 3210 and Biochemistry 4110 or consent of instructor.

6000 Doctoral Research and Dissertation

6100 Special Topics in Soil Science (3) May be repeated. Maximum 9 hrs.

6200 Special Topics in Plant Breeding (3) May be repeated. Maximum 9 hrs.

6300 Special Topics in Crop Physiology and Ecology (3) May be repeated. Maximum 9 hrs.

6410 Experimental Designs (3) Principles of experimental designs used in agricultural research. Completely randomized, randomized complete block and Latin square designs; the factorial experiment and confounding; lattice designs; and covariance. Prereq: 5310.

6510 Growth Control with Chemicals (3) Character, theories of action and use of auxins, gibberellins, cytokinins and inhibitors. Range of effects on growth. Prereq: Botany 3210 or equivalent. 2 hrs and 1 lab.

6600 Seminar (1) May be repeated. Maximum 3 hrs.
School of Architecture

Donald D. Hanson, Dean
William J. Lauer, Assistant Dean

Professors:

Associate Professors:

Assistant Professors:

Lecturers:
A. G. Anderson, M.A. Missouri; M. C. Martin.

4170 Introduction to Preservation and Restoration (4) History and theory of restoration and preservation.

4311 Historic Preservation Laboratory (8) Directed studies for buildings of historical significance. Techniques of preservation, research of historic methods of construction, and studies of viable uses. Rehabilitation, restoration, preservation and adaptive uses.


4733 Structural Design for Protection Against Extreme Hazards (4) Probability, risk, human values, insurance. Survey of possible hazards; floods, fire, hurricanes and tornadoes, earthquakes, nuclear effects, internal and external explosions. Building code and engineered design of steel, masonry, concrete and wood structures to resist extreme effects. Protective construction for human and system needs. Fire protection engineering, fire phenomena, life safety and analysis, high-rise building fires.

4739 Aesthetics of Engineering Structures (4) Architecture in engineering; theory and utilization of space, design, and materials in large structures. Bridges, exhibition halls, power plants.

4850 Elementary Structural Matrix Methods (4) Introduction to the generalized matrix methods of analysis of structure. Review of matrix algebra and vectors; development of member stiffness and flexibility matrices; assembly of structure stiffness and flexibility matrices. Prereq: Consent of instructor. (Same as Civil Engineering 4850 and Engineering Science 4850.)

4900 Aspects of Urban Environment (4) Interdisciplinary course in urban problems. Prereq: Consent of instructor. (Same as Psychology 4900, Real Estate 4900.) S/NC only.

4910 Architectural Photography (4) Use of photography as a design, research, and presentation medium. Emphasis on architectural photography using black and white media.

4920 Advanced Architectural Photography (4) Application of special photographic techniques with emphasis on color printing and processing. Prereq: Consent of instructor.
College of Business Administration

C. Warren Neel, Dean
Francis A. Chamblin, Assistant Dean
for Graduate Programs
Liston M. Fox, Assistant Dean
John A. Bachmann, Director,
Management Development
Programs
David A. Hake, Director, Center for
Business and Economic Research

Graduate programs of the College of Business Administration are designed to prepare men and women to assume executive, managerial and professional positions in the increasingly complex world of domestic and international business and industry, teaching and research, government and institutional management.

Viewing the business firm as operating in a dynamic social, political and economic environment which demands leaders capable of dealing with innovation and rapid change, the College places central importance on development of students' thought processes rather than on specialized subject matter and courses descriptive of past practices. Emphasis is focused on flexibility of mind, receptivity to new ideas, capacity to adapt one's reasoning powers and judgment to rapid changes, vigor and imagination in using the mind, ability to reason analytically and logically and, above all else, inculcation of an irrepressible desire to continue to learn and grow in knowledge throughout the student's life.

Graduate Programs

The College of Business Administration offers programs leading to six advanced degrees: the Doctor of Business Administration, the Doctor of Philosophy in Economics and in Management Science, the Master of Arts and the Master of Arts in College Teaching with a major in Economics, the Master of Science with majors in Economics and Statistics, and the Master of Business Administration. The Department of Industrial and Personnel Management participates with the Department of Psychology in the College of Liberal Arts in offering an intercollegiate program in Industrial and Organizational Psychology leading to the Master of Science and Doctor of Philosophy degrees. (See page 100.) Also, the Department of Management Science offers an intercollegiate program leading to the Master of Science degree. (See page 101.)

The two College-wide programs, the MBA and the DBA, are described below. Descriptions of other degree programs will be found under the appropriate departmental or program headings.

The MBA Program

The College-wide curriculum of the Master of Business Administration program is designed to prepare students for successful careers in business and institutional management and for imaginative and responsible citizenship and leadership roles in business and society. The program is designed to encompass the major functional areas of business and economics in order to provide the perspective necessary for those who aspire to positions of executive and professional leadership.

The curriculum reflects the application of evolving knowledge in economics and the behavioral and quantitative sciences. This program is accredited by the American Assembly of Collegiate Schools of Business.

Completion of the MBA program requires from four to six quarters (51 to 78 quarter hours of course work) for a full-time student, depending upon the individual's undergraduate preparation in business and economics. The four-quarter sequence is designed for those who have completed a baccalaureate program in business administration. Those with undergraduate degrees in the humanities, engineering, social sciences or natural sciences will require up to six quarters, depending upon the extent of their preparation in business and economics.

The complete MBA program with a concentration in industrial management is offered by the regular graduate faculty of the College as a part-time evening program on the Knoxville campus, at Oak Ridge and at the Kingsport University Center.

Students may begin the program in any of the four quarters of the academic year; however, those entering the program in the winter or spring may find it difficult to complete the program in minimum time due to course scheduling and sequencing. The MBA student may select an area of concentration from the following fields:

Accounting Management science
Economics Marketing
Finance Forest Industries
Real estate Management
Finance management Education
Governmental development
Management Statistics
Financial administration Transportation and
Industrial logistics
management

All entering students must have completed college-level mathematics through at least one quarter (or semester) of calculus or remove the deficiency by taking appropriate courses in mathematics. Specific requirements of the MBA program are shown below. To qualify for the degree, a student must complete a minimum of 51 quarter hours of graduate course work in Groups B, C and D, at least 42 hours of which must be at or above the 5000 level. Further, at least half of the credit hours taken in Group C (concentration area) must be at or above the 5000 level.

There is no thesis requirement although ample opportunity is provided for research and writing in course work.
undergraduate program or included in the MBA curriculum prior to undertaking courses in the concentration area.

Accounting. Graduates are eligible for the CPA examination in Tennessee. Area prereq: Introductory Financial Accounting (6); Intermediate Cost Accounting (6); Intermediate Theory (9); and Federal Income Tax (3).

The following areas must be included in the concentration unless taken in under-graduate program: auditing, consolidations, advanced federal income tax, and computer concepts in accounting. Additionally, at least three of the following must be included: 5110, 5120, 5130, 5210, and 5430.

Economics. (See also Master's and Ph.D. programs in this area.) Area prereq: Intermediate Macro- and Microeconomic Theory (6).

Any combination of 12-18 quarter hours of economics courses listed in this catalog as approved by the faculty advisor.

Finance. Area prereq: Finance 5050 or equivalent; 5110 (core course). A minimum of three courses must be taken in one of the following areas:
Financial Management: 5120, 5130, 5410, 5620, 5800, 5990
Investments: 5420, 5430, 5810
Monetary Policy and Financial Institutions: 5800, 5810, 5820, 5930
Forest Industries Management. Area prereq: B.S. degree in forestry, or equivalent.

Organization, planning and control: Industrial Management 5110, 5120, 5130
Industrial Forestry: Forestry 5200
Topics in Forest Industries Management: 5270
Group D—Elective courses shall be chosen from graduate courses offered in the College of Business Administration and in the Department of Forestry as approved by the student's faculty advisor.

Governmental Financial Administration. Area prereq: Economics 5070
Finance 5710, 5720, 5730, 5740
Accounting 5510
Political Science 5740
Industrial Management. Area prereq: Industrial Management 5050 or equivalent (for 5410 only).

Organizational Planning and Control: 5110, 5120, 5130
Personnel Management: 5210, 5220, 5230 (core course), 5240
Production Management: 5410, 5420, 5430
Management of Industrial Research: 5530
Management of Foreign Operations: 5710

Management Science. (See also Master of Science and Ph.D. degree programs in this area). Area prereq: Mathematics through second year of calculus, a course in application of digital computers in engineering and science, a course in statistics for engineering.

Statistics 5110 and Management Science 5310 are substituted in Group B—Core for Statistics 5311 and Management Science 5100, respectively. Group C—

Concentration includes Management Science 5330 and 5340 and two to four additional courses selected from computer science, management science, statistics, or mathematics as approved by the faculty advisor.

Marketing. Area prereq: Marketing 5050 or equivalent and 5200 (core course).

Any combination of 12-18 quarter hours of marketing courses listed in this catalog as approved by the faculty advisor.

Real Estate and Urban Development. Area prereq: Economics 5050-60, Real Estate 5110, 5120, 5130, 5140, Economics 5160.

A course selected from architecture, civil engineering, economics, planning, transportation or other relevant areas approved by the faculty advisor.

Statistics. (See also Master of Science program in this area.) Area prereq: Mathematics through second year of calculus including differential equations.

Any combination of 12-18 quarter hours of statistics courses listed in this catalog as approved by the faculty advisor.

Transportation and Logistics. Area prereq: Transportation 5050 or equivalent.

Any combination of 12-18 quarter hours of transportation courses listed in this catalog as approved by the faculty advisor.

Transportation 5210 normally is required.

Group D—Electives. Unless the student elects two areas of concentration, a minimum of 6 quarter hours must be taken in areas outside the area of concentration. The elective area is increased beyond 6 hours to the extent that the concentration area is less than 18 hours. With specific approval of the student's advisor, an elective course may be taken outside the College of Business Administration.

Total, Group D ..........................6 - 12

Total Program (except Group A) ..........................51

Other Requirements. The application for Admission to Candidacy (see page 19) must be approved by the faculty advisor. Members in the student's area(s) of concentration and the Assistant Dean for Graduate Programs of the College of Business Administration before submission to the Vice Chancellor for Graduate Studies and Research.

To qualify for the degree, the student must achieve a B average (3.0) or above in courses taken in the concentration area(s) as well as in the overall program and pass a written comprehensive examination during the final quarter of the program. If the results of the written examination are not clearly passing or failing, a supplementary written or oral examination may be given in the same quarter. The complete examination process may be repeated one time, but it may not be taken until the quarter following the first attempt.

Dual J.D.-MBA Program

The College of Business Administration and the College of Law offer a coordinated dual program leading to the conferment of
both Doctor of Jurisprudence and the Master of Business Administration degrees. A student pursuing the dual program may save up to two academic quarters (24 hours) of course work which would be required if the two degrees were to be earned separately.

Admissions. Applicants for the J.D.-MBA program must make separate application to, and be competitively and independently accepted by, the College of Law for the J.D. degree and the Graduate School and College of Business Administration for the MBA degree, and by the Dual Degree Committee.

Students who have been accepted by both colleges may apply anytime prior to, or after, matriculation in either college and may commence studies in the dual program at the beginning of any quarter subsequent to matriculation in both colleges, provided, however, that dual program studies be started prior to entry into the last 42 hours required for the J.D. degree and the last 24 hours required for the MBA degree.

Curriculum. A dual program candidate must satisfy the graduation requirements of each college. Students withdrawing from the dual program before completion of both degrees will not receive credit toward graduation from either college for courses in the other college, except as such courses qualify for credit without regard to the dual program.

The College of Law will award credit toward the J.D. degree for acceptable performance in a maximum of 12 quarter hours of approved graduate level courses offered by the College of Business Administration. Three of the 12 quarter hours must be earned in Accounting 5810 or a more advanced accounting course. If College of Law credit is given for such an accounting course, the student may not receive College of Law credit for Legal Accounting (Law College Course 8590).

The College of Business Administration will award credit toward the MBA degree for acceptable performance in a maximum of 12 quarter hours of approved courses offered by the College of Law. Except while completing the first year courses in the College of Law, students are encouraged to maximize the integrative facets of the dual program by taking courses in both colleges each quarter.

Awarding of Grades. For grade recording purposes in the College of Law for graduate business courses and in the College of Business Administration for law school courses, grades awarded will be converted to either Satisfactory or No Credit and will not be included in the computation of the student's grade average or class standing in the college where such grades are so converted. The College of Law will award a grade of�tisfactory for a graduate business course in which the student has earned a B grade or higher and No Credit for any lower grade. The College of Business Administration will award a grade of Satisfactory for a Law School course in which the student has earned a 2.3 grade or higher and a No Credit for any lower grade. Grades earned in courses of either college may be used on a regular graded basis for any appropriate purpose in the college offering the course. The student must pass a final written comprehensive examination to receive the MBA degree.

The DBA Program

The basic objective of the Doctor of Business Administration program is to provide the student an opportunity to expand the intellectual competence necessary to meet the highest standards for advancement to a professional position in an academic institution, business and industry, or government. The student will develop a sound foundation for expanding knowledge in the student's chosen area of concentration and will contribute through research to advancement of the state of knowledge in this area. Moreover, the student's educational experience should develop perspective toward education for business in a manner that will enable the student to spearhead innovation and change in response to needs.

The DBA program is structured around four major features. First, it recognizes the interdisciplinary thrust of graduate education and provides the student with a sound foundation for expanding the body of knowledge related to business systems and their interactions with other socioeconomic systems and environmental forces. Second, the student's program is flexible enough to respond to individual needs and interests yet is formulated within a sound framework to achieve overall objectives. Third, emphasis is placed upon conceptual foundations and analysis of decision-making processes rather than the descriptive aspects of business administration. Fourth, the student does advanced work in the basic disciplines of economic theory, behavioral science and quantitative science to provide the necessary foundations for research.

Foundation Requirements. Although the program is designed for students who have completed an accredited MBA (or equivalent) degree program, those with outstanding undergraduate records in any area may be admitted directly to the DBA program and may, if they desire, earn the MBA degree in a coordinated program of study. Program prerequisites include at least one year of college mathematics to include college algebra, general mathematics and a course in single variable calculus; a course in statistics; knowledge of computer programming (FORTRAN IV); intermediate economic theory (micro and macro); and introductory courses in financial accounting, business finance, marketing, operations (production) management, and the legal environment of business. Entering students deficient in any of these areas may enroll in courses designed to meet these requirements.

Course Requirements for the DBA Program. Each student must demonstrate, by passing appropriate graduate level courses and/or by examination, an understanding of the business functional areas, the basic disciplines underlying the study of business administration, the student's concentration area and a supporting area. Following are the requirements for each area:

A. Business Functional Areas. One graduate level course in each of the following areas must be completed: Students who have earned a MBA degree at an accredited institution probably will have met these requirements. Those without previous graduate work in one or more of these areas may fulfill the requirement by taking the following courses:

- Managerial Accounting (Accounting 5810)
- Financial Management (Finance 5110)
- Marketing Management (Marketing 5200)
- Organization Theory/Behavior (Industrial Management 5230)
- Business Policy (Business Administration 5310)

B. Basic Disciplines. Each student must demonstrate proficiency in the following areas by completing course work indicated or by passing appropriate examinations:

- Economics
- Advanced Microeconomic Theory (Economics 5111)
- Advanced Macroeconomic Theory (Economics 5121)
- Behavioral Science
- Organizational Behavior (Industrial Management 5610-20)
- Quantitative Sciences

C. Concentration Area. This is the focal point of the program and the area in which the student expects to do his/her research and dissertation. A minimum of 24 quarter hours of course work is required, including 8 hours of doctoral seminars taken at this University. A study of research methodology of the discipline is included. Graduate work in the field taken at other institutions is considered by the student's committee in determining additional course work required. Available concentration areas are:

- Accounting
- Finance
- Management
- Marketing
- Transportation and logistics

D. Supporting Area. A minimum of 12 quarter hours of graduate course work is required in an area outside, but complementary to, the concentration area. The student may choose the supporting area from one of the following: one of the business functional areas, additional work in one of the basic disciplines, or a related area in another school or department at the University. The program of study should be arranged with an advisor in the discipline chosen and must be approved by the student's committee.

1 Students who choose this field as a supporting area will take Industrial Management 5170 and 5180.
2 Students who choose this field as a supporting area will take Statistics 5311 and 5312 and Management Science 5100 may not be included.
Preliminary Examinations. Comprehensive written preliminary examinations consisting of two sessions of approximately four hours each in the concentration area and the concentration area supporting area are required of each person working toward the DBA degree. The student's committee may, if they deem it advisable, supplement the written examinations with oral examinations, and may accept the results of an oral examination only for supporting areas outside the College of Business Administration. These examinations are scheduled twice a year, in early October and early May. The student may opt to sit for all sessions during a single examining period, or may sit for the concentration sessions and the supporting session in two successive periods. A student who fails an area on the first attempt must, if he/she wishes to continue in the program, retake the examination at the next scheduled administration, the results of which shall be final.

Admission to Candidacy. A student may apply for admission to candidacy for the DBA degree after maintenance of at least a B average in course work, successful completion of preliminary examinations and acceptance of a research proposal for the dissertation. Admission to Candidacy is administered by the College of Business Administration. Admission to candidacy must be approved at least three quarters prior to the date the degree is conferred. (Admission in the fall quarter permits graduation in the following spring quarter.) Prior to presenting the research proposal for formal approval, the student must form his/her faculty committee and request the concentration area department head to recommend their appointment by the Vice Chancellor for Graduate Studies and Research. There must be at least four members, one of whom must be from a department (or discipline) outside the concentration area.

Research and Dissertation (minimum of 36 quarter hours). The purpose of this segment is to provide the candidate with a research experience that meets the general standards of the profession. The dissertation is supervised by the candidate's faculty committee, who must certify its completion and acceptability after the candidate's oral defense of his/her research effort.

Other Requirements. For information concerning program admission requirements, academic performance standards, fellowships and assistantships, and general rules and regulations of the Graduate School, see other parts of the College of Business Administration section of this catalog, "The Graduate School."

Minimum Academic Performance Standards

A graduate student in the College of Business Administration whose grade point average at the end of 12 hours is below 3.0 shall be placed on probation. A student on probation shall be dropped from the program unless his or her cumulative graduate grade point average is 3.0 or higher at the end of the probationary period. The probationary period is defined as the next 12 quarter hours of course work attempted which is specified in the student's degree program. Exceptions to this policy may be made only with the approval of the Assistant Dean for Graduate Programs of The College of Business Administration upon recommendation of the student's faculty committee.

Admission Requirements

General admission requirements for the Graduate School are stated on pages 11-12. MBA and DBA applicants are required to take the Graduate Management Admission Test (GMAT). Applicants for programs in economics, management science, and statistics may submit results of either the GMAT or the Graduate Record Examination (GRE) aptitude portion. Applicants for economics who submit GRE aptitude scores must also submit the Advanced GRE score for economics.

Admission Requirements for the Concentration in Management Science. Applicants for management science must score a minimum of 500 on the GMAT and meet the quantitative methods prerequisites stated in the program description.

Applicants whose native language is other than English must submit results of the Test of English as a Foreign Language (TOEFL). Scheduled dates and locations for taking these examinations may be obtained from Educational Testing Service, P.O. Box 696, Princeton, New Jersey 08540, and from most colleges and universities.

In addition to procedures required for admission to the Graduate School (pages 11-12), DBA applicants must submit additional information on forms provided by the College of Business Administration. The application for all programs and supporting materials should be submitted at least three months prior to desired entry date.

The College of Business Administration is associated with accredited graduate schools of business as a member of the Graduate Management Admission Council.

Fellowships and Assistantships

Fellowships. Information concerning non-service fellowships administered by the Graduate School as well as application blanks, may be obtained from the office of the Vice Chancellor for Graduate Studies and Research.

Assistantships. A limited number of graduate assistantships are available in each of the academic departments and in the Center for Business and Economic Research. Assistantships which carry remission of tuition and/or fees range up to $4500 per year, while others funded through various research centers of the University range up to $5500 per year for half-time service. Awards are generally made on the basis of scholarship and performance on the graduate record test. Application forms may be obtained in any of the departments or from the office of the Assistant Dean for Graduate Programs. Applications must be received by March 15 for consideration of assistantships to be awarded for the following fall term.

Center for Business and Economic Research

The staff of the Center for Business and Economic Research engages in studies of the business and economic environment in Tennessee, the Southeast, and the Nation. The Center serves the business community, state government, Individuals, and the University through dissemination of various kinds of economic and socio-economic information and supports the faculty of the College in seeking funding for research projects. Staff members conduct research in regional economics, public finance, and areas related to socioeconomic problems in the region. The Center publishes the results of its own research and that of others in monograph form so that significant developments in the various business disciplines and economics can achieve widespread exposure. In addition, the Center staff does contract research on business and economic problems for governmental organizations and private industry. The Center publishes periodically the Tennessee Statistical Abstract and bi-monthly the Survey of Business. The Center is a member of the Association for University Business and Economic Research.

Tennessee Executive Development Program

The Tennessee Executive Development Program (TEDP) is designed to provide extensive continuing educational opportunities for executives from firms and organizations in Tennessee, the South, and the nation. The primary objective of the program is to prepare and develop executives for increasingly higher levels of management responsibility and to sharpen existing executive skills needed for comprehensive decision making and leadership. Other major aims of the TEDP are to teach the fundamentals of analytical thinking and the use of the decision tools, and to examine the economic, political, technological and other environmental factors affecting the firm's operations.

The TEDP limits enrollment to thirty-two participants who live on campus for a total of four weeks spread over a three-month period. This arrangement provides executives with extensive opportunities to exchange ideas and operational concepts with contemporaries in other business areas and with TEDP faculty as well.

The faculty for the TEDP consists of some of the University's most productive business and economics-related faculty members as well as outside consultants and faculty members who teach upper level and graduate business courses. The TEDP faculty is augmented by out-
standing practitioners in their fields of business and industry.

**Departments of Instruction**

**Accounting and Business Law**

**Accounting**

Professor: J. E. Kiger (Head), Ph.D. Missouri, C.P.A.

Associate Professor: N. E. Dittrich, Ph.D. Ohio State, C.P.A.; J. R. Williams, Ph.D. Arkansas, C.P.A.

**Accounting Systems**

Assistant Professor: M. C. Letsinger, M.S. Tennessee, C.P.A.

**5120 Advanced Auditing (3)** Case-oriented course including audit of specific asset, liability, revenue and expense accounts, with emphasis on reporting, data processing, statistical sampling, and internal auditing. Prereq: Principles of Auditing with C or better.

**4630 Analysis and Design of Information Systems (3)** General systems concepts, flowcharting, planning of systems studies, determination of systems objectives, development and evaluation of design alternatives, implementation, documentation and control. Prereq: Computer Concepts and Control.

**4950 Individual Research in Accounting (3)** Special projects undertaken by majors in accounting under the direction of faculty members of professional rank. Prereq: Intermediate Accounting with C or better.

**4990 Accounting Theory (3)** Theory and conceptual framework underlying measurement of income and financial position as related to the resolution of key reporting problems. Prereq: Intermediate Accounting with C or better.

**5000 Thesis**

**5002 Non-Thesis Graduation Completion (3-15)** Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

**5050-60 Introduction to Accounting (3, 3)** User-oriented survey of financial and managerial accounting principles and practices. May not be taken by accounting majors.

**5110 Seminar in Accounting Theory (3)** Evolution of accounting theory, concepts underlying financial reporting models, and authoritative accounting literature as each relates to measurement of periodic performance and financial position. Prereq: Consent of department head. May not be taken by students with credit for 4900.


**5280 Corporate Reporting Problems (3)** A user-oriented survey of corporate financial reporting problems and issues. May not be taken for credit by students whose undergraduate major was accounting, or whose graduate concentration is in accounting. Prereq: 5810 or consent of instructor.

**5330 Advanced Income Tax (3)** Federal income taxation with emphasis on tax planning and research. Not intended for persons who have credit for an advanced tax course. Prereq: Intermediate Accounting.


**5420 Tax Research (3)** Development of expertise in tax research utilizing tax service, tax periodicals, legal cases and other available sources. Includes individual research projects. Prereq: Advanced Federal Taxes or equivalent.

**5430 Tax Planning (3)** Advanced study of income tax planning. Instead of emphasizing alternatives available to minimize tax liability compatible with achieving taxpayer objectives. Prereq: 5420.

**5510 Not-for-Profit Accounting (3)** Theory and practice of budgetary and fund accounting, financial reporting, measures of output and accomplishment, and financial and performance auditing for non-profit entities. Prereq: 8 hrs of accounting and consent of instructor.

**5630 Accounting Systems and EDP Concepts and Control (3)** Elements and operation of a computer in a business environment. The analysis, design, implementation, documentation, and control of accounting systems. Prereq: Introductory Cost Accounting and knowledge of a computer programming language.

**5640 Seminar in Accounting Information Systems (3)** A survey of contemporary literature on accounting information systems and advanced systems analysis and design concepts. The informational needs of other functional areas of business are analyzed and the activities and applications of these areas are considered. Prereq: 4630 or equivalent.

**5810 Accounting for Control (3)** User-oriented survey of contemporary financial and managerial control accounting. Prereq: 5060 or equivalent consent of instructor. Not available for accounting majors.

**5820 Corporate Reporting Problems (3)** A user-oriented survey of corporate financial reporting problems and issues. May not be taken for credit by students whose undergraduate major was accounting, or whose current concentration is in accounting. Prereq: 5810 or consent of instructor.

**6000 Doctoral Research and Dissertation**

**6110-30 Doctoral Seminar in Accounting (3, 3)** Analysis of issues reflected in accounting literature. Prereq: 5110 or consent of instructor.

**Business Law**


**5050 Legal Environment of Business (3)** Surveys legal and quasi-legal institutions with emphasis on the administrative agencies which have particular significance to the businessperson; examines the legal environment of business; explains basic legal notions and principles that pertain to business. (Available only as stated on page 36.)

**Business Administration**

**MAJOR**

**DEGREES**

Business Administration MBA, DBA

**5310 Business Policy (3)** Case studies covering policy formulation and implementation in the top and middle management, where company-wide objectives are set and departmental policies and activities are guided; emphasizes the nature of business organizations; explains basic legal notions and principles that pertain to business. (Available only as stated on page 36.)

**5410 Business and Its Societal Environment (3)** An analysis of current forces and changes in society and the interaction of plans and actions in business firms with environmental factors. Prereq: Consent of instructor.

**5510 Seminar in Applied Business Analysis (3)** Application of business concepts and analytical skills to the problems of small businesses in the community. Students work in teams under the supervision of a participating professor. Prereq: Consent of instructor. May be repeated. Maximum 8 hrs.

**5900 Academic Practicum (3)** Concepts, methods, and materials in the instruction of Business Administration subjects at the college level.

**6900 Research Methodology (3)** Philosophy and design of research in Business Administration.

**Business Education**

See College of Education

**Economics**

**MAJOR**

**DEGREES**

Economics M.A., MACT, M.S., Ph.D.


Associate Professors: S. Carroll, Ph.D. Harvard; H. S. Chang, Ph.D. Vanderbilt; C. B. Garrison, Ph.D. Kentucky; E. Giulstov, Ph.D. Stanford; H. R. Granade, Ph.D. Florida; A. Mayher, Ph.D. Texas; K. E. Philips, Ph.D. Washington (Seattle).
International economics
Regional economics
A field, as agreed to by the Department, combining two or three of the above.

Exceptions to the foregoing are discouraged but may be petitioned by writing directly to the Department head who will decide with the advice of an ad hoc committee of three tenured members of the faculty. This petition is to be submitted at least nine months before the student takes the preliminary exam in question.

Course Requirements. Candidates for the Ph.D. degree in Economics will be required to complete a minimum of 72 quarter hours of course work beyond the Bachelor's degree, plus the dissertation which carries 36 quarter hours of credit. At least 54 hours shall be in economics.

4000 Special Topics (3) Student-generated course offered at convenience of department upon student initiative. Subject matter and contents determined by students and instructor with approval of the department.

5000 Thesis
5002 Non-Thesis Graduation Completion (3-15) Required for students otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

5011-12 Problems in Lieu of Thesis (3, 3) May be repeated for credit with permission of the department. S/NC only.

6000 Doctoral Research and Dissertation

ECONOMIC THEORY

4110 Managerial Economics (3) Application of economic theory to business decision making; emphasis on profit objectives, measurement and forecasting demand and costs, and capital budgeting. (Same as Water Resources Development 4110.)

4130 Business Cycles (3) Fluctuations in income, employment, prices, and output in the economic system. The historical facts concerning booms and depressions, the statistical methods for analyzing business fluctuations, the theoretical explanations of cycles, and the policies that have been proposed to combat them. Prereq: Intermediate Macro Theory or equivalent.

4150 History of Economic Thought (3) A review of the development of economic thought, tools of analysis, and economics as a social science, together with an analysis of the socio-economic conditions which influenced this development. Period covered: 1776 through 1936. Prereq: 1 yr of Principles of Economics and consent of instructor.

4170-80 Introduction to Mathematical Economics (3, 3) Application of mathematical methods in theoretical study of micro- and macroeconomic phenomena. Designed for beginning graduate students who have limited training in analytic geometry and calculus. Must be taken in sequence. Prereq: Intermediate Micro Theory and college algebra, calculus, and analytic geometry or the equivalent.

5050 Introduction to Economic Analysis (3) The nature of economic phenomena as a science; brief survey of the evolution of economics; analytical tools of micro- and macroeconomics. (Available only as stated on page 36.)

5060 Introduction to Economic Problems and Policies (3) Economic theory as a basis for problem solving; tools of public and private policies for economic stability, growth and minimum income, international economic relations and the problems of balance of payments, and macroeconomics. (Available only as stated on page 36.)

5070-80 The Firm and Its Environment (3, 3) Macroeconomic environment; economic forecasting; microeconomic environment; organizational analysis; behavioral aspects of imperfect markets; legal aspects of imperfect markets; responsibilities of the businessman. Must be taken in sequence. Prereq: 5050-50.

5111 Microeconomics (3) Study of basic topics in microeconomics, employing verbal arguments and geometric and algebraic techniques. Topics include the theory of consumer behavior and demand, theory of production and cost, long and short run theories of the profit maximizing firm in both the perfectly competitive and monopolistic environments, and the theory of derived demand. Prereq: Intermediate Microtheory.

5112 Microeconomic Theory (3) Fundamental theory of price determination in partial and general equilibrium settings, including theories of preference and consumer behavior, production, and short and long run profit maximization under conditions of perfect and imperfect competition, demand for factors of production and distribution. Prereq: 4170 and 5111 or equivalent.

5121-22 Macroeconomic Theory (3, 3) Determination of the levels of employment and prices for the economy as a whole, focusing on the relationships between interest rates, price expectations, productivity, and the quantity of money, on the one hand, and aggregate saving, investment, and liquidity preference on the other. Prereq: Intermediate economic theory or equivalent.

5150 History of Economic Thought (3) Development of economic ideas from the mercantilists through Adam Smith and the classical and neoclassical tradition.

5180-90 Mathematical Methods in Economics (3, 3) Applications of basic concepts in the differential and integral calculus, difference and differential equations, linear algebra and stochastic models to topics in the theory of the firm, growth models, game theory, linear programming, and decision-making under uncertainty. Prereq: 1 yr of calculus.

5510 Quantitative Methods in Economic Research (3) Methods of estimation and testing of economic relations. Time series and cross section data, with applications to current economic problems. Prereq: Introduction to Statistics or Statistics 2611 or the equivalent.

5520 Introduction to Econometrics (3) Statistical demand analysis, production and cost analysis, distribution of income and wealth, models of growth and cycles, macroeconomic applications. Should not be taken by students who contemplate taking Economics 6170-80-90.

5710 Public Finance: Revenues (3) (Same as Finance 5710.)

5720 Public Finance: Expenditures (3) (Same as Finance 5720.)

5740 Seminar in Public Finance (3) (Same as Finance 5740.)

5810 Financial Markets and Intermediaries (3) (Same as Finance 5610.)

5820 Monetary Theory and Policy (3) (Same as Finance 5820.)

5830 Commercial Bank Management (3) (Same as Finance 5830.)

6111 Seminar in Advanced Microeconomic Theory (3) Topics in microeconomic theory. May be repeated for credit with permission of the department. Prereq: 5111, 5112 and consent of instructor.
621 Seminar in Advanced Macroeconomic Theory (3) Topics in macroeconomic theory. May be repeated for credit with permission of the department. Prereq: 5121, 5122 and consent of instructor.

6150-60 History of Economic Doctrines (3, 3) Impacts and ideas of thinkers from the Middle Ages to the present.

6170-90 Econometric Methods (3, 3, 3) Theory and techniques of statistical testing of economic hypotheses and construction and estimation of econometric models. Review of the classical least squares regression model, extensions of the least squares regression model, and approaches to simultaneous equation models with application to current econometric research. Prereq: 5180-90 and 5510 or the equivalent.

6710-20 Seminar: Fiscal Theory and Public Finance (3, 3) (Same as Finance 6710-20).

INTERNATIONAL TRADE AND ECONOMIC DEVELOPMENT

4250 Problems in International Trade and Economic Development (3) Problems or problem areas of current importance in the fields both of international economics and economic development.

4240 Economic Development of the United States (3) Historical developments in agriculture, industry, communications, transportation, banking, and trade and of changes in government economic policy.

4250 Economic Development of Europe (3) The beginnings of capitalism in medieval Europe, the expansion of Europe and the dominance of mercantilism in early modern times, the mechanization of industry, changes in agricultural organization, and growing importance of commerce in the nine teenth century; two world wars and their economic consequences.

4280 Economics of Resources (3) Description, needs and allocation of resources. Benefits and costs of development and use of resources in industrial society.

5210 Seminar in International Trade Theory (3) Studies in pure theory of international trade.

5220 Seminar in Economic Development (3) Study of the economic problems of developing countries.

5250 Economic History of Europe (3) Studies of the nature and functioning of economic systems and policies in the history of western civilization: economic life in the medieval period; economic issues of the sixteenth century; economic and political forces of the seventeenth century; the Industrial Revolution; the Napoleonic wars and their economic consequences.

5260 Economic History of the U.S. (3) Studies of major issues in the interpretation of American economic structure and policies from colonial times.

5610 Location and Regional Development Theory (3) Theory of industrial, agricultural, and residential location; the economic basis for land use patterns and central places; examination of regional inequalities and national assistance for regional economic development.

5620 Methods of Regional Analysis (3) Theory of regional structure and growth. Examination of regional models for impact analysis and economic forecasting. Methods of analysis include regional descriptive statistics, gravity and potential concepts, regional income and product accounts, shift and share analysis, economic base studies, and regional input-output, linear programming, and econometric models.

6211-12, 6221-22 Seminar in International Economics (3, 3, 3) Theory of specialization and trade. The balance of payments, exchange rates and major exchange problems, capital movements, and foreign trade policies.

6231-32, 6241-42 Seminar in Economic Development (3, 3, 3) Development and application of analytical tools to problems of economic policy faced by developing regions and countries.

6250 Seminar in European Economic History (3) Selected topics in European economic history. May be repeated for credit with permission of the department. Prereq: Consent of instructor.

6260 Seminar in American Economic History (3) Selected topics in American economic history. May be repeated for credit with permission of the department. Prereq: Consent of instructor.

6270 Seminar in the Economic History of the Third World (3) Selected topics in the economic history of societies other than those of Western Europe and English-speaking North America. May be repeated for credit with permission of the department. Prereq: Consent of instructor.

6510 Seminar in Regional Analysis (3) Selected topics in regional economic theory and analysis. May be repeated. Maximum 6 hrs.

6520 Regional Economics Workshop (3) Selected topics in applied regional research. Emphasis on the use of economic models in the design and estimation, forecasting, simulation and mathematical and computer programming. May be repeated. Maximum 6 hrs.

6550 Seminar in Environmental and Resource Economics (3) Topics in environmental quality, natural resource allocation by private markets, and issues in formulating public policy towards environmental problems. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

5340 Seminar in Private Enterprise and Public Policy (3) The structure of contemporary industry, factors in its development, and consequences for business conduct and performance; social control of business through antitrust and other government regulation.

5351 Seminar in the History of Economic Thought (3, 3, 3) Development and application of problems and techniques.

5500 Thesis

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

6000 Doctoral Research and Dissertation FINANCE AND INVESTMENTS

5050 Survey of Finance Functions in Business (3) The scope and nature of managerial finance: financial analysis, planning and control; financial investment decisions; financial structure and the cost of capital; internal and external long-term financing; and working capital management. Prereq: Principles of economics and fundamentals of financial accounting. (Available only as stated on page 36.)

5110 Theory of Financial Management (3) Financial decisions of the firm with the objective of maximizing shareholder wealth. Decision areas include the investment decision, capital costs and the financing decision, and the dividend decision of the firm. Prereq: 5050. Coreq: Probability theory.

5120 Quantitative Techniques in Financial Management (3) An introduction to the applications of mathematics, probability, and sta-
5130 Financial Administration (3) Cases and readings within the firm; refined techniques of analysis; optimal financing decisions; capital cost measurement; utilization of capital markets; general corporate financial theory. Prereq: 5120 or 5130.

5140 Seminar: Managerial Finance (3) Applications of theory and quantitative techniques to the solution of current problems in managerial finance. Prereq: 5120 or 5130.

5420-30 Investments (3, 3) The investment decision: influencing factors; portfolio policies and security prices; financial statement analysis; and stock-price valuation models. Must be taken in sequence.

5620 Taxation and Business Decisions (3) Impact of tax-expenditure policy on decisions of the firm. Description of tax systems; tax shifting and incidence; implications of specific taxes to price, employment, financial, and other decisions of the firm. The impact of taxes on industrial structure, international operations, and location.

5800 Executive-in-Residence Seminar for MBA (3) This course develops the practical aspects of financial management and investments. Leading industry, banking, and governmental personnel are invited to conduct the class. Prereq: Consent of the department.

5900 Research in Finance (3) Directed research on a topic of mutual interest to the student and staff member. May be repeated. Maximum 6 hrs. Prereq: 5110.


6420 Theory of Finance (3) The theory of financial decision making under conditions of uncertainty and probability. The application of the theory of choice to the allocation of financial resources over time with reference to financing decisions, investment decisions, and the determinants of the cost of capital.

6510 Seminar in Financial Management (3) Employment of quantitative techniques in the formulation and solution of financial management problems.

5810 Financial Markets and Intermediaries (3) A study of capital formation and the allocation of the U.S. and world financial systems. Impact of changing international conditions on the U.S. economy. Problems of resource allocation are analyzed from the perspectives of the sectors of the economy.


5830 Commercial Bank Management (3) Bank management decision-making analysis of changes in banking environment and structure; analysis of the growth of securities and the increases in capital and deposits; the growth of off-balance sheet items and the implications for the future of banking. Prereq: 5810 or consent of instrcutor.

6110-20 Seminar: Monetary Theory (3, 3) Analysis of economic factors and processes and their effects on the economy and the impact of financial institutions on financial markets. (Same as Economics 5810.)

5170-80-90 Proseminar in Industrial and Organizational Psychology (3, 3, 3) Introduction to the basic concepts and ideas required for graduate study in industrial and organizational psychology. Must be taken in sequence during the student's first year. (Same as Psychology 5170-80-90.)

5210 Personnel Management (3) Analysis and appraisal of the personnel function.

5220 Wage and Salary Administration (3) Analysis of programs, problems, and practices.

5230 Human Problems in Administration (3) Review and critique of research in industrial human relations. (Same as Psychology 5450.)

5240 Personnel Research Seminar (3) Review of research in personnel administration; development of experimental design. Prereq: 5210-20-30. (Same as Psychology 5460.)

5250-60-70—Industrial and Organizational Psychology (1-3, 1-3, 1-3) Reading in industrial and organizational psychology. Prereq: Consent of instructor. S/NC or letter grade.

5260 Management Problems in Industrial Research (3) Basic administrative problems encountered in management of industrial research procedure problems in which professional personnel participate.

5410-20-30 Production Management (3, 3, 3) A quantitative approach to the solution of production management problems. Prereq: 36 hrs of mathematics and statistics, including 3 hrs of computer programming, or equivalent and consent of instructor.

5610-20 Organizational Behavior (3, 3) An examination of behavioral models of organizational behavior; behavior in organizations. Must be taken in sequence.
5710 Management of Foreign Operations (3) Analysis of operational environment of international business firms and impact of internal and external factors on managerial decisions. Readings and cases will be used.

5810 Energy Management: Theory and Practice. An overview of energy resources in operating systems; decision criteria, trade-offs, system analysis, energy audits, technical parameters, conservation methods, worldwide energy supply and demand, new energy technologies.

6000 Doctoral Research and Dissertation

6110 History of Management Thought (3) Significant historical ideas leading to the present state of the art of management.

6120 Advanced Organizational Theory (3) Analysis of the functioning of complex organizations: structure, culture, and adaptation.

6130 Seminar in Contemporary Management Issues (3) An examination of contemporary management policy issues. May be repeated.

6250-60-70 Seminar in Industrial and Organizational Psychology (3, 3, 3) Advanced problems in organizational psychology. Areas include performance evaluation, executive development, group process, and morale. (Same as Psychology 6250-60-70.)

6380 Seminar in Industrial and Organizational Psychology (3) (Same as Psychology 6380.)

6900 Field Work in Industrial and Organizational Psychology (1-15) Supervised practice. One credit for each 30 hrs of such practice. Maximum 15 credits. (Same as Psychology 6900.)

Management Science

MAJOR DEGREE Ph.D.

Management Science

Associate Professors: C. E. Bell (Chairman), Ph.D. Yale; R. S. Garfinkel, Ph.D. Johns Hopkins.

Assistant Professor: R. E. Rosenthal, Ph.D. Georgia Institute of Technology.

Management Science Committee: Members of the Management Science faculty and in addition: R. W. Eling, Industrial Management; J. S. Bradley, Mathematics; R. L. Church, Civil Engineering; S. Selkow, Computer Science; C. G. Thigpen, Statistics.

MBA CONCENTRATION

Management Science 5310-30-40 forms the nucleus of a 12 to 18 hour concentration in management science for MBA students. See pages 35-36 for further MBA details.

THE DOCTORAL PROGRAM

The Ph.D. program in Management Science is designed to prepare students for management positions, research, and teaching related to the application of mathematical tools in the administration of complex organizations. Three primary objectives of the program are:

1. to provide, through management science course work, a thorough knowledge of common Management Science/Operations Research mathematical models and their uses.
2. to provide sufficient advanced study in an applied concentration area to qualify the graduate for a joint faculty position in the concentration area as well as in Management science. The candidate may choose from the business functional areas (accounting, finance, marketing, production management, and transportation and logistics) or other disciplines, e.g., forestry, ecology, and public administration;
3. to develop in the student, through course work in mathematics, statistics, and computer science, a high degree of mathematical maturity which will serve the graduate well throughout a life-long career, whether in management, research, or teaching.

Degree Requirements. General University requirements for the doctoral degree are stated on page 22.

Course Work. A minimum of 72 quarter hours of course work taken for graduate credit (exclusive of thesis or dissertation) is required. The candidate must complete a minimum of 36 quarter hours at The University of Tennessee, Knoxville, at least 9 of which must be at the 6000 level. Entering students who have completed graduate studies in applicable fields will be granted course credits for work which is equivalent to required courses in the program.

The program includes approximately 24 to 30 quarter hours of course work in the applied concentration area.

Qualifying Examinations. The student must demonstrate mastery of probability theory and statistical inference (Statistics 5110-20-30) by passing a written qualifying examination or by presenting other evidence of mastery of the material satisfactory to the faculty. Topics normally include matrix methods (Mathematics/Computer Science 5655-65-75) and real analysis (Mathematics 4510-20-30). Other options may be approved.

There is no foreign language requirement.

These requirements generally are completed by the end of the first year of the program.

Preliminary Examination. Prior to admission to candidacy for the degree, and normally after completion of the second year of the program, the student must pass a written preliminary examination covering the theory of deterministic and stochastic management science models. Topics included in this examination are determined on an individual basis. Students will be expected to demonstrate an integrative ability that goes beyond simple mastery of course content.

Research and Dissertation. The student must complete 36 quarter hours of Management Science 6000, Doctoral Research and Dissertation, through which he/she is expected to make a significant contribution to the science. A final oral examination is conducted over the dissertation and such other segments of the program that the faculty committee deems appropriate.

This effort, which is beyond the minimum 72 hours of course work, normally is completed in the third year of the program.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

5100 Introduction to Management Science Techniques (3) Review of matrix algebra and an introduction to techniques such as mathematical programming, decision theory, and queuing models. Prereq: Statistics 5110 or Mathematics 4750-60 or Mathematics 4650; proficiency in a computer language.


5340 Application of Management Science Methods (3). Application of methods from 5310-20-30 to large-scale management problems. 5350 may be taken concurrently.

5510 Topics in Optimization (3) In-depth study of one of the following: linear programming, dynamic programming, non-linear programming, integer programming, large scale programming, optimization theory, convex analysis, optimality conditions, Lagrangean and other dual approaches; course prerequisites vary with topic. May be repeated. Maximum 9 hrs.

5510 Markovian Decision Models (3) Formulation and analysis of Markov chain models; Markov chain models which incorporate decision criteria—formulation, application and solution through policy iteration. Stochastic dynamic programming models in continuous time. Prereq: 5300.

5620 Queuing Models (3) Application and mathematical analysis of models of congestion. Basic birth-death process models, other Markovian models; non-Markovian models for systems with general service or arrival patterns, priority customers or other complicating assumptions; queues in series. Prereq: 5330 or Mathematics 4750-60.

5810 Special Topics in Management Science (3) Prereq: Consent of Instructor. May be repeated. Maximum 9 hrs.

5910 Management Science Problems (1-6) Directed study on subject of mutual interest to student and staff member.

6000 Doctoral Research and Dissertation

6110-20-30 Models for Production Systems (3, 3, 3) A seminar providing research practice to enhance the professional development of doctoral students. Includes investigation of existing mathematical models for production processes and opportunities for original research.

6810 Special Topics (3) Prereq: 5310-20-30 and consent of instructor. May be repeated. Maximum 9 hrs.

6910-20-30 Management Science Seminar (1-3, 1-3, 1-3) Subjects selected from current management science literature.
Marketing and Transportation

G. N. Dicer (Head), DBA Indiana.

Marketing

Professors: D. W. Diers, DBA Indiana; G. E. Hils, DBA Indiana; R. B. Woodruff, DBA Indiana.

Associate Professors: D. J. Barnaby, Ph.D. Purdue; R. C. Reizenstein, Ph.D. Ohio State; J. R. McMillan, Ph.D. Illinois; R. B. Woodruff, DBA Indiana.

Assistant Professors: F. L. Barbour, MBA Illinios; E. R. Cadotte, Ph.D. Ohio State; R. L. Spiro, Ph.D. Georgia.

5002 Non-Thesis Graduation Completion (3-15)
Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

5050 Survey of Marketing (3) Analysis of the marketing structure, institutions, functions, and marketing problems. Current trends and developments. (Available only as stated on page 38.)

5200 Marketing Management (3) Management of the basic marketing functions. Case problems and marketing decision simulation. Prereq: 5200 or equivalent.

5220 Promotion Management and Strategy (3) Assessment of communications theories and concepts useful to firms in achieving promotional goals. Planning, implementing, and evaluating the firm’s promotional program. Social and economic role of persuasive communications. Prereq: 5200 or equivalent.

5230 Analysis and Design of Marketing Systems (3) A macroinstitutional approach to the marketing system. Conceptual framework for examining marketing agency and channel interrelationships, public policy, cost and efficiency, and innovation in marketing from the viewpoint of the decision maker. Prereq: 5200 or equivalent.

5300 Marketing Research (2) Investigation and solution of problems; application of research methods to functional areas of marketing. Research concepts, methods, and techniques. Prereq: Statistics 5311 or equivalent.

5310 Quantitative Techniques in Marketing Analysis (3) Application of quantitative techniques to marketing problems. Models for decision making and strategy formulation. Prereq: 5300.

5350 Buyer Behavior Analysis for Marketing (3) Buyer behavior patterns with emphasis on the implications for marketing analysis and executive action. Marketing and the behavioral sciences. Prereq: 5350 or equivalent.

5410 Marketing Strategy (3) Components of marketing strategy including the development of the marketing mix. Consideration of alternative strategies. Coordination and control of marketing activities. Prereq: 5300 and 5350.

5450 International Marketing Management (3) Development and management of international marketing programs. Problems involved in marketing products and services in foreign markets. Political, cultural, and economic conditions in different countries. Prereq: 5200 or equivalent.

5900 Research in Marketing (3) Directed research on a subject of mutual interest to student and staff member. Prereq: 5200 and 5300.

6000 Doctoral Research and Dissertation

6110 Seminar in Buyer Behavior Research (3) An examination of the behavior of individual and groups in their roles as buyers of economic goods and services. Prereq: 5300 or Statistics 5312 or the equivalent, and Industrial Management 5610-20.

6210 Seminar in Marketing Models and Model Building (3) Examination of the nature, composition, construction, and use of models for the analysis of marketing decisions and processes. Prereq: 9 hrs of graduate marketing.

6510 Seminar in Contemporary Marketing Issues (3) An examination of the fundamental nature of the marketing process, and analysis of several topics of current interest in marketing. Specific topic areas will vary with each course offering. Prereq: 9 hrs of graduate marketing, incl. 5300 and 6110.

Transportation and Logistics


Assistant Professor: J. H. Foggin, DBA Indiana.

5002 Non-Thesis Graduation Completion (3-15)
Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

5050 Survey of Transportation and Logistics (3) Intensive survey of the logistical demands made by society and specific users upon the nation’s transportation system and the problems facing carriers and government in meeting these demands. (May not be included in a concentration or minor in transportation.)


5120 Management and the Pricing Problem (3) A critical analysis of the application of economic theory and regulatory restraints to the pricing of carrier services.

5130 Transportation Management Problems (3) An analysis of significant transportation problems areas with a consideration of proposed solutions.

5210 Business Logistics (3) Development of concepts to guide the analysis and design of logistics systems. Source and importance of temporal and spatial decisions in the firm’s total strategy. Emphasis on top management integration of physical distribution operations with marketing, production, and other decision areas.

5220 Physical Distribution Strategy (3) Development and administration of basic logistical policies. Analysis of physical distribution and supply problems with emphasis on executive action. Practical applications through a case approach and simulation game. Prereq: 5210, Statistics 5311.

5510 Urban Transportation Policy (3) A study of the movement of people, goods and information in urbanized areas with special emphasis on the formulation of national, state and local policy toward the firms providing these services.

5810 International Transportation Policy (3) Comparative analysis of transport systems in other countries. Analysis of U.S. policy relative to international transportation.

5910 Transportation Law and Carrier Liability (3) Legal rights and responsibilities of carriers and users. Processes before regulatory agencies and analysis of the regulatory statutes with appropriate agency and court decisions.

5920 Current Topics in Transportation and Logistics (3) A seminar designed to study, in depth, a current policy or problem area in transportation or logistics. The topic selected will be announced prior to each offering.

5990 Research in Transportation and Business Logistics (3) Directed independent research on a subject of mutual interest to student and faculty member. Prereq: 12 hrs in transportation.

6000 Doctoral Research and Dissertation

6110 Seminar in National Transportation Policy (3) A critical analysis of contemporary national transportation policy issues. Prereq: 5110.

6210 Seminar in Transportation and Logistics Models (3) Analysis of the current quantitative methodologies used in transportation and logistics research. Prereq: Statistics 5311-12, Management Science 5100.

6220 Transportation and Logistics Systems—Analysis and Simulation (3) Directed independent research, analysis, and simulation of a transportation or logistics system. Prereq: 6210.

Office Administration

Professors: G. A. Wagoner (Head), M.S. Indiana; D. Reese, Ph.D. Iowa.


4310 Business Letter Writing (3) Modern business letters; types of letters studied; principles applied by solving letterwriting problems.

4320 Business Report Writing (3) Report writing, tabular and graphic presentation, basic instruction in formal research reports and thesis writing, sources of business information.

4410-20 Advanced Shorthand and Transcription (3, 3) Improvement of ability to take dictation and transcribe mallible copy; emphasis on skill necessary to meet occupational standards. 3-2 hr periods.

4430 Supervised Office Experience (3) Orientation to office position through actual office work; typewriting techniques, sources of information required by secretary, record keeping; office etiquette, interviews, and appropriate dress for office. 2-3 hr periods.

4530 Office Systems (3) Routines and procedures for handling correspondence and mailing; filing systems; oral communications; office planning and layout; systems of control.

4540 Problems in Office Management (3) Work simplification; cost control and budgeting; development of standards; use and preparation of office manuals. Prereq: Office equipment problems, 4330 or consent of instructor.

1 Alcoa Foundation Professor in Business Administration
THE MASTER'S PROGRAM

Assistant Professors:
H. A. Lasater, Ph.D. Rutgers; J. W. Philpot, Polytechnic Institute; D. S. Chambers, MBA

4551-69 Problems in Office Management (3, 3)
4558-68 Training
4557-67 Work Simplification
4556-66 Supervision
4555-65 Work Measurement
Prereq: 4320, 4520, or equivalent.

4710 Punched Card Methods (3) Card designing, key panel design, sorting, tabulating, and preparation of reports; application to problems in fields of accounting, statistics, personnel, economics, psychology and other areas of research. 3 hrs. and 2 2-hr. labs.

4720 Punched Card Applications (3) Advanced problems on tabulator and collator, introduction to programming, system design, and preparation of procedure manuals and flow charts. Prereq: 4710 or equivalent.

5011 Problems in Lieu of Thesis (3)

5050 Data Processing in Business (3) Fundamentals of data processing, computer programming and applications, systems design. (Available only as stated on page 36.)

Statistics

MAJOR DEGREES

Statistics M.S.

Professors:
C. C. Thigpen (Head), Ph.D. Virginia Polytechnic Institute; D. S. Chambers, MBA Texas; R. A. McLean, Ph.D. Purdue.

Associate Professors:
H. A. Lasater, Ph.D. Rutgers; J. W. Philipot, Ph.D. Virginia Polytechnic Institute; R. D. Sanders, Ph.D. Texas; D. J. Wheeler, Ph.D. Southern Methodist; M. S. Younger, Ph.D. Virginia Polytechnic Institute.

Assistant Professors:

THE MASTER'S PROGRAM

The M.S. program in Statistics is designed to provide students a basic foundation in theoretical and applied statistics for meaningful careers as consulting and practicing statisticians. A candidate should possess an undergraduate degree with a strong background in calculus, but no restrictions are imposed regarding the undergraduate major. The typical Master of Science degree program in Statistics is as follows:

Statistics Major Area Quarter Hours
Probability theory .......... 3
Theory of statistical inference .. 6
Additional coursework in statistics as approved by the student's committee .......... 9
Additional coursework as approved by the student's committee .. 9

Minor Area
Selected with the approval of both the Department of Statistics and the department in which the work is to be taken .......... 9

Thesis* .................................. 8
Total minimum hours ...... 45

*Twelve hours of approved course work, to include Statistics 5610, may be substituted for the thesis requirement.


Statistics for Engineering (3) Survey of statistical methods with special application for engineering students: frequency distributions, selected sampling distributions, some tests of significance; introduction to linear regression. Prereq: Third quarter of calculus and analytic geometry.

Non-Parametric Methods (3) Measures of association, two-sample tests, analysis of variance with ranked data; paired and multiple comparisons in preference testing; questionnaire evaluation.

Regression and Correlation (3) Techniques of linear regression and correlation, polynomial and multiple regression, multiple and partial correlation.

Design of Experiments (3) Principles and procedures for efficient experimental design. Randomization, choice of size and number of experimental units, utilization of blocking arrangements. Interpretation of experimental data.

Thesis* .................................. 9

Special Topics in Statistics (3) Prereq: Consent of Instructor. May be repeated. Maximum 9 hrs.

Special Multivariate Analysis (3) Canonical correlation; discriminant analysis for several groups; and for equal and unequal covariance matrices; principal component analysis; Hotelling's T², multivariate analysis of variance and covariance. Prereq: One year's coursework in applied statistics, including analysis of variance and multiple regression analysis.

Factor Analysis (3) Principal component analysis and principal factor analysis; estimates of communalities; methods of rotation; interpretation of factors; cluster analysis. Prereq: 6060.

Stochastic Processes II (3) Special analysis, time series, linear and nonlinear systems. Prereq: 5210.

4553-63 Records
4554-64 Mechanization
4555-65 Work Measurement

Statistics Major Area

4556-66 Supervision
4557-67 Work Simplification
4558-68 Training
4559-69 Work Measurement
Thesis* .................................. 9

Twelve hours of approved course work, to include Statistics 5610, may be substituted for the thesis requirement.
The College of Communications offers two graduate degrees with a major in Communications, the Master of Science (M.S.) degree and the Doctor of Philosophy (Ph.D.) degree.

In addition, communications is available as a minor for students majoring in other departments. Required course work will be selected after discussion with the major advisor and an advisor from the College of Communications.

The College is accredited by the American Council on Education for Undergraduate Studies and Undergraduate Studies and the American Council on Education for Graduate Studies.

Applicants must meet admission requirements normally are specified for admission to potential candidate status in the Master of Science program in the College of Communications:

- an undergraduate B average, b) an above average verbal aptitude score on the Graduate Record Examination, and c) such other evidence of qualifications as may be required by the Graduate Studies Committee. Applicants must also complete the California Psychological Inventory.

Students are admitted to the program only for summer and fall quarters each year. Applications for the graduate program, including all necessary materials, that are not received at least six weeks before registration may not be processed in time for admission to full potential candidate status in the first quarter. In these cases, the student may still qualify for non-degree or postbaccalaureate status.

The degree program has two options: the thesis option* requires 45 hours of approved graduate work:
- 33 hours of approved courses in communications, including Communications 5100, 5120, 5140, and 5160, at least 12 hours in one concentration area (advertising, broadcasting, journalism), and at least 15 hours at the 5000 level;
- at least 12 hours in a minor** area approved by the major advisor, at least 6 of which must be at the 5000 level.

(If a candidate submits evidence of record that he/she has satisfied the objectives of thesis research, the student may then petition to be exempt from the thesis and to substitute 9 hours of 5000-level communications courses approved by the committee.)

After the student completes the formal program of courses and research, the student must pass an oral examination conducted by his/her graduate committee.

The non-thesis* option requires completion of 45 hours of approved graduate work:
- 33 hours of approved courses in communications, including Communications 5100, 5120, and 5140, at least 12 hours in one concentration area (advertising, broadcasting, journalism), and at least 15 hours at the 5000 level;
- at least 12 hours in a minor** area approved by the major advisor, at least 6 of which must be at the 5000 level;

* The student must declare which option he/she will pursue upon completion of the core curricula (5100, 5140, 5120).

** Minor: Students who hold a bachelor's degree in advertising, broadcasting, journalism must minor outside the College of Communications.
—completion of an approved communications project (no more than one Independent study-type course directly related to the project may be taken as part of the 45-hour program);
—after completion of formal course and project, the student must pass a 3-4 hour comprehensive written examination conducted by his/her graduate advisor.

Communications majors in the M.S. program must demonstrate ability to use a typewriter proficiently within their first quarter in residence.

DOCTOR OF PHILOSOPHY

The Ph.D. degree with a major in Communications is intended to prepare scholars for teaching, research, administration, and service in the field of human communications.

The program is interdisciplinary, consisting of a required core curriculum and recommended emphasis outside the College in the related social and behavioral sciences. The program is flexible and will accommodate a variety of career goals in communications.

The Master's degree is not required for entry into or completion of the doctoral program. Program planning, however, will permit the Master's degree to be earned if desired. Students lacking academic or professional experience in communications will be required to take prerequisite courses. In general, however, the program may be completed within three academic years of full-time study beyond the Bachelor's degree.

The following are normally minimal requirements for admission to full potential candidate status: (a) a 3.0 (4.0 system) grade point average in undergraduate studies, or 3.5 for graduate work if applicant holds a Master's degree; (b) above the fiftieth percentile in verbal and quantitative aptitude on the Graduate Record Examination; (c) completion of the California Psychological Inventory; (d) endorsement by at least three former teachers or professional colleagues chosen by the Graduate Studies Committee; (e) a statement of the applicant's goals and reasons for pursuing the doctorate. Personal interviews with members of the Graduate Studies Committee may be required. Professional experience in some field of communications is a highly desirable criterion for admission.

The following program represents work normally required for an individual with only the Bachelor's degree and no technical competence: (a) prerequisite courses offered by the College of Communications and approved by the major advisor for applicants lacking the necessary academic and/or professional background; (b) core curriculum: 33 hours of course work; (c) primary concentration in a cognate minor subject normally outside communications: 12 hours of course work; (e) technical competence area in either teaching, research, or administration: 15-18 hours of course work and, for those who lack appropriate professional experience, an internship the equivalent of 9 credit hours; (f) research tool: 12 hours of course work, e.g., statistics, foreign language, or computer science; (g) dissertation: 36 hours of Communications 6000.

The following courses represent the required core curriculum (beyond the Bachelor's degree):

Communications 5100, Introduction to Graduate Studies
Communications 5140, Communications Theory
Communications 5210, Research Methods
Communications 6100, Seminar in Communications Theory
Communications 6200, Seminar in Communications Topics

One of the following: Communications 6300, Survey Research Methods in Communications; 6310, Experimental Research Methods in Communications; 6320 Seminar in Historical Research Methods in Communications.

For the teaching or administrative technical competence area: a one-week, non-credit computer program course and Statistics 5211, or Sociology 5320 and Statistics 4250; for the research technical competence area: Statistics 5050 and 5090.

Continuing and Higher Education 5450, Instruction in Higher Education.

Industrial and Personnel Management 5110-20, Organization Theory I and II (or equivalent courses approved by committee).

Admission to candidacy must be attained at least three quarters prior to graduation and requires successful completion of a preliminary examination.

Communications Research Center

The Communications Research Center is a vital adjunct to the communications graduate program. Objectives of the Center are: (a) to conduct original research in mass and public communication; (b) to disseminate research-generated information; and (c) to provide research services to faculty and students, professional communicators, and others interested in improving the quality of human communications.

Departments of Instruction

Numbers in parentheses indicate quarter hours credit offered.

Communications

MAJOR

DEGREES

M.S., Ph.D.

Communications

Professors:

B. Haines, Ph.D. Minnesota; D. G. Hileman, Ph.D. Illinois; D. W. Holt, Ph.D. Northwestern; J. R. Lynn, Ph.D. Southern Illinois.

Associate Professors:


5000 Thesis

5002 Non-Thesis Graduation Completion (3-15)

For the non-thesis student not otherwise registered during any quarter when such a student uses facilities and/or for faculty time before degree is completed may not be used toward degree requirements. May be repeated. S/NC only.

5100 Introduction to Graduate Studies (3)

Scope and methods of advanced study in communications. Information sources, literature review methods, scholarly style, thesis and degree requirements and procedures, overview of traditional and behavioral research methods.

5120 Research Methods (3)

Communications research strategy and methodology. Scientific process, bases for derivation and verification of hypotheses, and basic methods of designing research in communications.

5130 Advanced Principles of Mass Communications (3) A proseminar covering all phases of mass communications including the history, development and status of the communication industry, the principles of broadcasting, and the principles of advertising.

5140 Communications Theory (3)

Analysis of contemporary theories of human communication emphasizing similarities and differences in communication processes in interpersonal, intrapersonal, and mass communications systems. (Same as Speech 5140.)

5150 Seminar in Communications Issues (3)

Examination of contemporary topics in communications. Maximum 6 hrs. Prereq: 5100 and 5140, or consent of instructor.

5970 Independent Study (3)

Reading, research, or projects on special topics in communication. On an individual basis, under faculty direction, with consent. May be repeated.

6000 Doctoral Research and Dissertation

6100 Seminar in Communications Theory (3)

An intensive analysis of selected theories and supporting research data dealing with source, message, media, receiver, or situational variables in the process of communication. Prereq: 5140. Recommended: 5100.

6200 Seminar in Communication Topics (3)

Intensive analysis of special issues and problems in human communication. Repeatable; each section will cover a specific professional area, e.g., international communication, public service communication, political communication. Prereq: 5100. Recommended: 5140.

6300 Survey Research Methods in Communications (3)

Survey methods applied to opinion and communications media research problems. Planning, sampling, questionnaire construction, data gathering (mail, mail, and telephone), data processing and interpretation. Attitude measurement and message testing applications. Prereq: 5120 or consent of instructor.

6310 Experimental Research Methods in Communications (3)

Experimental methods applied to communications research problems. Causal inferences from various research designs. Control, single-factor and multifactor experimental designs. Laboratory and field experiment situations. Prereq: 5120 or consent of Instructor. Basic statistics course prerequisite or coreq.

6320 Seminar in Historical Research Methods in Communications (3)

Advertising

Professors: R. Joe (Head), M.A. Wisconsin; D. G. Hileman, Ph.D. Illinois; J. R. Lynn, Ph.D. Southern Illinois.

Associate Professors: A. D. Fischel, Ph.D. Illinois; S. K. Zeigler, Ph.D. Michigan State.

3630 Advertising Copy and Layout (4) Importance of visual and verbal elements in advertising, including layout and their translation into persuasive words and pictures. Principles and techniques of writing copy and preparing layouts. Lecture and lab. Prereq: Advertising Principles, Marketing Communications II, or consent of instructor.

4000 Advanced Advertising Copy and Layout (4) Creative strategy and execution of advertisements for mass media. Problems in idea creation for advertisers. Lectures and labs. Prereq: 3630 or consent of instructor.

4360 Advertising Media (3) Study of media, markets, and audiences. Evaluation of media in relationship to communication needs of advertisers. Prereq: Advertising Principles, Marketing Communications II or consent of instructor.


5310-20-30 Advertising Studies and Practices (3, 3, 3) Advertising in relation to the economic and social order. Organization and management of advertising, including measurement of advertising, media audiences, and evaluation of advertising messages. Prereq: 4460 or consent of instructor.

5510-20-30 Creative Projects (3, 3, 3) Creative or problem-solving interests related to advertising. Designed for the advanced student who wishes to develop theory and skills to solve specific problems in advertising. Prereq: 4000 and 4460 or consent of instructor.

5970 Independent Study (3)

Broadcasting

Professor: D. W. Holt (Head), Ph.D. Northwestern.

Associate Professors: H. H. Howard, Ph.D. Ohio; I. G. Simpson, M.S. Syracuse.

Assistant Professors: F. A. Lester, M.A. Tennessee; M. K. Side, Ph.B. Northwestern; R. A. Shirley, M.A. Tennessee.

3560 Television and Radio Advertising (3) Principles and practices underlying successful radio-television advertising, including emphasis on media research, rate structure, programming, creativity; instruction in television commercials.

3650 Radio-Television Writing (3) Theory and technique of writing all types of broadcasting scripts except news and dramatics. Special events, interviews, musical scripts, radio talks, and promotion material. Emphasis on commercials.

4010 Speech for Broadcasting (3) Fundamentals of today's broadcast conditions as they affect the communication and oral interpretation of general American speech; Spanish, Italian, German, and French pronunciations. Strongly recommended but not mandatory. Public Speaking.

4040 Advanced Television Production (3) A semi-independent course of study in program origination, producing, directing, and performing with extensive technique toward the professional broadcast student. Prereq: Television Production or consent of instructor.

4610 Broadcast News Operation (3) Theory and practice in news-gathering, news editing and public affairs events for radio and television. Gathering and production of news broadcasts, using tools of broadcast newsmen. 2 hrs and 1 lab. Prereq: Radio-Television News and Television Film News or consent of instructor.

4670 Radio-Television Management (3) Business policies and practices of networks and local stations. Departmental functions, cost and income figures, sales techniques, promotion, advertising agencies, and governmental regulations. Specialized lectures by commercial broadcasters. Prereq: Introduction to Broadcasting or consent of instructor.

4680 Broadcast Sales Management (3) Problems and techniques of television and radio sales, including case studies in sales development, pricing, promotion, and other problem areas of sales management. Prereq: Introduction to Broadcasting or consent of instructor.

5410 Educational Broadcasting (3) Discussion, analysis, application, and evaluation of television and radio broadcasting for educational purposes.

5510-20-30 Creative Projects (3, 3, 3) For students having specialized broadcasting interests or those who wish extensive directed study in creative writing or production projects.

5610 Public Affairs Broadcasting (3) Study of the news and public affairs function in broadcasting stations and networks, including management, economics, personnel utilization, sources of program materials, legal and ethical aspects. Public affairs program development, particularly the press conference, interviews, and management of public relations. Emphasis on writing for publication. Prereq: Radio-Television News or consent of instructor.

5620 Broadcast Law and Regulations (3) Sociopolitical control of broadcasting; effect of laws, regulations, and public policies upon station policies. Particular emphasis upon the unique situation of broadcasting among the media in terms of its regulatory and judicial precedents affecting mass communications. Emphasis in perspective or to clarify situations. Prereq: Educational Broadcasting or consent of instructor.

5630 Broadcast Documentary Writing (3) Study of the role of the documentary in radio and television. Research, writing, and critique of documentary programs.

5650 Radio-Television Program Development (3) Planning basic program structures for broadcasting stations. Historical trends in programming and current programming practices as related to audience requirements, governmental policy, and competitive conditions. Individual short program development on both the local station and network levels. Prereq: Introduction to Broadcasting or consent of instructor.

5970 Independent Study (3)
of the major field, investigative procedures, and report writing.

5210 Government and the Press (3) Historic and current problems in the relations of executive, judicial, legislative, and regulatory segments of the government and the press. Prereq: Communications History or consent of instructor.

5250 Public Opinion and Mass Media (3) Students will consider the nature of public opinion with emphasis on the role of the press in its formation and how the press in turn is influenced by public opinion. Prereq: 4410 or consent of instructor.

5510-20-30 Writing and Editing Projects (3, 3, 3) A course serving students with specialized writing or editing interests, such as agriculture, politics, labor, finance, science, for technical as well as general publications. Prereq: Reporting or Editing for Mass Media.

5560 Magazine Article Writing (3) Techniques of writing the in-depth article for mass circulation magazines. Methods of organizing and presenting material. Problems in specialized areas, such as business, science, agriculture, the humanities. Prereq: 3120 or consent of instructor.

5710 Studies in Public Relations Communications (3) Detailed examination of the problems of communication between institutions and organizations and their publics. Case histories and evaluations of programs. Prereq: 3710 or consent of instructor.

5810 Magazine Editing and Production (3) Analysis of editorial and production problems of general, regional, and specialized publications. Reader interest evaluation. Individual editorial projects. Prereq: Consent of instructor.

5950 Communications and International Development (3) A seminar examining the role of mass media in national and international development. Communications and change in the developing countries. Problems in international and cross-cultural communications. Prereq: 4950 or consent of instructor.

5970 Independent Study (3)
The faculty of the College of Education is committed to performing three major functions: (1) to provide professional preparation for teachers, administrators, and school service personnel at undergraduate and graduate levels; (2) to collaborate with school personnel, educational agencies, professional groups, and others interested in the evaluation and improvement of educational opportunities, programs, and services; and (3) to promote and conduct experimental and research studies in education.

The College of Education holds membership in the American Association of Colleges for Teacher Education. All certification and degree programs through the doctoral level are fully accredited by the National Council for Accreditation of Teacher Education, the Southern Association of Colleges and Schools, and the Tennessee State Department of Education.

The College of Education, through the Graduate School, offers programs leading to the Master of Arts in College Teaching, the Master of Science degree, the Specialist in Education degree, and the Doctor of Education and Doctor of Philosophy degrees.

MASTER OF SCIENCE
On the Master's level professional study may be planned (1) in one of the areas listed on page 6, (2) in appropriate combinations of these areas, or (3) in combinations of one or more of these areas with appropriate subjects or areas in other colleges.

SPECIALIST IN EDUCATION DEGREE
This degree may be earned in Educational Administration and Supervision, in Educational Psychology and Guidance, in Curriculum and Instruction, in Safety Education and Service, or in Vocational-Technical Education.

DOCTORAL DEGREES
The College of Education offers programs of advanced study leading to the Doctor of Education degree in the major areas listed on page 6, and to the Doctor of Philosophy degree in Health Education.

Bureau of Educational Research and Service
Four major types of activities—research, development, educational services, and publications—are channeled through the Bureau of Educational Research and Service (BERs), located in Claxton Education Building. The research activities relate to the development of research proposals, conducting research, and assisting others in development of research proposals in the College of Education. Developmental activities relate to change efforts in curricular content and instrumental methodology. Educational services include a wide list of activities such as in-service educational programs, consultant services, educational services, and administrative training programs. Official publications of the College of Education are developed through the Bureau. A limited number of graduate student assistantships are available.

The Educational Opportunities Planning Center and the School Planning Laboratory are integral parts of the Bureau of Educational Research and Service.

EDUCATIONAL OPPORTUNITIES PLANNING CENTER
The Educational Opportunities Planning Center (EOPC) works with school districts in the Tennessee-Kentucky area to help meet their desegregation and sex discrimination needs by assisting with needs assessment and by helping develop plans to meet the needs. Staff members provide in-service training for local district personnel. Such training is directed toward solutions of curricular, human relations, and other types of problems created or compounded by school desegregation and sex discrimination. On-site evaluation of locally installed practices and continuing cooperative evaluation of the progress of local programs are additional major efforts. This program is funded by the U.S. Office of Education.

SCHOOL PLANNING LABORATORY
The School Planning Laboratory (SPL), located in Claxton Education Building, assists schools and colleges in integrating curriculum offerings with architectural designs, organizing regional institutes to promote innovative construction concepts, encouraging full staff utilization to secure an optimal learning environment, facilitating renovative projects within existing buildings, and conducting custodial clinics on proper maintenance techniques. Course work relating specifically to school planning is offered through the Department of Educational Administration and Supervision, while two-year graduate assistantships are under the administrative auspices of the Laboratory.
 Departments of Instruction

Numbers in parentheses following the course titles indicate quarter hours credit offered.

Art and Music Education
Charles H. Ball, Head

Art Education

MAJOR DEGREE
Art Education M.S.

Professor: J. W. Robertson, Ed.D. Columbia.
Associate Professor: H. N. Hull, Ed.S. Peabody.
Assistant Professor: J. P. Watkins, M.S. Tennessee.

The Master of Science Degree in Art Education is offered for art teachers, supervisors, and art-trained persons holding the baccalaureate degree. The program provides both thesis and non-thesis options. Moreover, it is possible to achieve Tennessee Certification in art while pursing the Master's degree program.

The thesis option requires 45 quarter hours as follows:

1. Art Education 5310, 5320, and electives 18 hrs
2. Education Curriculum & Instruction 5710, and electives 9 hrs
3. Minor (selected with committee) 9 hrs
4. Thesis (Art Education 5000) 9 hrs

The non-thesis option requires 45 quarter hours as follows:

1. Art Education 5210, 5310, 5320, and electives 21 hrs
2. Education Curriculum & Instruction 5710, and electives 9 hrs
3. Minor (selected with committee) 9 hrs
4. Electives 6 hrs

The thesis option requires satisfactory completion of an oral examination prior to awarding the degree, while the non-thesis option requires satisfactory completion of a final written examination. Both the oral and written examinations are conducted by the student's Master's degree committee.

Not all courses in art education are offered regularly each quarter, so the student should plan his or her program carefully with a faculty advisor.

3210 Art in the Secondary School Program (3) Program planning; materials and equipment; relation to other school experiences. Classroom observation. Prereq: 9 hrs art education 1 hr and 2 labs.

3920 Clay in School Program (3) Exploring methods of hand-built forms, glazing and firing procedures. Prereq: Introduction to Art Education in the Schools. 1 hr and 2 labs.

3930 Textiles in School Program (3) Exploration of processes of weaving, stitchery, batik, and silk screen. Prereq: Introduction to Art Education in the Schools. 1 hr and 2 labs.

4120 Designing of Teaching Aids for Art In School Program (3) Design and preparation of charts, exhibitions, slides, films, and other teaching aids for art grades one through twelve. Prereq: Introduction to Art Education in the Schools or consent of instructor. 1 hr and 2 labs.

4130 Three-Dimensional Design in School Program (3) Exploration of wood, wire, metal, plastics, and other sculptural materials. Prereq: Introduction to Art Education in the Schools or consent of instructor. 1 hr and 2 labs.

4150 Lettering, Posters, and Displays in the School Program (3) Design and layout; techniques and procedures. Prereq: Introduction to Art Education in the Schools or consent of instructor. 1 hr and 2 labs.

4160 Appreciation of the Arts in the School Program (3) Prereq: Introduction to Art Education in the Schools or consent of instructor. 1 hr and 2 labs.

4350-50-70 Problems in Art Teaching (3, 3, 3) Prereq: Consent of instructor.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

5210 Organization, Administration, and Supervision of Art in the School Program (3) Objectives, organization, content selection, facilities, and equipment; supervision; evaluation; professional growth; leadership and community relationships; art for the special student.

5850-50-70 Problems in Art Education (3, 3, 3) Prereq: Consent of instructor.

Music Education

MAJOR DEGREE
Music Education M.S.


Assistant Professor: W. H. McDaniel, M.S. Tennessee.

The thesis and non-thesis programs lead to the Master of Science degree in music education. Required preparation: undergraduate degree or equivalent in music education. Admission to the graduate program requires satisfactory completion of a final written examination. Both the oral and written examinations are conducted by the student's Master's degree committee.

Thesis and non-thesis programs lead to the Master of Science degree in music education. Required preparation: undergraduate degree or equivalent in music education.

All graduate students in music education must pass proficiency examinations in music theory and applied music. Requirements for thesis program:

45 quarter hours including thesis (9 hours), the music education major (18 hours), minor areas in music (9 hours), and professional education (9 hours). Required courses: Music Education 5000, 5210, 5220, 5230; Curriculum and Instruction 5710.

Requirements for non-thesis option:

1. Minimum of 51 quarter hours of course work with a minimum of 26 hours at the 5000 level.

2. Evidence of ability to understand and interpret research through completion of:
   A. Educational Statistics 5610 or the equivalent.
   B. Music Education 5710.

3. Satisfactory performance of research activities in required courses in music education listed below.

4. Curriculum design:
   With the exception of the required courses listed below, with approval of the student's advisor, courses may be selected as described more fully below. This provides the flexibility necessary for the student to pursue in some depth specialized interests and needs in the following areas of music teaching: Elementary; Secondary (Junior and Senior High); Vocal (Choral); Instrumental (Band and Orchestra); and Supervision.
   (1) A major: at least 27 quarter hours in music education.
   (2) A minor: at least 15 quarter hours in music education.

5. 9 quarter hours in professional education, including Educational Statistics 5610 and Educational Psychology 4760 or equivalents and a 3-hour elective.

6. Specific course requirements:
   A. Music Education Foundation (15 quarter hours)
      (1) One seminar (3 hours)
      (2) 5210, Psychological Foundations of Music
      (3) 5240, Evaluation Procedure in Music Education

6. Specific course requirements:
   A. Music Education: 12 credit hours from courses numbered 5000.
   B. Music: 9 credit hours from courses at the 3000, 4000, or 5000 levels. No courses required in the undergraduate curriculum may be included.

C. Education: 3 credit hours, elected from other departments in Education.

6. Evaluation (in addition to routine examinations in courses):
   A. Written comprehensive examination in major and minor fields.
   B. The student shall elect one of the evaluation procedures below (with approval of advisor and committee):
      (1) Oral examinations in major and minor fields.
      (2) A public recital in principal instrument, piano or voice.
      (3) A presentation in public performance of an original musical composition(s)
accepted by the committee as music suitable for school music performing groups.

(4) Plan, rehearse and conduct a full public performance of music by junior or senior high school music groups. This shall be written off as a long-term project under the supervision of the student's committee.

7. Student's Committee: A minimum of three faculty members: the advisor from music education; one member from music; one member from education.

4410 The Administration and Organization of Recreational Music Programs (3) Purpose of music in recreation; scope of activities, organizational procedures, resources, and coordination required in community music programs.

4441-42-43 Teaching Class Piano (1, 1, 1) For majors in music, music education, or elementary education. Prereq: Consent of instructor.


4460 Marching Band Techniques (3) Functions, organization, and direction of the school marching band.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15) Required of candidates for the M.A. degree with a major in music or music education; choral and instrumental conducting, choral methods and materials or equivalent.

5060 Adult Education: A General Survey (3) Surveys the historical development of the field, philosophies of adult education, agencies, programs, current issues, and the literature of adult education.

5110 Seminar in College Teaching (3) Effective college teaching; testing and measurement; recent research in college instruction; major problems and trends in higher education. Required of candidates for the MACT degree. S/NC only.

5150 Studies in Secondary School Music (3) Development of understandings regarding growth patterns and processes through music experiences; cultural and community influences on secondary school music; programs in the administration and teaching of music in the secondary school; and relationship of music with the humanities in the curriculum. Sequel to Teaching Music in Junior and Senior High Schools.

5210 Psychological Foundations of Music (3) Perception; function; aesthetics; talent measurement; implications for teaching theory and practice. A review of classic and current experimental studies. Prereq: Consent of instructor.

5220 The Administration and Supervision of School Music (3) Relates primarily to improvement of the teacher-learning, child-learning process in music education. Problems of supervision, research, and in-service education, teacher preparation, and guidance given careful consideration and study.

5230 Comparative Teaching Procedures in Music Education (3) Modern teaching theories and their implications.

5240 Evaluation Procedures in Music Education (3) Tests, measurements, and evaluation of musical development of students at all levels. Standard educational measurements and teacher-made tests applicable to music and specialized evaluative techniques for use in classroom situations. The uses of musical aptitude and achievement tests. Statistical measures applied to learning music. Prereq: General psychology, educational psychology and elementary education.

5250 The Role of Music in Education (3) An exploratory course designed for school personnel, other than music teachers, on the role of music in public education. No previous experience in music required.

5260 Music for Early Childhood (3) Prereq: Teaching Music in the Intermediate and Upper Grades or Teaching Music in the Elementary School or consent of instructor.

5270 Studies of Music for Children in the Primary Grades (3) Children's growth processes in music for the pre-elementary, musical experiences. For the major in music education and/ or elementary education. Prereq: Teaching Music in the Intermediate and Upper Grades or Elementary School or consent of instructor.

5320 Advanced Choral Literature and Conducting (3) Reading, conducting, and interpreting vocal scores suitable for school, college, church, and community groups; emphasis on contemporary and standard major choral works. Prereq: Undergraduate degree with a major in music or music education; choral and instrumental conducting, choral methods and materials or equivalent.

5350-60-70 Special Problems in Music Education (3, 3, 3) Individual identification and study of current problems in music education at all levels of instruction and in the various specialized areas of the music curriculum. Prereq: 5710 or the equivalent and consent of instructor.

5410 Advanced Band Literature and Conducting (3) Reading, conducting, and interpreting band scores suitable for school, college, and community bands; emphasis on contemporary and standard band literature. Prereq: Undergraduate degree with a major in music or music education; choral and instrumental conducting and teaching instrumental music or equivalent.

5510-20-30 The Talent Education Program of Shinichi Suzuki (2, 2, 2) Study of the psychology, procedures and literature utilized by Shinichi Suzuki in the Talent Education program in Japan. Prereq: Consent of instructor.

5710 Research in Music Education (3) Prereq: Consent of instructor.

5810 Seminar (3) Music teaching in the primary and intermediate grades. Survey of research, professional literature and development of bibliography, laboratory activities. Projects. Prereq: Admission to M.S. program.

5820 Seminar (3) Music teaching in the vocal and general music areas of the junior high school curriculum. Survey of research, professional literature and development of bibliography, laboratory activities. Projects. Prereq: Admission to M.S. program.

5830 Seminar (3) Music teaching in the instrumental areas of the elementary, junior high, and senior high curricula. Survey of research, professional literature and development of bibliography, laboratory activities. Projects. Prereq: Admission to M.S. program.

5840 Seminar (3) Music teaching in the vocal, theoretical, historical, and appreciation areas of the secondary school curriculum. Survey of research, professional literature and development of bibliography, laboratory activities. Projects. Prereq: Admission to M.S. program.

Continuing and Higher Education

MAJOR

Adult Education

M.S.

Professors:


Associate Professor:

K. O. McCullough, Ph.D. Florida State.

Assistant Professor:


The Master of Science degree in Adult Education is offered for teachers, administrators, counselors, and community specialists. The curriculum requires two options. A thesis option requires a minimum of 45 hours, with 18 hours in the major field, 15 hours of electives, 3 hours of educational research, and 9 hours of thesis work. The non-thesis option requires a minimum of 51 hours, with 24 hours in the major field, 24 hours of electives, and 3 hours of research methods. For each option, 9 hours must be completed in the behavioral sciences. A minor may be developed from the hours allotted to electives. The thesis option requires satisfactory completion of a final oral examination, and the non-thesis option requires satisfactory completion of a final written examination.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not other- wise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

5060 Adult Education: A General Survey (3) Surveys the historical development of the field, philosophies of adult education, agencies, programs, current issues, and the literature of adult education.

5110 Seminar in College Teaching (3) Effective college teaching; testing and measurement; recent research in college instruction; major problems and trends in higher education. Required of candidates for the MACT degree. S/NC only.

5320 Theory and Research in Human Learning (3) Same as Educational Psychology 5330.

5360-70 Problems in Continuing and Higher Education (3) A dependent study of problems and special institutes.

5440 American Higher Education (3) Purposes, functions, organization, and programs.

5450 Instruction in Higher Education (3) Problems, procedures, and techniques.

5460 Adult Development (3) Changes in characteristics of the adult over the life span and implications for adult education.

5510 Governance of Colleges and Universities (3) Study of the development, change, trends, process, and structure of collegiate governance.

5550 Fiscal Problems in Higher Education (3) A study of revenue sources and fiscal management in public and private colleges and universities.

5660 Program Planning in Continuing and Higher Education (3) Theory and method for planning adult education programs.

5860 The Community-Junior College (3) History and role of the two-year college, major functions, organization and administration, problems, and issues.

5855-55-75 Practicum in Continuing and Higher Education (3, 3, 3) Supervised practice in selected areas of instruction or administration of continuing or higher education programs.
5960-70 Seminar in Continuing and Higher Education (3, 3) Problems and issues confronting professionals in the fields of adult or higher education.

6450 Community Education for Adults (3) Contemporary programs and extension of secondary school opportunities for adults.

See also course listings under the Departments of Curriculum and Instruction, Educational Administration and Supervision, and Educational Psychology and Guidance.

Curriculum and Instruction

MAJORS

<table>
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<tr>
<th>Degree</th>
<th>Curriculum and Instruction</th>
<th>Elementary Education</th>
<th>English Education</th>
<th>Foreign Language Education</th>
<th>Instructional Materials</th>
<th>Mathematics Education</th>
<th>Science Education</th>
<th>Social Science Education</th>
<th>Professors</th>
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Associate Professors:

- K. J. Blank, Ph.D. Ohio State
- L. G. Breen, Ed.D. Oregon

Assistant Professors:


Instructor:


Graduate programs are designed to improve scholarship and educational competence in a number of areas leading to the Master of Science degree, the Specialist in Education degree, or the Doctor of Education degree.

THE MASTER'S PROGRAM

For the Master of Science degree, thesis and non-thesis options are available in the following majors: Curriculum, Elementary Education, English Education, Foreign Language Education, Instructional Materials, Mathematics Education, Science Education, or Social Science Education. The non-thesis option requires the completion of 51 quarter hours of course work.

THE SPECIALIST PROGRAM

The Educational Specialist degree program in the Department of Curriculum and Instruction will encompass concentrations in the following areas:

- Curriculum Elementary education 
- English education 
- Foreign language education 
- Instructional materials (media) 
- Mathematics education 
- Science education 
- Social science education

The program includes a minimum of 90 quarter hours of graduate study. If the student gains the Master's degree, a maximum of 45 hours of the Master's work may be credited to the 90 hour Ed.S. requirement. (45 hours of 5000-level courses are required.) The program must also include the following:

1. A minimum of 12 hours taken in one of the eight areas listed above.
2. A minimum of 12 hours taken within the College of Education in areas other than the student's major area.
3. A minimum of 12 hours outside of the College of Education.
4. A minimum of 9 hours earned through the writing of a thesis. (Students who have written a thesis for the Master's degree may be exempted from a thesis in the Ed.S. program provided, in the judgment of the student's committee, the thesis meets the standards of research appropriate for the Ed.S. degree.)
5. A minimum of 45 elective hours taken according to a plan jointly developed by the student and the major professor in terms of the student's professional goals.
4531 Supervised Readings in Philosophy of Education (3) Prereq: At least 3 hrs in history or philosophy of education.

5143 Supervised Readings in Philosophy of Education (3) Prereq: At least 3 hrs in history or philosophy of education.

5150-60-70 Seminar 1-3, 1-3, 1-3 Topics of significance in curriculum, elementary education, secondary education or social foundations as they relate to the goals of the student's program. Maximum 9 hrs. S/NC only.

5180-90-200 Educational Specialist Research and Thesis (3, 3, 3)

5210 Seminar in International Education: Asia and Africa (3) Historical, philosophical, and sociological foundations; special reference to Japan, China, India and Nigeria.

5211 Instructional Strategies in Elementary School Social Studies (3) Specific teaching methods and instructional procedures for organizing social studies learnings will be compared. Prereq: An undergraduate social studies course or equivalent.

5220 Supervised Readings in International Education (3) Supervised readings and research in any area of international education, with emphasis on comparative, historical, theoretical, and sociological foundations. Prereq: Consent of instructor.

5230 Diagnosis and Remediation of Arithmetic Difficulties: Identification and solving of student problems in learning arithmetic concepts with emphasis on tools and strategies for the diagnostic teaching. Prereq: 5250 or 5585, or consent of instructor.

5240 Creative Thinking and Expression in the Elementary School (3) Designed to give students the opportunity to examine the development of creative potential across the academic curriculum of the elementary school. Prereq: Consent of instructor.

5250 Secondary School Instruction (3)

5270 The Elementary School Curriculum (3) Theoretical background and experimental approaches.

5280 The Teaching of Language Arts in the Elementary School (3) Trends, issues, and research in content and method for the language arts program, grades 1-8. Prereq: Undergraduate course Teaching Language Arts in the Elementary School or consent of instructor.

5281 Teaching Social Studies in the Elementary School (3) Recent trends, issues, and research findings cannot be received for both 5281 and 5970.

5282 Teaching Science in the Elementary School (3) Trends, issues, and research in content and method for the elementary program.

5283 Programs and Materials in Teaching Elementary Science (3) In-depth analysis of new and innovative science program materials, as well as instructional strategies inherent in the teaching of these materials. Prereq: 5282 or equivalent, or consent of instructor.

5284 Seminar in Teaching Elementary Science (3) Analysis of current curricular issues related to elementary school language arts education. Emphasis on individual student presentations, projects, and investigations. Prereq: Teaching Science in the Elementary School or 5282 or equivalent, or consent of instructor. At least one year teaching experience (K-9).

5290 The Teaching of Mathematics in the Elementary School (3) Trends, issues, and research in content and method for the mathematics program, grades 1-8. Prereq: Teaching Arithmetic in the Elementary School and 5 hrs Structure of the Number System or consent of instructor.

5291 Programs and Materials in Elementary School Language Arts (3) Examination of programs and special instructional aids associated with the language arts. Prereq: 5280 or equivalent, or consent of instructor.

5292 Seminar in Research and Theory in Teaching Mathematics in the Elementary School (3) A systematic study of research and theory and their application to the teaching of mathematics. Prereq: Teaching Arithmetic in the Elementary School or equivalent, consent of instructor, and 1 yr of teaching experience.

5302 Psychology of Reading (3) Presents a deeper understanding of the reading act, a more accurate insight into the relationship between learning theory and reading, and a greater knowledge of the role of reading in the child's overall intellectual development. Prereq: An undergraduate reading course or consent of instructor.

5304 Programs and Materials for Reading Instruction (3) Developing a rationale for the examination, selection, and use of materials in the reading program. Special emphasis on distinguishing between approaches and materials for teaching reading. Prereq: Teaching of Reading in the Elementary School or 4300 or consent of instructor.

5305 Trends and Issues in Teaching Reading (3) Critical analysis of programs, materials, innovations, and developments in reading. Prereq: An undergraduate course in reading or consent of instructor.

5306 Teaching Reading to the Linguistically Different Learner (3) Language characteristics and special reading problems pertaining to the linguistically different learner. Prereq: Undergraduate reading course, 4300 or 4301 or consent of instructor.

5350 Curriculum Development and Evaluation (3)

5360-70 Curriculum Development in the Local School (3, 3)

5365 Mathematics Laboratories in Elementary School (K-9) (3) Designed for elementary school teachers dealing with activity-oriented mathematics laboratory materials and pedagogical strategies. Theoretical considerations and development of curricula and materials for the laboratory. Prereq: Consent of instructor.

5380 Diagnosis of Remedial Reading Problems (3) Prereq: 5200.

5381 Remediation of Remedial Reading Problems (3) Prereq: 5380 or consent of instructor.

5382 Developmental Reading Practicum (3) Diagnosing and teaching children having developmental and corrective reading needs. Prereq: 5282.

5383 Remedial Reading Practicum (3) Prereq: 5381.

5390 Organization and Administration of Reading Programs (3)

5410 The High School Curriculum (3) Theoretical background and experimental approaches.

5530 Curriculum Laboratory for High Schools (2, 3) Supervised instruction in the production of curricula, study of school activity, and other materials.

5590 Curriculum Planning and Development (3)

5610 Educational Statistics (3)

5620 Problems in Direction and Supervision of Student Teaching (3)


5640 Newer Trends in Elementary Education (3) Trends in classroom procedures, equipment, and materials of instruction; problems involving improvement of instruction.
5670 Curriculum Laboratory for Early Childhood Education (3)

5830 Seminar in Mathematics Education (3) Current curriculum issues on individual student projects and investigation.

5835 Teaching Mathematics in the Senior High School and Community/Junior College (3) Study of curriculum and teaching problems. Emphasis on methods of teaching "analytical" courses such as Algebra II, trigonometry, analytic geometry and calculus. Prereq: Teaching of Math, Grades 7-12, or equivalent.

5841 Trends and Issues in Early Childhood Education (3) Historical background, trends, and issues as basis for evaluating current programs; materials and techniques of teaching.

5842 Problems in Education: Early Childhood Education (3) May be repeated. Maximum 8 hrs. Six hrs may be taken concurrently.

5843 Seminar in Early Childhood Education (3) Analysis of research dealing with various aspects of early childhood education (K-3) with emphasis on application to programs and methods of instruction. Prereq: 5710 or 5600 or equivalent.

5844 Mathematics in Early Childhood Education (3) Study of behavioral characteristics of children in regard to mathematics, content materials and functional instructional settings and teaching strategies for development of mathematical ideas. Prereq: Teaching Arithmetic in the Elementary School or equivalent.

5845 Social Studies and Science in Early Childhood Education (3) Systematic examination of integrative approaches to and substantive classification systems of the content areas of social studies and science for early childhood teachers and on selection of appropriate social studies and science content and approaches for the young child. Prereq: Teaching Social Studies and Science in the Elementary School or equivalent.

5846 Language Arts in Early Childhood Education (3) Examination of language development of the young learner with emphasis on teaching methods, procedures, program and materials in an early childhood language arts program. Prereq: Teaching Language Arts in the Elementary School and Teaching Developmental Reading in the Elementary School or equivalent.

5850-60-70 Problems in Education: English (3, 3, 3)

5851-61-71 Problems in Education: Mathematics (3, 3, 3)

5852-62-72 Problems in Education: Social Studies (3, 3, 3)

5853-63-73 Problems in Education: Science (3, 3, 3)

5854-64-74 Problems in Education: Language Arts (3, 3, 3)

5855-65-75 Problems in Education: General Curriculum (3, 3, 3)

5856-66-76 Problems in Education: Instructional Materials (3, 3, 3)

5857-67-77 Problems in Education: Foreign Languages (3, 3, 3)

5859-69-79 Problems in Education: Conservation (3, 3, 3)

5899 Field Experience (1-6) Experiences in the application of curricular and instructional principles, methods, and materials in the schools. Prereq: Program continues must be of and permission of instructor required. May be repeated. Maximum 12 hrs. S/NC only.

5900 Seminar in the Teaching of English in the Secondary School (3)

5901 Linguistics and the Teacher of English (3) Analysis and application of linguistics in the classroom.

5902 Teaching Composition in the High School (3) Techniques for teaching rhetoric.

5903 Teaching Fiction in the Secondary School (3) Research, study, and analysis of literary selections.

5904 Teaching the Mass Media in the English Classroom (3) To acquaint the English teacher with the nature of mass media and its importance to American education and life.

5905 Teaching English in the Community/Junior College (3) Emphasis upon gaining a thorough understanding of the communication needs of community/junior college students and the objectives, strategies, and materials for meeting these needs.

5906 Teaching Poetry in Grades 7-12 (3) A study of poetry and materials for teaching poetry.

5907 Teaching Drama in Grades 7-12 (3) A study of strategies and materials for teaching drama in the classroom.

5908 Developing Speaking and Listening Skills in Grades 7-12 (3) A study of strategies and materials for teaching skills of speaking and listening.

5909 Instructional Theory and Design (3) Course is designed for those individuals at the Master's and PhD levels who have interest in intensive study of the instructional process and its relationship to curriculum and learning.

5910-20-30 Problems in Lieu of Thesis (3, 3, 3)

5911 Directing the Forensic Program (4) (Same as Speech 5911)

5912 Play Production in Secondary Schools (4) (Same as Theatre 5912)

5915 The Function of the Thinking Process in Education (3) Analysis of the thinking processes for the purpose of tracing its implications for educational theory and practice.

5960 The Teaching of Natural Science (3) Emphasis on teaching strategies, testing and evaluation techniques, and professional guidelines for program planning in science.

5961 Seminar in Science and Environmental Education (3) Comprehensive studies of recent developments in science education of concern to classroom instructors and scientists on the interrelationships of environmental factors on science education.

5970 The Teaching of the Social Studies (3)

5980 Projects, Programs, and Materials in Social Studies (3) Examination of projects and aids associated with each of the social science disciplines.

6000 Doctoral Research and Dissertation

6010 Studies in English Education (3) Reading and study in areas of the teaching of English: composition, language, and literature.

6020 Seminar in Teaching the Social Studies (3) A critical review of topics new to the broad area of language arts. Two topics each term chosen by the need and the instructor(s). Prereq: Two 5000-level courses in reading and one 5000-level course in language arts.
6040 Seminar in Curriculum and Instruction
(1) Required three quarters. S/NC only.

6060 Advanced Study of Methodology in the Elementary School (3) (Continuation of 5640) Consideration will be given to recent and current literature in the field and to sound educational practices in guiding the learning of children. Prereq: 5640 or consent of instructor.

6070 Advanced Seminar in International Education (3) Analysis of selected problems: political factors in the creation of educational policy, social stratification and its bearing on education in elite and mass societies, relation of education to manpower planning and technological change, and others.

6080 Advanced Seminar in Philosophy of Education (3) A critical study of some selected philosophical issues in education. Prereq: At least 2 courses in history or philosophy of education.

6081 Phenomenology and Education (3) A critical study of some selected philosophical issues in education. Prereq: At least 2 courses in history or philosophy of education.

6082 Philosophical Analysis and Education (3) The philosophical analysis of the language and concepts used in educational research and writing. Prereq: At least 2 courses in history or philosophy of education.

6150 Education as Social Policy (3) Education as an instrument of national or cultural well-being: problems faced by society in shaping an educational program; comparisons of education in this country and in other nations.

6210 Seminar in Elementary School Social Studies Research (3) Survey of current research in elementary social studies, the status of research in the field, needed research related to research found in the fields. Prereq: An undergraduate course and one graduate course in social studies, or equivalent.

6230 Programs for Curriculum Improvement (3)

6250 Seminar in History of Education (3) May be repeated with consent of instructor.

6282 Advanced Studies in Elementary School Language Arts (3) Critical research analysis of some selected issues in elementary school language arts. Prereq: 5280 or equivalent and consent of instructor.

6350 The Professional Education of Teachers (3) Basic theories, programs, and practices.

6400 The Dynamics of Educational Change (3) Causes of the lag between educational theoretical practice; factors useful in reducing this lag.

6500 Advanced Studies in Early Childhood Education (3) May be repeated. Maximum 6 hrs.

6510 Advanced Studies in Elementary School Science (3) A critical analysis of literature in the field of elementary school science. Prereq: An undergraduate course and one graduate course in science, or equivalent.

6530 The Professional Education of Teachers (3) Basic theories, programs, and practices.

6710 Advanced Educational Statistics (3)

6720 Interpretation of Data (3) Types of data found in published materials in education; principles of sound interpretation.

6730 Theory and Evaluation in Curriculum Planning (3) Application of principles of evaluation to curriculum programs in the elementary and secondary school. Prereq: 5270 or 5410 or equivalent.

6731 Studies in Curriculum Theory and the Structure of Knowledge (3) Analysis of major curriculum theories, models, and designs; structures of knowledge and structures of discipline in elementary and secondary school programs. Prereq: 5270 or 5410 or equivalent.

6740 Curriculum Workshops in Instructional Improvement (3) Observation and participation in workshops sponsored by the College of Education; evaluation of workshop approaches to teacher education and instructional improvement.

6750-60-70 Problems in Curriculum and Instruction (3, 3, 3)

6830 Studies in Mathematics Education (3) Reading and study related to historical trends and issues in mathematics education in the United States for the purpose of providing a broad perspective on current curricular problems and trends. Prereq: 5630 or consent of instructor.

6850 Principles of Educational Leadership (3) Contradicting concepts, with application to major problems in instruction, supervision, and administration.

6859 Internship (1-6) Advanced level experiences in application of principles and practices of curriculum development and instructional improvement. Program prerequisites must be met and permission of instructor required. May be repeated. Maximum 12 hrs. S/NC only.

Educational Administration and Supervision

MAJOR

DEGREES

Educational Administration
M.S., Ed.S., and Ed.D.

Professors:
D. H. Stillar (Head), Ph.D. Ohio State;
C. M. Achilles, Ed.D. Rochester; O. B. Griffin (Emeritus), Ph.D. Ohio State;
C. K. Tanner, Ed.D. Florida State;
G. E. Trotter, Jr., Ed.D. Tennessee;

Associate Professors:

Programs are planned for (1) students preparing for administrative positions normally found in the educational structure of the state; (2) students preparing for the position of supervisor of education; (3) administrators and supervisors in service who wish to improve their professional competence; (4) students and teachers preparing for teaching positions involving administrative responsibilities; and (5) students preparing for teaching educational administration or for administrative positions in higher education.

In addition to M.S. and Ed.D. degrees, a special two-year graduate program is offered which leads to the Ed.S. (Specialist in Education) degree and which provides advanced preparation for applicants judged to be potentially competent school administrators.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses college facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

5100 Internship in Educational Administration (3) May be repeated with consent of department. Maximum 6 hrs.

5130 Introduction to Educational Administration (3)

5180-50-200 Educational Specialist Research and Thesis (3, 3)

5220 Philosophy and Theory in Educational Administration (3)

5230 Seminar in the Behavioral Sciences for Educational Administration (3)

5290 The Politics of Education (3) Special emphasis on leadership structures, operational beliefs, and communication of ideas with regard to community decisions concerning education.

5310 School Administration in a Multilingual Society (3) Seminar offering opportunity to identify and explore educational problems arising from ethnic and racial diversity, tensions, and possibilities with which school administrators must deal within the individual school or on a district-wide basis.

5420 District Level Administration (3)

5430 Building Level Administration (3) For beginning school principals and administrators, and for those operating in rural elementary, secondary, or consolidated schools.

5440 Introduction to Law, Finance, and Business Management at the Building Level (3)

5450 Organization of the School Program (3)

5470 Introduction to School Facility Planning (3)

5480 Introduction to Supervision and Personnel Administration (3) Principles, methods, and techniques of leadership.

5490 Administration of Community Education (3) Examine administrative factors of primary importance in the development of community education programs in the public schools.

5530 Introduction to Educational Planning (3)

5560 Analysis and Interpretation of Research for Educational Administrators (3)

5580 Seminar in Communication Skills for Educational Administrators (3)

5711-21-31 Problems in Educational Administration and Supervision: School Operation (3, 3, 3)

5712-22-32 Problems in Educational Administration and Supervision: Higher Education (3, 3, 3)

5713-23-33 Problems in Educational Administration and Supervision: State School Administration (3, 3, 3)

5714-24-34 Problems in Educational Administration and Supervision: Preparation Programs (3, 3, 3)

5715-25-35 Problems in Educational Administration and Supervision: Community Education (3, 3, 3) Investigations of administrative problems through independent study.

5720 Seminar in Urban School Administration (3) Studying and analyzing administration in urban school districts.

5730 School Business Management (3)

5740 School Law (3) Study of constitutional provisions, special legislation, and legal interpretation of Tennessee law affecting educational administration.
DEGREES

MAJORS

DEGREES

Ph.D. Texas; W. A. Poppes, Ph.D. Ohio State; E. W. Schoch, Ed.D. Florida; C. L. Thompson, Ph.D. Ohio State; J. L. Williams, Ph.D. George Peabody.

Associate Professors:


Assistant Professors:


Graduate programs (thesis or non-thesis option) lead to the M.A. or Ed.M. degree with a major in Guidance, College Student Personnel, or Educational Psychology, to the Specialist in Education degree, and to the Doctor of Education degree. Appropriate courses taken in this department and in the Department of Psychology will satisfy requirements for certification as a school psychologist.

Write the department for information concerning the program requirements. Application deadline to Ed.D. is February 1 and July 15; Ed.S. and M.S. deadline is October 15, February 1, May 1, and July 15.

Psychology of Sex Role Development

Examination, from both a theoretical and research base, of factors which contribute to sex role development with attention to changes in sex role definition in society and role of education in these changes. Aimed at the undergraduate or graduate student with minimal background in behavioral sciences.

3450-55-75 Student Leadership Workshops

Degree with a major in Guidance, College Student Personnel, or Educational Psychology, to the Specialist in Education degree, and to the Doctor of Education degree. Appropriate courses taken in this department and in the Department of Psychology will satisfy requirements for certification as a school psychologist.

Write the department for information concerning the program requirements. Application deadline to Ed.D. is February 1 and July 15; Ed.S. and M.S. deadline is October 15, February 1, May 1, and July 15.

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Write the department for information concerning the program requirements. Application deadline to Ed.D. is February 1 and July 15; Ed.S. and M.S. deadline is October 15, February 1, May 1, and July 15.

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Examination, from both a theoretical and research base, of factors which contribute to sex role development with attention to changes in sex role definition in society and role of education in these changes. Aimed at the undergraduate or graduate student with minimal background in behavioral sciences.

3450-55-75 Student Leadership Workshops

Degree with a major in Guidance, College Student Personnel, or Educational Psychology, to the Specialist in Education degree, and to the Doctor of Education degree. Appropriate courses taken in this department and in the Department of Psychology will satisfy requirements for certification as a school psychologist.

Write the department for information concerning the program requirements. Application deadline to Ed.D. is February 1 and July 15; Ed.S. and M.S. deadline is October 15, February 1, May 1, and July 15.
5340 Group Dynamics (3) Principles of group dynamics as they apply to a variety of group settings. Emphasis on group counseling, per-
sonal growth, and group leadership skills. (Same as Psychology 5340.)
5350 Educational Applications of Cognitive Theories (3) Developmental theory of Jean Piaget and implications for education. Related theo-
rist such as Bruner and Ausubel.
5550 Student Personnel in Higher Education (3) Philosophy and scope.
5580 The College Student (3) Nature, characteris-
tics, and needs.
5570 Case Studies in College Student Per-
sonnel (3) Prereq: 5550 or consent of instruc-
tor.
5720 Evaluation in Education (3) Techniques and instruments for identifying and appraising social values, the linking processes, social adjustment, emotional needs, personal in-
terests and problems.
5780 Career Development: Theory and Re-
search (3)
5790 Career Development: Program Develop-
ment Implementation and Evaluation (3) A study of career development and prevocational counseling programs and projects. K-adult with emphasis on their development, implementation and eval-
uation. Prereq: 5780 or equivalent, or consent of instructor.
5790 Career Development: Workshop (1-4) Pri-
marily designed for in-service training of school personnel. Developments, programs, and trends related to career develop-
ment. May be repeated. Maximum 6 hrs.
5840 Student Appraisal (3) Gathering, inter-
preting, and using data for development of programs and individual counseling plans. Prereq: Educational Psychology or Psychology 4640 or equivalent in standardizing tested. (Same as Psychology 5840.)
5850-60-70 Problems in Educational Psy-
chology and Guidance (1-6, 1-6, 1-6) May be 
repeated. S/NC only.
5880 Career Development: Occupational and Edu-
cational Resources (3) Gathering, interpret-
ing, and using educational, social, occupa-
tional, and community information in the guid-
ance program; sources, types of materials, and occupational planning. For use both in group and individual guidance programs.
5890 Counseling Theories and Techniques (3) Presentation, demonstration, and application of counseling theories and techniques. Open to students who are interested in the counseling process. Prereq: 4130, 4540 or consent of instructor. (Same as Psychology 5890.)
5897 Prepracticum (3) Didactic experiences and counseling simulations in a learning labor-
yor, Corq: 5890.
5910-20-30 Problems in Lieu of Thesis (3, 3, 3)
5940 Counseling Practicum (3) Supervised prac-
tice in counseling in elementary or second-
ary school guidance and/or student personnel work. Prereq: 5060 or (5340), 5980, 5987 or consent of instructor. May be repeated with permission of department. Maximum 6 hrs.
5945 Group Counseling Practicum (3) Super-
vised practicum in group counseling with chil-
dren and/or adults. May be repeated. Maximum 6 hrs with consent of department. Prereq: 5340, 5980, 5987, and 5940 and consent of instructor.
5950-60-70 Consultation in Human Develop-
ment Settings (3, 3, 3) (Same as Psychology 5950-60-70.)
5959-60-70 Practicum in School Psychology II (2, 2, 2) S/NC only. (Same as Psychology 5959-69-73.)
5980 Organization and Administration of Counselor Programs (3) Basic principles, pro-
cedures, and policies. Prereq: 4130, 4640 or consent of instructor.
5990 Practicum in College Student Personnel (3) Prereq: 5550-60-70 or consent of instructor. May be repeated by permission of instructor. Maximum 9 hrs.
6000 Doctoral Research and Dissertation
6040 Seminar in Educational Psychology and Guidance Required 3 quarters.
6099 Internship (1-6) Supervised employment at a professionally approved internship site. Consent of instructor. May be repeated. Maxi-
mum 12 hrs. S/NC only.
6110 Application of Research Design in Edu-
cational Psychology and Guidance (3) Major types of research design and statistical analy-
sis unique to educational psychology, counsel-
ing, and college student personnel. Although several types of designs are discussed, em-
phasis is on those designs that are "experi-
mental" in nature. Prereq: 2 courses in statistics or consent of instructor.
6120 Application of Experimental Research Des-
igns in Educational Psychology and Guidance (3) Major types of experimental designs used by researchers in educational psychology, counseling, and college student personnel. Prereq: 6110 or equivalent course.
6219 Field Work in School Psychology: Level I (2) (Same as Psychology 6219.)
6550-60-70 Seminar in College Student Per-
sonnel (2, 2, 2) Contemporary issues in the area of college student personnel, college counseling, student development, etc. Prereq: Consent of instructor, admission to the doctoral program. S/NC only.
6510-20-30 Seminar in Dissertation Proposal Writing (2, 2, 2) The preparation and evaluation of doctoral dissertation proposals. Prereq: Two consecutive statistics courses or consent of instructor.
6560-60-70 Systems Approaches in Psychological Services II (3, 3, 3) (Same as Psychology 6560-60-70.)
6659-69-79 Practicum in School Psychology III (2, 2, 2) S/NC only. (Same as Psychology 6659-69-79.)
6760-60-70 Problems in Educational Psy-
chology and Guidance (3, 3, 3) S/NC only.
6810 Seminar in Counseling (3) In-depth study of a selected counseling theory, topic, or issue. Prereq: 5860 or consent of Instructor. May be repeated.
6840-50-60 Seminar in Professional Issues (1, 1, 1) Issues in professional development: Job selection, convention participation, publishing, writing grant proposals, consulting, etc. For
final year doctoral students only.
6910 Special Topics Seminar (3) Intensive exploration of specific research or theoretical topics with students who have the necessary background. This course may be taken two quarters and/or be repeated. Permission of instructor. Prereq: Advanced standing as a doctoral stu-
dent. May be repeated. S/NC only.
6941-42-43 Practicum in Guidance, Counsel-
ing, and Personnel Services (3, 3, 3) Super-
vised practice in application of guidance tools and techniques. Minimum: 90 clock hours each quarter. Prereq: 5860 and consent of Instruc-
tor.
6944-45-46 Teaching Practicum in Educational Psychology and Guidance (3, 3, 3) Prereq: Acceptance in doctoral program and consent of instructor.
Special Education and Rehabilitation

 Majors and Degrees

Special Education

M.S.

Vocational Rehabilitation Counseling

M.S.

Professors:


Associate Professors:


Assistant Professors:

J. L. Cassell, Ph.D. Kansas; C. R. Colvin, Ed.D. Virginia; R. E. Kreutzer, Ph.D. Kansas; W. D. Smith, M.S. Florida State.

Instructors:

R. F. Bynum, M.S. Florida State; R. N. Freeman, Ph.D. Tennessee; M. H. Raulerson, M.A. Kentucky; J. E. Siefaff, B.A. Gustavus Adolphus.

Lecturers:

L. H. Byrd, Jr., M.S. Tennessee; S. W. Mulkey, M.S. Tennessee; O. E. Reece, B.S. Memphis State.

Coordinator:


An experience program for regular teachers, special teachers, and rehabilitation personnel may be planned to meet the needs of exceptional children and adults in relationship to the program of general and special education. Specialized courses may be distributed over the several areas of exceptionality with emphasis in an area of special interests or need. Facilities are available for continuous observation and participation in direct relationships with handicapped children and adults who are hospitalized, homebound, or in residential schools, special classes, or regular classes.

Course sequences may be planned in specialized areas to include (1) hearing impaired; (2) gifted; (3) learning disabilities; (4) mentally retarded; (5) multiple disabilities; (6) socially or emotionally maladjusted; (7) rehabilitation counselor education; (8) disability evaluation education.

Programs lead to the Master of Science degree in Special Education with an emphasis in one of the specialized areas. Among the areas of specialization available is disability evaluation (non-thesis only).

Under the sponsorship of Social and Rehabilitation Services, a specialized institute for the preparation of professionals to adapt their skills toward services to hearing impaired and deaf people is provided.

For further information write the department head.

EDUCATION OF THE HEARING IMPAIRED

4000 Rehabilitation Practicum (3) Evaluation of client data and practicing rehabilitation program. Prereq: 4200.

4190 Speech Development of the Hearing Impaired (3) Anatomy and physiology of the speech system. Relationship of hearing to speech development. Theories and techniques of speech development and improvement for hearing impaired children. Prereq: Audiology 3050. (Same as Audiology and Speech Pathology 4190.)

4200 Practicum in Speech Development of the Hearing Impaired (3) Applications of theories and techniques of speech development and improvement with hearing impaired children. Prereq: 4190 and consent of instructor. (Same as Audiology and Speech Pathology 4200.)

4210 Language Development of the Hearing Impaired I (3) Systems by which formal language is presented. (Same as Audiology and Speech Pathology 4210.)

4220 Language Development of the Hearing Impaired II (3) Techniques; various systems by which formal language is presented. Prereq.: 4210 and consent of instructor. (Same as Audiology and Speech Pathology 4220.)

4230 Communication Processes for the Hearing Impaired (3) The various communicative skills required by the hearing impaired person; speech and language development; auditory training; speech—reading; manual language and its relation to other forms of communication. Observations and practicum. (Student must acquire a degree of proficiency in the use of manual language.)

4240 Nature of Hearing Impairments (3) Basic principles of audiology, anatomy and physiology of hearing loss; methods and instrumentation for the assessment of hearing loss; interpretation of audiograms; selection and use of hearing aids; relation of audiologic services to medical and other rehabilitative disciplines. Observations and practicum.

4250 Introduction to the Education and Psychology of the Hearing Impaired (3) (Same as Audiology and Speech Pathology 4250.)

4280 Curriculum Development in Elementary and Secondary Schools for the Hearing Impaired (3) Adaptation of curricula and production techniques in public school education to meet needs of deaf and hard of hearing students in residential and integrated settings. Prereq. 4280.

4290 The Teaching of Reading to Hearing Impaired Children (3) Reading readiness activities, developmental approaches, theories, and specialized materials for curricula in teaching reading. Prereq: 4210 or consent of instructor.

4870 Student Teaching with Hearing Impaired Children (9) S/NC only.

4871 Practicum with Hearing Impaired Children (6) S/NC only.

4879 Laboratory in Aural Rehabilitation (1-6) (Same as Audiology 4879.)

5040 Advanced Clinical Practice in Audiology (3) (Same as Audiology 5040.)

5220 Linguistics in the Education of the Hearing Impaired (3) Recent research and developments in linguistics related to the hearing impaired. Prereq. 4200 and 4210. (Same as Audiology and Speech Pathology 5220.)

5240 Seminar in Language Remediation for the Hearing Impaired (3) Projects and discussion will pertain to current and recent developments in educational methodologies and to research pertaining to teaching language to the hearing impaired. The topics will include research and materials current in the use of various communication systems and their adaptations. Emphasis will be placed on approaches which accommodate and assist the integration of hearing impaired children in the regular classroom.

5290 Seminar on Educational Implications of Language Deficiency (3) Readings, discussion, and projects pertaining to the impact of language deficiency on educational programming for the variety of children whose educational experience may be defined in terms of language deficiency.

5310-20-30 Manual Communication (2, 2, 2) Acquisition of basic and advanced skills in fingerspelled and signed forms of communication. Emphasis is on ability to express and receive the manual forms. Prereq: Consent of instructor. Must be taken in sequence.

5410 Instructional Media for the Handicapped: Design, Production, and Evaluation of Prototypical Curriculum Materials (9) Perception, communication, and learning theories; media design and advanced production techniques; evaluation procedures. Emphasis on planning and producing prototypical media materials specifically designed to meet the needs of handicapped individuals. Introduction to persons holding major responsibilities for media in the handicapped or similar setting. Prereq.: 4410 or equivalent. (For Summer Media Institute only.)

5490 Educational and Vocational Guidance of the Deaf and the Hard of Hearing (3) Evaluation; test techniques for diagnostic assessment; social and personality adjustment; occupational opportunities.

5540 Seminar in Language Pathology (3) (Same as Audiology and Speech Pathology 5540.)

5820 Curriculum Development Applied to Programs for the Hearing Impaired (3) Analysis of current curriculum trends in order to adapt them for hearing impaired individuals. Application of new curriculum options in the education of these children. Implementation of current education theories into programs for hearing impaired children. Prereq.: Curriculum and Instruction 5850 or the equivalent and consent of instructor.

EDUCATION OF THE MENTALLY RETARDED

4110 The Nature and Concept of Mental Retardation (3) Identification, description, and study.

4120 Education of the Mentally Retarded Child (3) Philosophy and rationale underlying the teaching and guidance of the mentally retarded; methods and materials in special and regular classes. Prereq. or coreq.: 4110.

4440 High School Programs for the Mentally Retarded (3) Trends, issues and research relating to core and work study programs.

4810 Student Teaching Mental Retardation (3) Prereq.: Major in educable mentally retarded. S/NC only.

4811 Student Teaching Mental Retardation (9) S/NC only.

4922 Student Teaching of the Educable Mentally Retarded (3) Observation and supervised practicum. S/NC only.

5111 Psychology of Mental Retardation (3) Intellectual functioning, psychological theories and learning impairments. Enrollment limited to graduate students. Prereq. or coreq.: 4110.

5112 Psychology of the Severely Mentally Retarded (3) Program and curriculum development for training/education of the severely
5115 Case Load Management in Rehabilitation (3) Study of problems and procedures involved in the management of caseloads in state rehabilitation agencies and public/private rehabilitation facilities: analysis of appropriate industrial management models related to rehabilitation programs; and simulated experience in planning, decision making, and case selection.

5120 Psychosocial Aspects of Disability (3) Medical aspects and psychological impact of major disabilities; rehabilitation processes including implications of family and community.

5130-40 Seminar in Rehabilitation (3, 3)

5145-46-47 Practicum in Rehabilitation (3, 3, 3) Supervised experience in the area of rehabilitation with emphasis on utilization of the application of concepts, principles, and skills acquired in previous or concurrent course work. Prereq: Consent of instructor.

5150-60 Internship in Rehabilitation (9, 9)

5170 Systematic Human Relations Training (3) Instruction and exercises in active listening, observing verbal and non-verbal behavior, empathetic understanding, and communicating with handicapped individuals.

5180 Approaches to Rehabilitation Counseling (3) Exploration of various approaches and techniques in individual and group counseling with handicapped adults to further develop the student's counseling skills. Training in problem-solving techniques and utilization of alternative modes of counseling procedures in rehabilitation. Prereq: 5170 or consent of instructor.

DISABILITY EVALUATION EDUCATION

5700 Evaluation and Mobilization of Community Resources (3) Study of issues, processes, and programs relating to community resources and service integration with emphasis on social and rehabilitation facilities and agencies. Introduction to the evaluation of community resources to facilitate development of innovative service programs for the handicapped.

5710 Medical Aspects of Disability I (3) A study of the etiology, clinical signs, symptoms and diagnostic procedures related to musculoskeletal, neurological, circulatory, and respiratory disabilities. Disease processes encountered in the helping professions (and how these conditions affect the structure and function of the human body). Diagnostic and treatment measures used to eliminate or minimize resulting handicaps are emphasized along with the skills necessary to communicate effectively with lay persons and the medical community concerning the evaluation of impairments and administration of appropriate rehabilitation services.

5720 Medical Aspects of Disability II (3) A study of the etiology, clinical signs, symptoms and diagnostic procedures related to neoplastic, skin, digestive, genito-urinary, endocrine, mental, visual and hearing disorders commonly encountered in the helping professions (and how these conditions affect the structure and function of the human body). Restorative treatments or procedures used to eliminate or minimize resulting handicaps are emphasized, along with the skills necessary to communicate effectively with lay persons and the medical community concerning the evaluation of impairments and administration of appropriate rehabilitation services.

5720 Medical Aspects of Disability II (3) A study of the etiology, clinical signs, symptoms and diagnostic procedures related to neoplastic, skin, digestive, genito-urinary, endocrine, mental, visual and hearing disorders commonly encountered in the helping professions (and how these conditions affect the structure and function of the human body). Restorative treatments or procedures used to eliminate or minimize resulting handicaps are emphasized, along with the skills necessary to communicate effectively with lay persons and the medical community concerning the evaluation of impairments and administration of appropriate rehabilitation services.

5740 Disability and Work in Society (3) The relationship of workers with physical, social, psychological, and economic development of the disabled individual. Orientation to the process and techniques of vocational evaluation, and work adjustment services in rehabilitation.

5750 Principles and Problems of Disability Evaluation (3) Seminar; individual identification and analysis of principles and problems of disability evaluation process or structures; emphasis on problems of disability evaluation process or structures; emphasis on innovation, exploration of alternatives, and sharing experience within the group. Prereq: 5700 or consent of instructor.

5760 Seminar; Functional Capacity Assessment (3) Study of the criteria for residual functional capacity assessment in disability insurance claims evaluation; problems in achievement or acquisition of residual functional capacity assessments. Prereq: 5710-20 or consent of instructor.

5770-71 Current Problems in Disability Claims Evaluation (3, 3) Group examination of current problems in process, content or administration of disability claims evaluation; workshops in identification and proposal of alternative solutions. May be repeated with consent of instructor. S/NC only.

SCHOOL SPEECH AND HEARING THERAPY

4930 The Public School Speech and Hearing Program (3) Organization, administration, and procedures.

4940 Appraisal of Speech and Language Disorders (4) (Same as Audiology and Speech Pathology 4940)

4950 Stuttering (4) (Same as Audiology and Speech Pathology 4950)

4960-4980 Clinical Practice in Speech Pathology (1-6, 1-6, 1-6) (Same as Audiology and Speech Pathology 4960-4980)

4931 Clinical Practice in Speech Correction in the Public Schools (3) S/NC only.

4932 Seminar in Speech Correction in Public Schools (3) Prereq: Audiology and Speech Pathology 4930 and 4931; Consent of instructor.

4940 Voice Disorders (4) Prereq: Speech Science I (Same as Audiology and Speech Pathology 4940)

4940 Voice Disorders (4) Prereq: Speech Science I (Same as Audiology and Speech Pathology 4940)

4950-4970 Clinical Practice in Audiology (1-6, 1-6, 1-6) (Same as Audiology and Speech Pathology 4950-4970)

4952 Audiology II (4) (Same as Audiology and Speech Pathology 4952)

4930 Aural Rehabilitation: Speechreading and Auditory Training (4) (Same as Audiology and Speech Pathology 4930)

4939 Laboratory in Aural Rehabilitation (1) (Same as Audiology and Speech Pathology 4939)

4940 Advanced Aural Rehabilitation (4) (Same as Audiology and Speech Pathology 4940)

5040 Advanced Clinical Practice in Audiology (1-4) (Same as Audiology and Speech Pathology 5040)

5380 Cleft Palate (3) (Same as Audiology and Speech Pathology 5380)

5390 Cleft Palate (3) (Same as Audiology and Speech Pathology 5390)

5540 Seminar in Language Pathology (3) (Same as Audiology and Speech Pathology 5540)
EDUCATION OF THE VISUALLY HANDICAPPED

4169 Education of Partially Sighted Children (3) Curricular adjustments and materials; home visits for parents; cooperation in medical care and social and psychological needs.

4850 Eye Problems Encountered by the Teacher (3) Eye anatomy and hygiene; common diseases and defects; testing and treatment: educational adjustments for specific eye conditions; related service resources.

4923 Student Teaching of the Partially Sighted (3) S/NC only.

GENERAL COURSES

3333 Education of the Exceptional Child (3) Principles, characteristics, and special needs; local and state programs for diagnosis and care; educational provisions in regular or special classes; home teaching; social and vocational guidance.

3520 Language-Speech Handicapped Child in the Classroom (3) Recognizing and understanding speech problems; observing normal and defective speech development in children; incorporating speech improvement activities into the curriculum. For students not majoring in speech hearing.

4360-60-70 Problems in the Education of Exceptional Children (3, 3, 3) Prereq: Consent of instructor.

4740 Diagnostic and Remedial Approaches in Special Education and Rehabilitation (3) A critical examination of specialized tests and methods employed in measurement of educational needs of children and adults who are mentally retarded, learning disabled, multiply handicapped or physically handicapped.

5000 Thesis 5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student has completed all academic and/or curricular time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

5260 Education of Gifted Children (3) Curricular and social adjustments.

5400 Assessment and Remediation of Learning Disabilities (3) Three approaches involving identification and remediation of learning problems of children related to neurological and medical aspects; task analysis of cognitive, affective, and psychomotor skills and use of formal diagnostic and testing materials emphasizing cognitive development. Research dealing with optimizing teaching instruction combined with a prescriptive teaching approach to learning disabilities.

5401 Prescriptive Teaching for Children with Learning Disabilities (3) Diagnostic test materials to assess functional levels of ability followed by specific remedial recommendation consistent with functional ability level. Emphasis on reading and mathematics skill development. Materials designed for ethnic population; high interest-low vocabulary, assessing sensory, linguistic, and motor development.

5402 The Exceptional Child in the Regular Classroom (3) Adoption, modification, delivery, and maintenance of instructional activities for the exceptional child within the regular classroom. Learning and academic considerations will be stressed. Prereq: 5401 or consent of instructor.

5403 Resource Teachers for the Handicapped (3) To help students acquire the skills to maintain visually handicapped children in regular public education environments; includes job descriptions and expectations; interpersonal relations; assessment of abilities, modifications of curriculum content, and applied teaching methodologies.

5450-60-70 Experience in Teaching and Supervising of Exceptional Children (1-6, 1-6, 1-6)

5510-20-30 Administrative Practicum on Problems in Institutional Care of Children (3, 3, 3) Physical and social development; business and personnel management. Prereq: Training and experience in institutions for children, or consent of instructor.

5550-60-70 Problems in the Education of Exceptional Children (3, 3, 3)

5620 Counseling Parents of Exceptional Children (3) Interpreting exceptionalities (handicapped and gifted) to parents and helping in the understanding and acceptance of the child in the home.


5910-20-30 Problems in Lieu of Thesis (3, 3, 3)

5970 Juvenile Delinquency and the School (3) Responsibilities of the school in community programs for children's welfare: curricular adjustments; directed study of socially maladjusted children, their environment, and programs for meeting their needs.

Vocational-Technical Education

MAJORS

DEGREES

Agricultural Education M.S.
Business Education M.S., MACT
Distributive Education Home Economics Education M.S.
Industrial Education M.S.
Vocational Technical Education M.S., Ed.S., Ed.D.

Professors:
R. J. Woodin (Emeritus), Ph.D. Ohio State.

Associate Professors:

Assistant Professors:
W. A. Cameron (Acting Head), Ph.D. Ohio State.

THE MASTER'S PROGRAM

Each vocational service area (agricultural education, business education, distributive education, home economics education, industrial education, and vocational-technical education) offers similar programs leading to the Master's degree. Both thesis and non-thesis options are available. Details regarding the Master's programs of each of the service areas may be obtained from the chairman of the different services. The MACT is also available in the business education area.

THE SPECIALIST PROGRAM

The Ed.S. degree program, which is a thesis or non-thesis program, is a cooperative undertaking involving all vocational service areas. Options are available in agricultural, business, distributive, and industrial education and in general vocational-technical education.

THE DOCTORAL PROGRAM

The comprehensive Ed.D. program in Vocational-Technical Education is designed to provide for achieving professional objectives, developing needed competencies, and gaining desirable experiences and understanding of vocational-technical areas.

The Vocational-Technical Education doctoral curriculum consists of the following: professional education core, 15 quarter hours; service area, 18 hours; vocational-technical education, 18-27 hours; cognate fields, 9-18 hours; research techniques, 6-12 hours; and dissertation, 36 hours. A minimum of 120 hours above the baccalaureate is required.

4750 Audiovisual Methods and Techniques (3) (Same as Curriculum and Instruction 4750.)

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

5010 History and Organization of Vocational-Technical Education (3) Development of vocational and technical education in the public schools through an analysis of social forces, legislation and organizational models.

5029 Competency Based Vocational Education (3) Introductory, comparative, and practical approaches to competency-based curricula and materials in vocational and technical education.

5040 Guidance and Pupil Personnel Services in Education (3) (Same as Educational Psychology 5040.)

5180-90-200 Educational Specialist Research and Thesis (3, 3, 3) Selection, analysis and completion of a thesis involving original investigation which will be beneficial to the investigator and the vocational-technical field.

5260 Continuing Education in Vocational-Technical Education (3) Importance, objectives, historical development, psychological and sociological formulations, methods and techniques, research, and evaluation.

5270 Placement, Follow-up and Evaluation Procedures in Occupational Education (3) A comprehensive course to explore the methods and procedures in establishing placement programs, follow-up procedures, evaluation, and curriculum revision in occupational education.

5300 Occupational Program Development for Disadvantaged Persons (3) Emphasis will be on problems of the academic, socioeconomic, cultural and/or other handicaps that prevent individuals from succeeding in regular vocational education programs.

5310 Supervision of Vocational-Technical Education (3) Principles of supervision of program planning, coordination and instruction. Roles and functions of supervisors.


6000 Doctoral Research and Dissertation

6040 Seminar in Vocational-Technical Education (1, 1, 1) Required 3 consecutive quarters during residency. S/NC only.

6210 Curriculum Planning in Vocational-Technical Education (3) Prereq: Curriculum and Instruction 5410 or equivalent.

6220 Program Planning and Development in Vocational-Technical Education (3) Concepts and principles of planning vocational-technical and manpower state, local and institutional programs; use of research in planning, role of advisory committees, theories of planned change, administrative structures, and evaluation procedures.

6230 Evaluation of Vocational-Technical Education Programs (3)

6310 Administration of Vocational-Technical Education (3) A study of administrative principles and their relationship to vocational and technical training.

6411-12-13 Internship in Vocational and Technical Education (3, 3, 3) Field experiences in selected areas of vocational and technical education. S/NC only.

Agricultural Education

4510-20-30 Problems in Agribusiness Education (1-6, 1-6, 1-6) May be repeated. Maximum 9 hrs.

4710-20-30 Seminar in Agricultural Education (1) Prereq: Student Teaching in Agricultural Education or consent of department head.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during the quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

5011 Problems in Lieu of Thesis (3)

5110 Graduate Seminar in Current Problems (3)

5112-12-13 Graduate Seminar: Current Problems in Business Education (1, 1, 1)

5120 Graduate Seminar in Tests and Measurement (3)

5130 Graduate Seminar in Guidance (3)

5140 Organization and Operation of Area Vocational-Technical Schools (3) (Same as Industrial Education 5140.)

5410-20-30 Practicum in Business Education (2, 2, 2)

5510 Evaluation of Research in Business Education (3) Prereq: Curriculum and Instruction 5610 or equivalent.

5611-21-31 Problems in Business Education: Typing (3, 3, 3)

5612-22-32 Problems in Business Education: Shorthand (3, 3, 3)

5613-23-33 Problems in Business Education: Bookkeeping and Accounting (3, 3, 3)

5614 Methods and Materials for Vocational Office Education (3) Course designed for concentration on methods and materials for vocational office education programs. Emphasis will be given to development of instructional aids, recent developments and research, individualized instruction, and occupational clusters for VOG.

5624 Problems in Business Education: Clerical Practice (3)

5615-25-35 Problems in Business Education: General Business (3, 3, 3)

5617 Problems in Business Education: Business Law (3)

5618 Organization and Management of Vocational Office Education Program (3) Principles and procedures for developing office occupations with emphasis given to guidelines in co-operatives, laboratories, and model office programs. Consideration will be given to problem solving in instructional aids, related instructional activities (clubs), the enrollment, the instructor and advisory committees.

5628-38 Problems in Business Education: Administration (3, 3)

5619 Problems in Business Education: Psychology and Skill Building (3)

6110-20-30 Current Issues in Business Education (3, 3, 3)

6210-20-30 Advanced Studies in Business Education (3, 3, 3)

6410 Higher Education for Business (3)

Distributive Education

4130 Areas of Distribution (3) Marketing, product or service technology, social skills, basic skills, and distribution in the economy as these areas affect the distributive education curriculum in secondary and postsecondary programs.

4140 Supervised Distributive Experience (3) Minimum 200 hours experience in approved distributive business; concurrent analytic project.

4310 Organization and Operation of Distributive Education (3) Background and development; needs; federal and state legislation; curriculum implications; establishing, evaluating, reporting, and improving the programs.

4320 Methods and Materials in Distributive Education (3) Prereq: 4310 or consent of instructor.

4330 Coordination Techniques in Distributive Education (3) Selecting training agencies; job analysis; selecting and briefing the training supervisors; advisory committees; adult and other community services. Prereq: 4310, 4320.

4510-20-30 Problems in Distributive Education (3, 3, 3) Selected research problems in teaching and coordinating distributive education programs.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

5110 Administration and Supervision of Distributive Education (3) Operation of a distributive education program and the work of the principal, the assistant principal, the department head, the teacher-coordinator and the class. Appreciation of problems from the high school principal's and the department head's point of view. Trends in distributive education, including community surveys, state plans, teacher-coordinator qualifications, the changing curriculum.

5120 Organizing and Teaching Adult Distributive Education (3) Planning, organizing, promoting, teaching, and evaluating continuing education programs in distributive education; utilization of trade associations, employment agencies, business groups, and advisory committees in implementation.

5210-20-30 Special Problems in Distributive Education (3, 3, 3) Individual research problems in teaching and supervising high school, postsecondary, and adult programs.

5616-26-36 Problems in Distributive Education: Retailing (3, 3, 3)

Home Economics Education

5000 Thesis
### Industrial Education

**3110 History and Philosophy of Industrial Education** (3) 
Prereq: B.S. in Industrial Education.

**3210-20-30 Part-time Programs in Cooperative Industrial Training** (3, 3, 3) 
Principles of organization, methods and materials.

**3310 Shop Organization and Management (3)**

**3320-30 Materials and Methods for Shop and Related Subjects Teachers** (3, 3)

**3340 School Shop Safety (3)**

**3610 Development and Utilization of Advisory Committees (3)** 
Philosophy and rationale for use of craft advisory committees. Their selection, organization, implementation and utilization.

**4110 Forwmanship Training by the Conference Method (3)**

**4120-30 Job Analysis (3, 3) Principles, practice, instructional methods.**

**4310-20 Curriculum Building in Trade and Industrial Subjects (3, 3) Prereq or coreq: 4210.**

**4510-11-12 Seminar in Industrial Education (3, 3, 3)** 
Educational innovations, current events, problems and other topics associated with the field of industrial education.

**4520-21-22 New Developments in Industrial Education (3, 3, 3)** 
Developments, pressing problems, and recent trends in the field of industrial education as presented by a coordinating instructor in conjunction with knowledgeable resource personnel.

**4621 Special Topics in Drafting (3)** 
Industrial practices in specialized areas of drafting selected for the individual student. Prereq: 6 hrs drafting.

**4662 Construction Processes (3)** 

**4670 Manufacturing Processes (3)** 
The manufacturing processes of industry and their relationship to careers. Prereq: Architectural Grading, Machining, Metals, Furniture and Cabinetry, Construction, Plastic Processing, or consent of instructor.

**4671 Materials and Processes (3)** 
Organic and inorganic materials and processes used to produce finished products. Content, curriculum and techniques of laboratory operation. Prereq: Consent of instructor.

**4682 Power and Energy (3)** 
Development, control, transmission, conversion, interrelation of power sources; content, curriculum, and techniques of laboratory operation. Prereq: Consent of instructor.

**5000 Thesis**

**5002 Non-Thesis Graduation Completion (3-15)** 
Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

**5110 Administration and Supervision of Industrial Education (3, 3, 3)** 
Principles of vocational education, relationships with general education and with trade and labor organizations; special problems in administering and supervising various types of schools and classes under the federal vocational education acts.

**5140 Organization and Operation of Area Vocational-Technical Schools (3)** 
Understanding of the area vocational-technical school concept; administration and supervision of vocational-technical education in area schools. (Same as Business Education 5140.)

**5210-20-30 Special Problems in Industrial Education (3, 3, 3)**

**5310 Methods of Research in Industrial Education (3)**

**5410 Improving Teachers in Service (3)** 
Problems of coordination in part-time and apprentice training programs.

**5420 Advisory Committees and Apprentice Training (3)**

**5430 Vocational School Administration and Management (3)**

**5440 Advanced Methods of Teaching Skills and Technical Information (3)** 
Use of craft advisory committees. Their selection, organization, implementation and utilization.
Division of Health and Safety

MAJORS

Health Education

Public Health

Safety Education and Service

School Health Education

DEGREES

Ed.D., Ph.D.

M.P.H.

M.S.

Ed.S.

M.S.

Professors:

R. H. Kirk (Chairperson), H.S.D. Indiana;

W. J. Huffman, Ed.D. Illinois; R. Kent, Ph.D.

North Carolina; B. C. Wallace, Ed.D. Colorado

Associate Professors:

I. A. Ahmad, Ph.D. Oregon; A. J. Brown,

Ed.D. Tennessee; C. B. Hamilton, Dr. P. H.

Oklahoma; J. Goraki, Dr. P. H. U.C.L.A.;

M. A. Milliken (Emeritus), M.A. Yale.

Assistant Professors:

A. J. Pickett, M.S. Columbia; A. F. Thompson,

Ph.D. Michigan State.

Lecturers:

M. Duffy, M.D. Pennsylvania; H. P. Hopkins,

Ph.D. North Carolina; C. P. McCammon

(Emeritus), M.D. Temple.

The Health and Safety Division offers

the following degree programs:

Master of Public Health degree with

a major in Public Health. Option in

community health education is

accredited by the American Public

Health Association. Options with

specialization in health planning/

administration or occupational/

environmental health and safety are

also available.

Master of Science degree with a major

in School Health Education or

Safety Education and Service (thesis

and non-thesis options). Non-thesis

option requires 45 quarter hours of

course work.

Educational Specialist degree in Safety

Education and Service.

Doctor of Education degree in Health

Education.

Doctor of Philosophy degree in Health

Education.

Public Health

3000 Foundations of Health Science (3)

In-depth study of the several content areas

relating to personal and health-related health

problems, i.e., mood modifying prod-

ucts, consumer health, international health,

personal health, practices, reciprocal relations-

Ship involving man, disease, and environment.

3210 First Aid and Emergency Care (4)

Theory and practice of first aid and emergency care.

Instruction in medical self-help. Course leads to

Red Cross Certification in First Aid and Emergency Care.

(Prep: 1 yr of biological science and 1 course in bacteriology)

3310 Communicable and Noncommunicable Diseases (3)

Modern concepts of diseases; etiology of common communicable and chronic diseases; problems involving control.

(Prep: 1 yr of biological science and 1 course in bacteriology)

3320 Environmental Health (3)

History of the sanitary awakening, disease-producing relations-

ships and controls of water, sewage, refuse, milk, meat and other foods, air, insects, and soil; sanitation of homes, swimming pools, indus-

trial plants, markets, restaurants, markets, and public bathing places. Healthful school living as affected by buildings and grounds, lighting, heating, ventilation, and safety provisions. 2 hrs and 1 lab.

4120 Community Health Problems—Alco-

holism (3) Explores problems of alcoholism regarding overall health of community. Emphasis placed on factors making alcoholism a serious public health problem. Various types of educational programs to control the disease covered.

4130 Community Health Problems—Suicide

(3) Explores problems of suicide regarding overall health of community.

4140 Community Health Problems—Health

Education (3) Exploration of ramifications of death and dying as related to personal and community health.

4210 Urban and Industrial Health (3) Health

problems created by a burgeoning population and the megalopolis; industrial health problems of concern to management, supervisor, and industrial worker; control of occupational diseases, poisons, accidents, and other conditions incidental to industry.

4220 Communications for Better Health (3)

Selective study of communications in the health area; field practice in public health under progression of the problems of transmitting current and new information to practitioners, communications and public health teams, among health agencies, and the use of mass media for transmitting health information.

4410 Consumer Health and Safety Education

(3) Survey of major consumer health and safety problems; selecting, purchasing, and financing of safety and medical services.

4411 Instructor's Advanced First Aid and Emergency Care (3) Designed to teach first aid. Satisfactory completion qualifies one for American National Red Cross Certification as an Advanced First Aid and Emergency Care Instructor. (Applicant must be at least 21 years of age.) Prep: First Aid and Emergency Care or valid Advanced First Aid and Emergency Care Certificate.

4420 Drug Abuse Education (3) The drug abuse problem and suspected causes; the pharmacology of drugs and their effects on society and methods of drug abuse education.

4700-10-20 Field Practice in Public Health

(3, 3, 3) Field practice in public health under supervision of public health professional. S/ NC only.

4730 Workshop in Public Health Education (3-6)

For teachers, nurses, case workers, san-

itarians, and other members of public health agency personnel; emphasizes the problem-solving approach through small group interaction. (Prep: 3 credits in critical incident tech-

nique. May be repeated.

4840-50-60 Problems in Public Health Educa-

tion (1, 1, 1) Individual identification and study of current problems in public health education. Extensive reading of literature required.

5002 Non-Thesis Graduation Completion (3-15)

Required for the non-thesis student not other-

wise registered during any quarter when such a student uses university facilities and or facultv time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

5010-20-30 Workshop in Public Health (3, 3, 3, 3-6) Designed to deal with specific public health problems in a short or an extended period of time.

5070-50-60 Field Practice and Seminar in Public Health (3-3, 3-5, 3-5) Internship or field experience under professional supervision in public health. S/NC only.

5110 Environmental Health (3-5) Varied en-

vironmental factors within the general frame-

work of air, food, water, shelter, transportation
as they affect man's survival, prevention of disease, performance and enjoyment. Lecture, demonstrations, laboratory and field practice. Prereq: Consent of instructor.

5120-30 Occupational Health and Safety (3, 5) Two- to three-year occupational health and safety theory and practice related to overall improvement of community health and safety. Lectures, demonstrations, laboratory and field practice. Prereq: Consent of instructor.

5150 Industrial Toxicology (3) Study of elements of industrial toxicology as they relate to the improvement of occupational safety and health. Prereq: Consent of instructor.

5220 Health and Sickness in the Focus of Public Health Education (2) Formulation of models of positive health within the life cycle and within the community; types of sickness afflicting individuals and groups. 1 hr and 2 labs.

5410 Epidemiology (3) The study of the incidence and prevalence of disease in man.

5420 Administration of Public Health (3) Administrative considerations of public health agencies including governmental aspects, legal bases, organizational principles, personnel factors, fiscal management, and public relations.

5430 Vital and Medical Statistics (1) Application of basic statistical principles to living things.

5440 Methods and Materials in Public Health Education (4) Theory and practice in the use of communication techniques and materials in community health education. 3 hrs and 2 labs.

5540 Factors in Problem Solving for Community Health (5) Test skills in communications and group process en route to problem identification, objective setting, problem solving, and planning for health education. 4 hrs and 2 labs.

5550 The Public Health Educator in Community Organization and Development (4) An overview of health organizations and agencies in the community; premises exploration of conflicting theories and divergent styles of practice in community organization and development. Laboratory to delineate a community near the campus and to practice. 2 hrs and 4 labs.

5560 Functions and Roles of the Public Health Educator (3) Professional scene is examined with special attention to roles and functions. Consideration of philosophy and motivation and differences between health education service and health education program for community learning levels. 1 hr 2-hr lecture-seminar session per week.

5580 Physical Activity and Health (5) (Same as Physical Education 5580.)

5705-95 Advanced Professional Health Education (3-5) Theory and practice in selected areas.

5705-10-15 Health Planning I, II, III (3-5, 3-5, 3-5)

5720 Dental Health Education (3-5)

5735 Emergency Medical Services (3-5)

5745 Family Health Unit (3-5)

5750 Health and Medical Care Legislation and Law (3-5)

5755 Health Facilities Administration (3-5)

5760 Health Services Administration (3-5)

5785 Occupational Health Unit (3-5)

5790 Self-Care Unit (3-5)

5795 The Training of Paramedical Personnel (3-5)

5840-50-60 Problems in Public Health Education (1-3, 1-5, 1-3) Individual identification of current issues. Extensive reading and critical analysis of literature required.

5850 Critical Analysis of Writing and Research in Health Education (3) (Same as School Health Education 6530.)

5850-50 Seminar in Health Education (3, 3) (Same as School Health Education 6050-60.)

6210 Health Aspects of Gerontology (3)

6220 Seminar on the Nation's Health (3)

6250 International Health (3)

Safety

3520 Principles of General Safety (3) Deals with the principles, practices, and procedures in general safety. Covers safety problems in school, traffic, recreation, industry, home, and other public areas.

4010-20-30 Problems in Safety (1-3, 1-5, 1-3) Individual identification and study of current problems in safety.

4410 Driver and Traffic Safety Education (5) Preparation of teachers of driver education in schools and colleges. Students are required to teach at least one non-driver. Valid driver's license required. 3 hrs and 2 labs.

4420 Advanced Driver and Traffic Safety Education (5) Development of competence in teaching of driver education through use of simulation, multimedia and multiple-car driving range. Emphasis placed on teaching skills and supervision. Prereq: 4410.

4430 Sports Safety (5) Accident prevention and injury control in sports activities; philosophy of sports safety; human environmental factors and their interrelationship in sports injury and their control; risk-taking and decision solution strategies; and contributions of sports medicine to safety. 3 hrs and 2 labs.

4720 Workshop in Safety (3-6) Deals with special safety education problems. For advanced undergraduate students, graduate students, teachers, supervisors, and administrators. May be repeated.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15) Non-Thesis graduation completion for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

5320 Behavioral Problems in Safety Education and Accident Prevention (3) Problems of behavior, causes of accidents, and the application of the principles of psychology in the development of safe behavior in all segments of our environment.

5330 Problems and Research in Accident Prevention (3) Analysis of safety problems found in a wide variety of accidents that occur in the community; the findings of current research in the behavioral sciences related to the prevention in the incidents of accidents.

5340 Organization, Administration, and Supervision of Safety Programs (3) National, state, and local level programs including administrative, institutional, and supervisory aspects. Basic emphasis on implementation of relevant programs.

5530 Civil and Defense Education (3) In-depth study of civil and defense problems; tornadoes, floods, fires, mass civil disorders, and nuclear and personnel attack by alien countries.

5720-30-40 Graduate Workshop in Safety (3-6, 3-6, 3-6) Deals with specific safety problems. Designed especially to explore safety problems in a concentrated period of time.


5870-90 Current Issues in Safety Education (1, 1)

6010-20 Internship and Research in Safety (3, 3, 3) Designed to allow the student opportunities for engaging in field experience to the end that a significant problem in that experience will be identified, researched, and reported on in acceptable form.

School Health

3210 First Aid and Emergency Care (4) (Same as Public Health 3210)

3410 School Health Instruction (3) Selection of health content for the school student.

3420 School Health Services (3) Development, maintenance, and protection of the health of students including examination, screening, special services, communicable disease control, emergency care, and school health records.

3510 The School in Community Health (3) Role of the teacher in community health education; the school's responsibility in promoting healthful living and the place of existing media and agencies in the program. Not open to health and physical education majors.

3510 Methods in Elementary Health Instruction (3) Preparation and presentation of health topics. Teaching method is emphasized and student participation stressed. Required for elementary teachers. Prereq: 3510 or Principles of Personal Health or Elementary Nutrition.

3620 The Teaching of Sex Education (3) Trends, content, methods and materials in sex education.

3650 Methods in Secondary Health Instruction (3) Preparation and presentation of health topics. Teaching method is emphasized and student participation stressed. Required for secondary health certification. Prereq: 3410 or Principles in Personal Health or Elementary Nutrition.

4710 Workshop in School Health Education (3-6) For advanced students, teachers, school administrators, nurses and other paramedical school personnel. Lectures, demonstrations, films, field trips, and supervised research in special school health problems. May be repeated.

4810-20-30 Problems in School Health Education (1, 1, 1) Individual identification and study of current problems in school health education. Extensive reading of literature required.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

5010 Problems and Practices in School Health (3) Comprehensive study and analysis of the principles, problems, systems, and trends of and in school health.

5020 Teaching of Sex Education and Human Sexuality (3) Analysis and explanation of
duct of a study including the final writing of a research paper. S/NC only.

6410 Practicum in Kinesiology (3) Electromyography laboratory and film analysis of sports skills. Prereq: 5310, 5500 and first quarter Elements in Physics or equivalent. May be repeated with consent of instructor. S/NC only.

6510 Seminar in Exercise Physiology (2) Prereq: 5510. May be repeated with consent of the instructor. S/NC only.

6540 Research Participation in Applied Physiology (1-6) Advanced research techniques are studied under supervision of a faculty member whose research area coincides with interests of the student. Prereq: Consent of instructor. May be repeated with consent of instructor. S/NC only.

6810-20 Practicum (2, 2) Intern experience in areas of major interest. S/NC only.

Division of Recreation

MAJOR DEGREE
Recreation M.S.

Associate Professor:
M. L. Pefers (Chairperson), Ph.D. Illinois.

Assistant Professors:

The Recreation Division offers the following degree program:

Master of Science degree in Recreation (thesis and non-thesis programs)

3100 Recreation Leadership Procedures (3) Principles and practice of recreation leadership; techniques and methods of working with individuals and groups in leisure activity.

3140 Philosophical Foundations of Recreation (3) Examination of recreation as personal experience; theories of play; philosophies of leisure and relationship to economy, ecology, health, government, culture, and self-realization; history of recreation movement.

3200 Planning Leisure Programs (3) Principles and methods employed in planning effective and well-balanced leisure time programs for varied groups in various settings.

3880 Social Recreation (3) (Same as Physical Education 3880.)

4130 Recreation Administration (3) Introduction to recreation administration, including planning, personnel, areas and facilities, program services, finances, and public relations. Prereq: Orientation to the Recreation Profession, 3160, 3140, or consent of Instructor.

4200 Survey of Recreation for Special Populations: Responsibility of recreation profession to minority groups whose leisure opportunities and needs may require special servicing.

4500 Specialized Study in a Selected Area of Recreation (1-9) Comprehensive study in a selected specialized area within the broad field of recreation. For recreation students only. May be repeated with consent of the division. Maximum 9 hrs.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated S/NC only.

5130 Interpretation of Leisure (3) Examination of concepts of leisure including social, psychological, cultural, and philosophical; recreational uses of leisure. Prereq: 3140 or consent of instructor.

5140 Leisure Service Delivery Systems (3) An in-depth study of the various systems—public, private, and commercial—involved in the provision of leisure services for the community at large. Prereq: Consent of instructor.

5150 Current Issues in Recreation (3) Identification and consideration of some of the broad issues—social, environmental, ethical—which currently have the greatest impact on people's use of leisure, and implications for the recreation administrator. Prereq: Consent of instructor.

5240 Therapeutic Recreation (3) Concerned with the role of recreation in the lives and treatment of persons with disabilities—mental, physical, and medical. Considers possibilities for helping the ill and disabled realize their fullest potential. Prereq: Consent of Instructor.

5250 Implementations of Recreation Services for the Ill or Disabled (3) Policies and guidelines for organizing and implementing programs of recreation for the ill or disabled in treatment centers and other community agencies. Prereq: 4200 or consent of Instructor.

5260 Leisure and Mental Health (3) A study of the relationship between leisure activity and mental health, with emphasis on its use in therapeutic recreation. Prereq: Abnormal Psychology or equivalent, and consent of instructor.

5300 Seminar in Recreation (1) Presentation and general discussion of students' research studies, projects, and theses in recreation. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. S/NC only.

5340 Administration of Recreation Funds (3) The process of development and management of budgets for recreation agencies with special emphasis on obtaining federal funds appropriated specifically for recreation, management of revenue received, and exploration of funding alternatives. Prereq: 4130.

5350 Organizational Policies for Recreation (3) Advanced study in the analysis of organizational policies and functions of management in recreation. Prereq: 4130.

5360 Management and Operation of Recreation Facilities (3) Provides students with knowledge and an understanding of the management process as it pertains to the operation of recreation facilities.

5440 Problems and Projects in Recreation (1-9) Individual research on a problem of special significance to the student. Research projects of a limited nature undertaken in lieu of thesis. May be repeated. Maximum 9 hrs. A new problem must be undertaken for each repetition.

5450 Specialized Study in Recreation (1-9) Advanced comprehensive study in a selected specialized area within the leisure and recreation field. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.
Graduate degree programs of the College of Engineering provide opportunities for advanced study leading to the Master of Science degree, the Master of Engineering degree, and the Doctor of Philosophy degree. For a listing, consult majors and degrees available on page 8.

OFF-CAMPUS GRADUATE INSTRUCTION BY VIDEOTAPE-ELECTROWRITER

Since 1966, the College of Engineering has made use of electronic communication techniques to reach students beyond the confines of Knoxville classrooms. These remotely-taught classes make the specialized talents of engineering college faculty available to students at off-campus centers and industrial sites. This effort makes use of video tapes prepared from a regular on-campus class in a specially-equipped classroom. The tapes contain a visual and audible record of a professor’s lecture and discussions with the on-campus class. When the tapes are played back at remote locations, telephone/Electrowriter contact is established between the professor and the off-campus class. Periodic visits by the professor are made to each remote class.

Graduate courses have been offered to students at other campuses and established centers of the UT System (Chattanooga, Kingsport, Martin, Nashville, and Tullahoma). A limited number of graduate courses have also been made available to engineers in industrial plants. Such courses are also offered to students using classroom facilities at Jackson State Community College and Columbia State Community College.

The remotely-taught courses offered by UTK carry full graduate credit toward the master’s degree under authorization of the regional accrediting agency, the Southern Association of Colleges and Schools.

YEAR-IN-JAPAN M.S. PROGRAM

This is a unique program allowing American engineering students to develop some understanding, both scientific and cultural, of Japan. It allows an M.S. candidate to obtain a degree from UTK while carrying out research work at a Japanese university. The program requires approximately two years, one year being spent in Japan and the remaining period being spent at UTK to fulfill the course requirements and to write the thesis or project report, as appropriate to the particular department. The program is administered in the framework of each department’s regular graduate program except that the research is done in Japan.

Although the language of communication in Japan would be English, cultural understanding is one of the important objectives of the program and as such a participant would be asked to begin Japanese language study. At the option of the department, up to 8 hours of graduate credit may be allowed for language study, either at UTK or in Japan.

Financial support for living expenses in Japan and for the roundtrip transportation can usually be arranged through fellowships from the Japanese Ministry of Education.

Financial support for living expenses in Japan and for the roundtrip transportation can usually be arranged through fellowships from the Japanese Ministry of Education.
portunity for in-depth study of any of the traditional areas of business administration, and students with such interests are advised to consider graduate programs available in the College of Business Administration.

To be admitted to the Graduate School as a potential candidate for a Master's degree with a major in Engineering Administration, the applicant must submit reasonable evidence of ability to pursue graduate studies at an acceptable level of performance. In general, the applicant should have graduated from a recognized undergraduate institution in engineering with a satisfactory grade point average. In addition, applicants must satisfy one of the following experience requirements: (1) at least two years of engineering experience after graduation if a full-time student or (2) current employment in engineering work if a part-time student.

THE MASTER'S PROGRAM

Minimum requirements for the Master's degree are the satisfactory completion of the following courses:

1. An Engineering Core, 27 hours of graduate credit consisting of Engineering Administration 5900, at least three courses chosen from Industrial Engineering 4150, 5110, 5520, and 5710, and a complement of engineering courses normally selected from the student's undergraduate major department or from courses of other departments pertinent to the program.

2. A Business Administration Core, 15 hours of graduate credit consisting of Accounting 5810, Finance 5050, Marketing 5050, Industrial Management 5130 and Transportation 5210.

3. General Electives, 9 hours of graduate credit chosen from computer science, economics, engineering, management science, mathematics, psychology, statistics, and other program-related disciplines.

The program requirement totals 51 hours of graduate course credit. No thesis is required. A final oral and written examination must be passed on the work offered for the degree. Course prerequisites for the program are Accounting 5030 or 2110, Computer Science 3150, Industrial Engineering 4520, and Statistics 3450 or their equivalents. None of these prerequisites may be counted as part of the 51 hours of credit offered for the degree. These course prerequisites will be waived upon presentation of evidence of competency in the course subjects. Other prerequisite courses may be required, depending upon the student's background and the electives chosen.

5002 Non-Thesis Graduation Completion (3-15)
Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

5900 Project Engineering Administration (3)
An in-depth study and formal report of an engineering administration topic, normally performed during the last quarter of work toward degree. For M.S. in Engineering Administration candidates only. May be repeated. Maximum of 3 hours credit to be applied toward degree. Must register for 5900 until project is complete. S/NC only.

Departments of Instruction

Numbers in parentheses following the course titles indicate quarter hours credit offered.

Chemical, Metallurgical, and Polymer Engineering

MAJORS DEGREES

Chemical Engineering M.S., Ph.D.
Metallurgical Engineering M.S., Ph.D.
Polymer Engineering M.S., Ph.D.

Professors: H. F. Johnson (Head), D.Eng. Yale; D. C. Bogue, Ph.D. Delaware; E. S. Clark, Ph.D. California (Berkeley); W. L. Crawford, Ph.D. Cincinnati; O. L. Culberson, Ph.D. Texas; G. C.razier, Ph.D. Johns Hopkins; J. M. Holmes, Ph.D. Tennessee; H. W. Hsu, Ph.D. Wisconsin; S. H. Jurry, Ph.D. Cincinnati; C. D. Lundin, Ph.D. Pennsylvania State; T. D. Parish, Ph.D. Northwestern; J. W. Prados, Ph.D. Tennessee; J. E. Spruill, Ph.D. Tennessee; E. E. Stansbury, Ph.D. Cincinnati; C. O. Thomas, Ph.D. Tennessee; R. A. Vandermeer, Ph.D. Illinois Institute of Technology; J. S. Watson, Ph.D. Tennessee; J. L. White, Ph.D. Delaware; M. A. Wright, Ph.D. Wales.


THE MASTER'S PROGRAM

Minimum departmental requirements include the satisfactory completion of:

1. A major consisting of 18 to 27 quarter hours of graduate courses in chemical engineering, metallurgical engineering, or polymer engineering. The polymer engineering major must include Polymer Engineering 4920, 5110, 5230, 5310, and 5520.

2. One or two minors or collateral work, 9 to 18 hours total in engineering, chemistry, mathematics, physics, or other related fields.


4. Active participation in graduate seminars in the department. Resident students must register for the appropriate 5010 every quarter offered.

5. Final examination covering thesis, related fields, and graduate course work.

THE DOCTORAL PROGRAM

Students applying for entrance into the doctoral program must display concrete evidence of ability to perform and report independent research to the satisfaction of the department. The Master's thesis may be offered as such evidence.

Degree requirements consist essentially of the satisfactory completion of:

1. Graduate courses in chemical engineering, metallurgical engineering, or polymer engineering amounting to approximately 36 quarter hours, at least 12 of which must be in 6000 series courses.

The polymer engineering major must include Polymer Engineering 4920, 5110, 5210, 5230, 5310, 5510, and Chemistry 5140.

2. Supporting courses in related scientific and engineering fields amounting to approximately 36 quarter hours, subject to approval by the student's faculty committee. These related fields will normally include chemistry, mathematics, physics, and engineering.

3. The preliminary examination, usually given in two parts, and covering such material as chemical, metallurgical, and polymer engineering operations and processes, thermodynamics, technology, mathematics, physics, chemistry, and other related fields.

4. Active participation in graduate seminars conducted by the department. Resident students must register for the appropriate 5010 every quarter offered.

5. Reading knowledge of a foreign language relevant to the candidate's research program; selection and proficiency to be made in consultation with the faculty committee. Appropriate languages are French, German, Italian, Japanese, Russian.

PROGRAM OPTIONS IN POLYMER SCIENCE AND ENGINEERING

M.S. and Ph.D. degrees with specialization in polymer science and engineering are possible through two routes—one in the department (through chemical or metallurgical engineering) with an engineering emphasis and a second in a joint program with the Chemistry Department having a chemical emphasis.

The specializations in these programs in this department requires, for the M.S. degree, a thesis in the field, completion of Polymer Engineering 4910, 4920, 5110, 5310, and either 5230 or 5210 plus active participation in the Polymer Seminar. The Ph.D. candidate must meet the above requirements, pass a special written examination in polymer science and engineering, and
complete an additional academic program to be specified by the student's committee. M.S. and Ph.D. degrees in the joint specialization program with the chemistry department require a thesis or dissertation in the field. Chemical and metallurgical engineering departmental requirements include completion of Polymer Engineering 4505 and 4510, Chemistry 5531 and 5140, plus active participation in the Polymer Seminar. Ph.D. students must also pass a special written examination as well as complete the above requirements.

Chemical Engineering

4310 Flow of Fluids (4) Differential and overall momentum balances, mechanical energy balances; flow in tubes, piping systems, and packed beds; metering devices, pumps. Prereq: Elementary Linear Algebra and Calculus of Several Variables, and Mass and Energy Relations. 3 hrs. and 1 lab.

4320 Heat Transfer (4) Differential and overall energy balances; steady and unsteady state heat conduction in simple geometries; heat transfer to gases and liquids; heat exchangers; condensation and boiling; radiation. Prereq: 3410, Thermodynamics of Phase Equilibrium. 3 hrs. and 1 lab.

4340 Stagewise Operations (3) Analytical and graphical methods applied to stagewise separatory operations. Prereq: Thermodynamics of Phase Equilibrium.

4350 Diffusional Operations (3) Diffusion, simultaneous heat and material transfer, transfer in packed beds; applications including humidification, gas absorption, extraction. Prereq: 3420.

3610 Introduction to Process Dynamics and Control (3) Introduction to concepts of process dynamics and control; steady-state analysis of chemical process control systems. Unsteady state nature of chemical processes. LapPlace transform techniques, block diagram algebra and transfer functions. Mathematical models for several processes are developed and analyzed in detail. Prereq: Introduction to Differential Equations.

3620 Chemical Process Control (3) Basic control theory applied to chemical processes; feedback control systems, cascade control, feed forward control, stability analysis, frequency response, Survey of modern control of typical industrial unit operations. Prereq: 3610.

4110 Chemical Engineering Data Analysis (3) Analysis of data, identification of system variables, system identification of system variables; mathematical models of samples and source systems; empirical modeling of processes; statistical process control. Prereq: 3420 and Math 3150.


4130 Introduction to Optimization (3) Principles and applications of various optimization techniques to chemical process design; unconstrained optimization, equality constrained optimization, inequality constrained optimization, and dynamic programming. Prereq: Differential Equations.


4420 Process Design and Economic Analysis (3) Development of basic information on a particular chemical process integrated to device design consideration of mass and energy balances, product specifications, equipment characteristics, capital and operating costs and economic merit. Prereq: 4410, 4530.

4430 Special Problems in Design and Economics (3) Special problems of design and economic analysis for student participation in the American Institute of Chemical Engineering annual contest problem; other advanced design projects. Prereq: 4420.

4450 Hydrocarbon Processing (3) Study of specialized characteristics of physical properties of fossil fuel raw materials and products, and of processes for conversion of fossil fuel raw materials into industrial products. Introduction to industrial energy, raw materials and consumer markets. Prereq: 3440.

4470 Sulfur Removal from Coal and Associated Problems (3) Chemical and physical properties of solid and liquid coals, sulfur distributions; beneficiation by both physical and chemical methods; fluidized bed combustion with both traditional and synthetic Sorbents; stack gas SOX scrubbing. Prereq: Consent of Instructor.

4480 Coal Processing to Liquid Fuels (3) Characterization of various coals with respect to current liquefaction methods; modeling of conversion processes and estimation of maximum yields; water and oxygen requirements; pyrolysis, catalytic hydrogenation; reactor design considerations; review and critique of selected articles from both the current literature and patents. Prereq: Consent of instructor.

4530 Chemical Engineering Reaction Kinetics (3) Chemical reaction rates in closed and flow systems; interpretation of laboratory and pilot plant data; reactor design. Prereq: 3420, Chemical Thermodynamic of Chemical Equilibrium.

4540 Fluid Solid Operations (3) Heat and mass transfer in fixed and fluidized beds: applications include absorption, ion exchange crystallization. Prereq: 3440-50.

4620 Process Modeling, Simulation, and Control of Chemical Processes (3) Development of process models, experimental process identification, process computer simulation, conventional and advanced control concepts. Prereq: 3820 or equivalent background in basic control theory and differential equations.

4730 Mass and Energy Flow in Biological Systems (3) Basic physicochemical and organizational principles applicable to biological systems. Derivations of general equations of bio-mass and energy transfer. Thermodynamics of transport and equilibrium in biological systems. Discussion of Volterra's equation and biological clocks. Prereq: Consent of Instructor.

4740 Introduction to Transport Phenomena in Biological Systems (3) Application of principles of transport phenomena to biological systems. Transfer of chemical energy and various cellular active transports; structure and rheology of physiological fluids, membrane and interfacial phenomena; analysis and design of artificial organs. Prereq: 3440, 3450 or consent of instructor.

4750 Microbiological Process Engineering (3) Application of chemical engineering principles and design concepts to microbiological processes; continuous culture of microorganisms, food production, and biochemical processes. Prereq: 3440, 3450 or consent of instructor.

4760 Principles of Biochemical Separation (3) Fundamental aspects and similarities of modern biochemical separation methods; classroom demonstrations, design of production and analytical systems. Prereq: Consent of Instructor.

4781-82-83 Topics in Chemical Bioengineering (3, 3, 3) Special interest in chemical bioengineering. Prereq: Consent of instructor.

4810-20-30 Special Problems in Chemical Engineering (3, 3, 3) Chemical engineering problems of special interest in industrial practice. Prereq: Consent of instructor.

5000 Thesis

5010 Graduate Seminar (1) May be repeated. Prereq: Admission to graduate program.

5050 Engineering Analysis (3) Analytical formulation and solution of chemical, metallurgical and polymer engineering problems involving the deformation of solids, heat transfer and the motion of fluids. (Same as Metallurgical Engineering 5050 and Polymer Engineering 5050.)

5120 Heat Convection (3) Analysis of heat convection in fluids under viscous and turbulent flow conditions, numerical and analytical approach; simultaneous diffusion of momentum and heat. Prereq: 5111.

5130 Methods of Optimization (3) Principles and applications of various mathematical programming techniques to chemical design and control; variational method, maximum principle, dynamic programming, and geometric programming. Prereq: 4130.

5210 Process Dynamics (3) Generalized analysis of recycle operations, steady state simulation and optimization of typical processes.


5310 Thermodynamics of Heterogeneous Equilibrium (3) Phase rule; equilibrium between phases; composition relationship between phases; ideal and nonideal solutions. Prereq: Thermodynamics.

5320 Statistical Thermodynamics (3) Basic concepts of statistical mechanics and application to evaluation of thermophysical properties. Prereq: 5310.

5410-20-30 Research and Design in Chemical Engineering (3, 3, 3) Selected diffusional operations, design concepts to microbiological processes and design of experiments in chemical engineering research.

5510 Chemical Reactor Design (3) Nonideal flow patterns in chemical reactors; diffusion and reaction in two phase systems; introduction to heterogeneous catalysis and reactor stability. Prereq: 4530.

5510 Stagewise Mass Transfer Operations (3) Equilibrium stagewise and continuous processes applied to mass transfer operations, emphasizing nonisothermal and multicomponent systems.

5620 Differential Mass Transfer Operations (3) Differential mass transfer operations; falling film, packed tower and bubble contacting devices; nonisothermal and multicomponent systems; current theories of mass transfer; mass heat and momentum transfer analogies. Prereq: Differential Equations.

5810 Mechanics of Viscous Flow (3) (Same as Engineering Mechanics 5220.)

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6130 Process Optimization (3) Optimization of chemical process equipment and systems by various techniques; static and dynamic systems. Prereq: 5130.

6210 Advanced Diffusional Operations (3) A study of fixed and fluidized bed operations utilizing the stagewise and differential mass transfer bed concepts. Prereq: Consent of instructor.

6250 Venture Analysis in the Process Industries (3) The interactions among the line functions of a typical chemical company in the application of modern decision theory and mathematical models to achieve an optimum program of investment and expansion in the face of external competition. Prereq: 5250.
6310 Thermodynamics of Irreversible Processes (3) Introduction to the treatment of irreversible chemical processes, transport processes, coupling phenomena, with special emphasis on reaction kinetics, development of the equations of thermodynamic stability of jets and formation of emulsions, thermal conductivity, viscosity, and diffusion coefficients for pure gases and gas mixtures. Prereq: 5310.

3120 Statistical Thermodynamics of Non-equilibrium System (3) A review of elementary kinetic theory, introduction to modern kinetic theory, development of the equations of thermodynamic stability of jets and formation of emulsions, Banard instability, Maragoni turbulence. Prereq: 5810 and 5620 or equivalent.

6510 Applied Chemical Reaction Kinetics (3) Chemical reaction rates and gas phase chemical equilibria as well as heterogeneous catalysis, catalyst effectiveness and the role of transport in catalytic reactor design. Development of a phenomenological description although mechanistic models are discussed. Prereq: 5510.

3520 Catalytic Reactor Design (3) Principles of kinetics, heat and mass transfer applied to the design and analysis of heterogeneous catalytic reactors. Prereq: 6510.

6610 Special Topics in Chemical Engineering (3) Advanced problems of current interest to chemical engineers. Prereq: Consent of instructor.

6710 Process Dynamics (3) Development of dynamic models of process equipment from conservation and rate laws; testing of models by frequency, step, and pulse response methods. Prereq: Consent of instructor.

Metallurgical Engineering

3110 Engineering Materials I (4) Introductory course correlating the atomic, crystal, and microstructure of solids with mechanical, physical, and chemical behavior of materials. Prereq: 1 lab. or 2 hrs and 1 lab.


3150 Engineering Materials V (3) Extension of 3110 with emphasis on the mechanisms and control of engineering materials with aqueous, nonaqueous, and gaseous environments. Prereq: 3110 or Engineering Materials I or Process Principles and Materials III.

3160 Engineering Materials VI (3) Extension of Engineering Materials with emphasis on materials of significance in nuclear engineering; nuclear reactor materials, nuclear fuel materials, and the interaction of radiation with solids to produce changes in engineering; materials suggested for nuclear and mechanical engineers.


3220 Diffusion and Annealing (3) Introduction to solid state kinetics; point defects, solid solutions, diffusion equations and mechanisms, annealing of cold-worked structures. Prereq: 3210. Coreq: Introduction to Differential Equations.

3230 Phase Transformations (4) Thermodynamic and structural factors governing binary equilibrium. Ternary systems; kinetics and morphology of processes of transformation in simple and complex systems. Prereq: 3220. 3 hrs and 1 lab.

3310 Biomedical Applications of Materials for Life Sciences (4) Principles of engineering materials; metals, polymers and ceramics; methods of fabrication of components; corrosion applications of prosthetic devices and dental materials. Prereq: General Chemistry or equivalent.

3520 Materials Behavior and Chemical Process Equipment Design (3) Mechanical, metallurgical and chemical considerations in design of chemical processing equipment. Prereq: Process Principles and Materials III or equivalent; 3210 or 3420. (Same as Engineering Mechanics 3520.)

3710 Metallurgical Applications in Manufacturing Technology (8) Fabrication methods and principles of mechanical/thermal processing for finished and semifinished articles; casting, powder metallurgy, plastic forming, joining, heat treatment. Prereq: Engineering Mechanics I or equivalent.

4240-50 Design and Analysis (3, 3) Design and laboratory sessions on the analysis of materials requirements and performance in engineering structures and components. Coreq: 4740. 3 labs.

4510-20 X-Ray Diffraction and Crystallography (3, 3) Lecture and laboratory work in crystallography, projections, x-rays, diffraction phenomena and techniques, introduction to structure determinations. The first quarter serves as an introduction to the subject. 2 hrs and 1 lab.

4540 Fracture-safe Design (3) (Same as Engineering Mechanics 4540.)

4610 Physical Properties of Materials (3) Introduction to electron theory of solids, types of bonding in solids; thermal, electrical and magnetic properties of materials; relationship between metallurgical structure and properties. Prereq: Physical Metallurgy II. 3 hrs or 2 hrs and 1 lab.

4710 Production Metallurgy (3) Thermodynamic and kinetic principles of melting, smelting, refining. Prereq: Thermodynamics.

4730 Mechanical Metallurgy I (3) Elastic behavior; description of stress, strain, and elastic constitutive relations. Effects of composition, microstructure, and loading on mechanical behavior; failure by yielding. Prereq: 3110 or Engineering Materials I or Process Principles and Materials III. Suggested for mechanical engineering, engineering mechanics and engineering science students. 3 hrs, or 2 hrs and 1 lab.

4740 Mechanical Metallurgy II (3) Ductile and brittle fracture, creep and stress rupture, fatigue, and residual stresses. Effects of state of stress, loading rate, time, temperature and metallurgical structure. Prereq: 3120 or 3230, and 4730 or Mechanical Engineering 3560 or consent of instructor. Also suggested for mechanical engineering, engineering mechanics, or engineering science students. 3 hrs, or 2 hrs and 1 lab.

4760 Casting and Welding (3) Principles and processes of casting and welding; heat transfer, solidification, control of electrical and magnetic properties, gas-metal and slag-metal interactions, thermal treatments, associated stresses. Prereq: 3220. 3 hrs, or 2 hrs and 1 lab.

4770 Mechanical Metallurgy III (3) Finite plastic strain. Plastic stress-strain relations. Principles of fabrication: forging, swaging, extrusion, rolling, deep drawing. Prereq: 4730 or consent of instructor. Also suggested for mechanical engineering, engineering mechanics, and engineering science majors. 3 hrs, or 2 hrs and 1 lab.

5000 Thesis

5010 Graduate Seminar (1) May be repeated. Prereq: Admission to graduate program.

5050 Engineering Analysis (3) (Same as Chemical Engineering 5050.)

5110 Point Defects and Dislocations (3) Theoretical and experimental analysis of point, line, and planar imperfections in solids. Prereq: Consent of instructor.

5120 Plastic Deformation I (3) Geometry and mechanisms of plastic deformation of single crystals; slip and twinning; work hardening; effects of temperature and alloying on short-term loading. Prereq: 5110.

5130 Plastic Deformation II (3) Plastic deformation of polycrystalline materials; theoretical and experimental analysis of texture formation resulting from deformation and annealing. Prereq: 5120.

5140 Diffusion and Annealing in Solids (3) Analysis of models and experimental observations relating to the solid-liquid transition, solidification, precipitation, spinodal decomposition. Prereq: 5140.

5150 Phase Transformations I (3) Analysis of models and experimental observations relating to the solid-liquid transition, solidification, precipitation, spinodal decomposition. Prereq: 5140.

5170-80 Plastic Deformation III (3, 3) Fundamental analysis of the principles of mechanical behavior of metals; fatigue, and fracture in materials. Prereq: 5180. 3 hrs or 2 hrs and 1 lab.

5210-30-30 Welding Metallurgy (3, 3, 3) Welding processes and the physical metallurgy of welding, including power supplies, heat flow, residual stresses, solidification, and solid state reactions, for both simple and complex alloys. Current theories of cold cracking, hot cracking and porosity; segregation are developed. Prereq: Physical Metallurgy.

5310 Solidification and Crystal Growth I (3) Solutes redistribution, thermodynamic considerations; kinematic, convection and fluid flow effects on the solid to liquid transition. Prereq: Mathematics 4550.

5410-20-30 Advanced X-Ray Diffraction (3, 3, 3) Review of mathematical techniques; generalization of diffraction theory, analysis of scattered intensity in reciprocal space; relationship of scattered intensity to thermal motion, order-disorder, particle size and lattice faults. Introduction to crystal symmetry, space group theory, and crystal structure problems; some laboratory work. Prereq: Mathematics 4610.

5510-30 Applied Theory of Solids (3, 3) Survey course in the properties of solids; crystallography, x-rays, properties of single
Polymer Engineering

4910 Applied Polymer Science (3) A first course in the physical properties of polymers. Polymer structure, crystalline and glass transition, physical properties of amorphous and crystalline polymers, crystallization kinetics and mechanical properties are discussed.

4920 Polymer Processing (3) Rheological properties of polymer melts and solutions, viscosity, unit operations of fiber, plastics and rubber industries: dimensional analysis and scale-up, flow through dies and pipelines, screw extrusion, spinning of fibers, injection molding.

4920 Principles of Fiber and Textile Engineering (3) Chemical and crystalline structure of important fibers; melt, wet and dry spinning of man-made fibers; drawing and texturizing; preparation of yarn; dyeing; weaving and knitting. Emphasis on quantitative aspects.

4940 Plastics Fabrication Operations (3) Lecturing and laboratory. Examine unit operations of fabrication parts. Operations to include: extrusion, coextrusion, injection molding including structural foam, thermoforming, blow molding, rotational molding.

5000 Thesis

5100 Graduate Seminar (1) May be repeated. Prereq: Admission to graduate program.

5100 Engineering Analysis (3) (Same as Chemical Engineering 5050.)

5110 Structural Characterization of Polymers (3) Experimental methods of determining the nature of transitions and structural characteristics of polymers most pertinent to plastics, fibers, and rubber applications. Methods of determination of tacticity, crystalline structure, orientation, morphology, including x-ray diffraction, nuclear magnetic resonance, and electron microscopy. Coreq: 4910 or equivalent.

5210 Non-Newtonian Fluid Mechanics (3) Tensor analysis; generalized equations of motion; survey of non-Newtonian technology. Prereq: 4920 or permission of instructor. (Same as Engineering Science and Mechanics 5230.)

5230 Mechanical Behavior of Solid Polymers (3) Application of linear viscoelasticity and large deformation elasticity to thermoplastics and thermosetting (especially vulcanized rubber and crystalline polymer) properties. Topics include dynamic modulus and loss tangent, wave propagation, friction, tearing, tensile failure, abrasion. Experimental methods of determining properties. Prereq: Mechanics of Materials.

5310 Polymer Solution Properties and Characterization (3) Molecular weight determination, chromatography, solution thermodynamics, phase separation; application to synthetic and natural organic and inorganic behavior. Prereq: Undergraduate physical chemistry.

5510 Modern Research Tools and Instruments for Polymer Science (3, 3) Laboratory course in methods of characterization of polymers; includes gel permeation chromatography, intrinsic viscosity, spectral analysis, measurement of melt flow properties, calorimetry, and dynamic mechanical measurements. Coreq: 5310.

5710 Phase Transformations in Polymer Systems (3) Analysis of nucleation and growth of phases in polymer systems, spinodal decomposition, application to crystalization from the melt, precipitation from solution.
A minimum of 9 quarter hours of thesis is required. Offers both thesis and non-thesis options.

Graduate programs in Civil Engineering and in Environmental Engineering leading to the degree of Master of Engineering are available to qualified graduates of ECPD-accredited undergraduate curricula in civil engineering or environmental engineering. At least one-third of the program of study must be classified as engineering design. The student's advisor will assist in planning the program of study to ensure that it includes the necessary design content. The thesis and non-thesis options noted under the Master of Science Programs are also available under these programs.

Masters of Engineering Program

Graduate programs in Civil Engineering and in Environmental Engineering leading to the degree of Master of Science are available to graduates of recognized undergraduate curricula.

Departmental requirements provide that for a major in Civil Engineering, the Bachelor's degree must be in civil engineering, or graduate preliminary requisite courses must be taken before admission to candidacy for the Master of Science in Civil Engineering.

Civil Engineering

The Department of Civil Engineering offers two options for the Master of Science degree in Civil Engineering.

Option I: A minimum of 45 quarter hours, including at least 9 hours of thesis, is required.

Option II: A minimum of 48 quarter hours, including a 3 quarter-hour special problem, is required. The special problem will culminate in a written report which must be approved by the student's major professor.

Environmental Engineering

For a major in Environmental Engineering, the Bachelor's degree may be in fields other than civil engineering. In some cases prerequisite undergraduate courses may be indicated, and in general these must be completed before courses for graduate credit can be taken.

The Department of Civil Engineering offers both thesis and non-thesis options for work toward the Master of Science degree in Environmental Engineering.

Option I: The student must present a minimum of 45 quarter hours of approved graduate courses. The major shall include a minimum of 9 quarter hours of thesis and 18 quarter hours credit of approved environmental engineering course work. A minor may be selected but is not necessarily required.

Option II: The student must present a minimum of 48 quarter hours of approved graduate courses. The major shall include a minimum of 27 quarter hours of approved environmental engineering course work. A minor may be selected but is not necessarily required.

Option I or II must be approved by the department.

Normally, the graduate program of study will be adjusted by the head of the department and the student's committee to suit the individual academic requirements.

The DOCTORAL PROGRAM

A graduate program leading to the degree of Doctor of Philosophy is offered in Civil Engineering. Major fields of study include environmental engineering, structural engineering, and transportation planning.

Specific departmental requirements for the Ph.D. degree include the following:

1. A minimum of 108 quarter hours, exclusive of credit for the M.S. thesis, is required.

2. A minimum of 36 quarter hours credit in Doctoral Research and Dissertation will be required.

3. A minimum of 36 quarter hours of graduate courses in the Civil Engineering Department, exclusive of thesis or dissertation credit, at least 9 hours of which must be 6000-level courses.

4. Supporting courses in related scientific and engineering fields, amounting to approximately 36 quarter hours, subject to approval by the student's faculty committee. These related fields will normally include such disciplines as mechanics, chemistry, mathematics, microbiology, physics, and other engineering fields. A minimum of 12 quarter hours of mathematics will be required beyond the civil engineering undergraduate requirements.

5. One foreign language if the student's faculty committee feels that a reading knowledge of a foreign language is crucial to the student's research efforts.

6. Upon completion of at least one-half of all course work, each student must pass a preliminary examination.

5. After completion of the dissertation, prior to graduation, each student must pass a final examination administered by a faculty committee.

Civil Engineering

4120 Concrete Design (3) Reinforced concrete continuous beams and floor slabs; footings, and retaining walls. Prereq: Concrete Design and Deflections and Statically Indeterminate Structures.

4220 Foundations and Substructures (3) Foundation explorations; principles of design of dry and subaqueous foundations. Prereq: Engineering Properties of Soils.

4230 Legal and Ethical Aspects of Engineering (3) Legal principles underlying engineering work; laws of contracts, torts, agency, real property; problems of professional registration and ethics.

4240 Structural Design (3) Plastic theory, eccentric connections, industrial building design. timber design. Design of Framed Structures and Deflections and Statically Indeterminate Structures. 3 hr periods.

4250 Photogrammetry (3) Methods of plotting maps from aerial photographs; stereoscopic plotting, instruments; applications. Prereq: Engineering Surveys, or Forestry Summer Camp for forestry majors.

4420 Analysis of Framed Structures (3) Maximum stresses due to moving loads; uses of influence lines; effects of forces due to earthquakes and wind; analysis of portals, building frames and space frames.

4430 Construction Methods and Equipment (3) Fundamental cost concepts, selection and use of equipment; production rates, balancing of equipment, and cost estimates.

4510-20 Advanced Structural Design (3, 3) Plastic design in steel in 4510; design of typical short span highway bridges in 4520. Prereq: Design of Framed Structures for 4510; and Concrete Design for 4520.

4530 Cost Comparison in Design and Construction (3) The cost comparison of alternate designs with emphasis on applications to civil engineering problems. Prereq: Concrete Design, Design of Framed Structures.

4540 Computer Utilization (3) Computer use, the economic justification, and the extent of its use by industry. The utilization of computers for the solution of civil engineering problems. Prereq: Design of Framed Structures.

4550 Engineering Behavior of Soils (3) Plastic and elastic behavior of soils, determination and use of engineering properties of in-situ soils. Prereq: 5220 or consent of Instructor. 2 hrs and 1 lab.

4560 Stabilization of Soils (3) Mechanical stabilization of soils: compaction, drainage, and blending; chemical stabilization of soils with admixtures; waterproofing and modifying soils and additives. Prereq: Physical Properties of Soils. 2 hrs and 1 lab.

4620 Airport Planning and Design I (3) Emphasis on airport master planning. Included for consideration on the air side; runway configuration, capacity, and geometric and lighting; on the land side are included terminal layout and design, and ground access systems and parking. Prereq: Transportation Planning and Transportation Engineering.

4640 Traffic Engineering (3) Study of the characteristics of the driver, vehicle, and roadway and their interrelationship; traffic
studies; basic considerations of traffic circulation and control; elements of urban transportation planning studies.

4660 Airport Planning and Design II (3) Integration and application of the principles of airport planning and design for the purpose of the selection and design of an airport facility through a comprehensive team project, also includes environmental evaluation of design. Prereq: 4620 and 1 hr and 2 lab.

4710 Portland Cement Concrete Mix Design (3) Properties and tests of portland cement concrete, methods of concrete mix design, nominations of concrete structural and functional properties; use of concrete admixtures. Prereq: Materials of Construction. 2 hrs and 1 lab.

4720 Asphalt and Bituminous Concrete (3) Properties and tests of asphalts and asphaltic mixes, design of bituminous concrete. Emphasis on use of asphalt in transportation construction projects. Prereq: Materials of Construction. 2 hrs and 1 lab.

4731-32 Earthquake Resistant Structures I & II (4, 4) (Same as Architecture 4731-32.) Properties and tests of portland cement concrete; causes of failures. Prereq: 4710. 3 hrs and 1 lab.

5140 Statically Indeterminate Structures (3) Analysis of all civil engineering systems and their specific application to problems of transportation, environmental, water resources, and materials engineering. Prereq: Senior standing or consent of instructor.

5170 Introduction to Structural Dynamics (3) Free and forced vibrations, and stress analysis. Prereq: 5110.

5170.20-30 Special Topics (3, 3, 3) Advanced topics in civil engineering system and practice in the geometric design of highways. Prereq: 5170.

5250 Advanced Materials of Civil Engineering (3) Properties and tests of concrete, masonry, and steel materials; their use in structural design. Prereq: 5170.

5280 Pavement Design (3) Characteristics of pavement surface and subgrades; pavement and subgrade design; design practices; construction and maintenance. Prereq: Engineering Properties of Soils.

5290 Advanced Properties of Materials: Cement and Concrete (3) Properties and tests of cement and concrete; volume changes and creep; elastic and thermal properties of concrete, special types of concrete; causes of failure. Prereq: 4710.

5310 Engineering Practice (3) Valuation and feasibility studies; depreciation and useful life; engineering economics.

5320-30 Engineering Practice Applied to Administration of Engineering Projects (3, 3) Factors of engineering administration; planning of governmental and industrial projects; cost estimates and methods of financing.

5420 Structural Model Analysis (3) Experimental methods of shear, moment, and stress analysis.

5430-40-50 Construction Management I, II, III (3, 3, 3) Management and organization of heavy and building construction projects. Prereq: 4450 or consent of instructor.


5520 Properties and tests of asphaltic and asphaltic mixes, design of bituminous concrete. Emphasis on use of asphalt in transportation construction projects. Prereq: Materials of Construction. 2 hrs and 1 lab.

5550 Soil Mechanics-Plastic Equilibrium (3) Analysis of failure theories; earth pressure analysis, bearing capacity analysis, and slope stability analysis. Prereq: Physical Properties of Soils or consent of instructor.

5560 Soil Mechanics-Elastics Behavior (3) Stress-deformation characteristics, theory of consolidation, theories of settlement analysis. Prereq: Physical Properties of Soils or consent of instructor.

5570 Soil Mechanics-Soil Pore Space (3) Saturated flow through embankments, filter design criteria, seepage forces and velocities, subdrains, and embankment design. Prereq: Physical Properties of Soils or consent of instructor.

5590 Behavior of Steel Structures (3) Behavior of structural steel members due to static and dynamic loading; relation between research results and current specifications for design. Prereq: Design of Framed Structures.

5730 Prestressed Concrete (3) Properties of prestressing materials and anchorage systems; methods of posttensioning and posttensioning analysis and design of members and continuous structures.

5740 Behavior of Reinforced Concrete Members (3) Ultimate strength and behavior of reinforced concrete members; relation between research results and current specifications for design. Prereq: 4120.

5800 Urban Systems: Engineering and Management I (3) The management of various urban systems usually under the responsibility of a city manager and/or city engineer. Includes organizational structure, personnel administration, purchasing and equipment management and dealing with engineering consultants as each deals with municipal public works. Prereq: Graduate standing in Civil or Environmental Engineering or consent of instructor.

5805 Urban Systems: Engineering and Management II (3) Continuation of 5800 dealing with the management and engineering of urban streets, including lighting, clean-
5830 Traffic Flow Theory (3) Special problems in traffic engineering, using queuing theory, mathematical models, Monte Carlo methods, and simulations of various conditions and/or designs. Prereq. 4540 or Mathematics 3150; 5820.

5860 Statewide Passenger Transportation Planning (3) Preparation of comprehensive multimodal transportation plans for complex urban areas. Includes use of computer models, functional classification, programming and scheduling. Emphasis on government policies and decisions, especially as they affect air and highway investments. Prereq. 5860.

5870 Future Transit Technology and Research (3) New transit systems and new technology are identified and evaluated. Also considered are other modes; possible channel changes in both technology and the planning process and possible research designs. Prereq. 5870.

5880 Planning Models for Transportation Systems I (3) An analytical analysis of trip generation employing mathematical, statistical, and computer science techniques. Also an introduction to modal split, trip distribution, and trip assignment will be made. These statistical procedures are integrated into the urban transportation planning process. State-of-the-art and new modeling techniques are investigated. Prereq. 5270, Mathematics 3150 and Statistics 3450.

5890 Planning Models for Transportation Systems II (3) An analytical analysis of modal split, trip distribution, and trip assignment. Mathematical, statistical, and computer science techniques are used in the modeling process. These models are integrated for use in the urban transportation planning process. Prereq. 5880.

5910-20-30 Special Topics in Civil Engineering (3, 3, 3) Selected advanced problems of current interest to civil engineering. Prereq. Consent of instructor.

NOTE: Not all of the above courses will be offered in any one year.

Environmental Engineering

3000 Introduction to Environmental Engineering (3) Introduction to man's interaction with the air, water, and land environment in which he lives; role of engineering in environmental management. Consent of instructor.

4030 Environmental Engineering Chemistry (3) Fundamentals of chemistry related to generation, formation, and removal of environmental contaminants. Analytical techniques for evaluation of specific air, water, and solid waste pollutants. Prereq. 3000 and general chemistry.

4150 Urban Water Management (3) Introduction to urban water modeling; evaluation of optimum urban water policies; formulation of system constraints and analysis of decision-making process; management of storm water for beneficial use. Prereq. 3000 and Elementary Hydrology.

4210 Water Resources Engineering Design (3) Elements of water resource structures and systems, including reservoirs, dams, control work, and channel design. Dam safety control, environmental impact of reservoir projects. Prereq: Consent of instructor.

4220 Water Resources Engineering Development (3) Principles of water resource development and single or multipurpose planning; economics in alternative decisions; principal water uses; multiphase evaluation procedures for water and resource projects; Tennessee water law principles; special topics of current interest. Prereq: Consent of instructor.

4300 Hydrologic Design (3) Application of frequency analysis, spatial analysis, and component analysis to hydrologic design of water resources system; unsteady surface runoff and streamflow modeling; urban peak runoff design using kinematic wave theory; evaluation of effects of land use changes on streamflow quantity and quality. Prereq: Elementary Hydrology.

4510 Elements of Water and Wastewater Transportation Systems (3) An introduction to theory and design of water transportation and distribution systems and wastewater collection systems. Introduction to Environmental Engineering, Hydraulics, and Elementary Hydrology.

4520 Elements of Water and Wastewater Treatment Systems Design (3) An introduction to the unit operations and processes employed in the physical, chemical, and biological treatment of water and wastewater. Application of unit processes and systems design to water and wastewater treatment plants. Prereq: 3000 and Hydraulics.

4530 Sanitary Engineering Laboratory (3) Physical, chemical, and bacteriological analysis of water and wastewater. Prereq. 4030. 3 labs.

4600 Solid Waste Management (3) Quantities and characteristics of solid wastes; collection methods in the urban environment. The impact of solid waste management on the physical, chemical, and bacteriological environment. Prereq. 5261 or consent of instructor.

4700 Air Pollution-Air Resources Management (3) An introductory course on the concepts of air pollution; analysis of the relationship among emission sources; meteorology and topographic factors in atmospheric dispersion; air quality modeling and computer simulations. Prereq. Consent of instructor. Consent of instructor.

4810 Water Law (3) Survey study in water law, including case studies and water law doctrines. (Same as Water Resources Development 4810.)

4820 Environmental Engineering Law (3) Legal aspects of water and air pollution, drainage, land use, property rights, and clean air pollution act. The impact of federal, state and local pollution control laws. Prereq. Senior standing.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student is enrolled at the university and is at the end of his degree program. May not be used toward degree requirements. May be repeated. SR/NC only.

5100 Water and Urban Welfare (3) Evaluation of social, economic, and environmental impacts on planning and management of urban water systems. Emphasis upon conflict and choice, reconciliation between environmental and developmental values, measurement of social well-being and quality of life parameters. Procedures for analyzing multifaceted policy alternatives with selected case studies. Prereq: Consent of instructor.

5160 and Water Resources Development 5160.)

5200 Water Resources Systems (3) Control, utilization and management of water in water resource engineering. (Same as Water Resources Development 5200.)

5210 Advanced Water Resources Engineering (3) Complex problems encountered in water resources engineering such as water hammer, surge, wave action, and regression analysis to hydraulic design of complex water resources structures. Prereq. Consent of instructor.

5230 Surface Water Transport Processes (3) Dynamics of flow in porous media, estimation of flow in porous media, subterranean and suspended load movement; erosion, scour, transportation and deposition of sediments by flowing water; sifting of reserves and related topics. Prereq. 5230.

5250 Flood Damage Reduction (3) Survey of national, regional, local flood problems; hydrologic design criteria; traditional flood control measurements; land use controls and adjustments; floodproofing, flood insurance, and other flood damage reduction elements; interdisciplinary approach in floodplain management; case studies. Prereq: Consent of instructor.

5261 Basic Principles of Remote Sensing (3) Introduction to the applications of remote sensing in agriculture, engineering, forestry, meteorology, land use planning, and resource management; properties of electromagnetic radiation including wave theory, physical and geometric optics, interference and diffraction, radiation and matter; current data handling technology. Prereq: Consent of instructor.

5262 Remote Sensing Data Acquisition (3) Theory of active and passive sensors, their array and special characteristics; introduction to and description of remote sensing platforms, including the Earth Resources Satellite Communication System; mission planning. Prereq. 5261 or consent of instructor.


5301 Stormwater Modeling I (3) Interpretation of hydrologic data using methods of systems analysis. Hydrologic components are analyzed as linear and non-linear systems and integrated into mathematical models of watershed response. Models are presented for optimizing management parameters for both active and passive solutions. Prereq: Consent of instructor.

5302 Stormwater Modeling II (3) Continuous streamflow records are interpreted using methods of stochastic processes in flood frequency and time series analysis. Hydrologic design of water resources systems using streamflow records, including autoregressive and fractional gaussian noise models. Prereq: Consent of Instructor.


5330 Descriptive Hydrology (3) Occurrence and description of elements of the hydrologic cycle, its effects on earth and its relation to man. Not for civil engineering majors. (Same as Water Resources Development 5330.)

5400 Introduction to Environmental Systems (3) Consideration of models of air and water quality, water resources, solid waste disposal, and location of central facilities; it is aimed at exposing students to current literature on environmental management problems. The pollution problem will be one of the basic problems emphasized. Prereq. Consent of instructor.
5501 Water and Wastewater Treatment Theory I (3) Theory of unit operations employed in sanitary engineering. Prereq: 4520.

5502 Water and Wastewater Treatment Theory II (3) Theory of physical, chemical, and biological processes employed in sanitary engineering. Prereq: 5501.


5530 Environmental Engineering and Natural System Behavior (3) Course centers about the relationship between physical and environmental engineering and natural system behavior by focusing on eutrophication and the limiting nutrient concept in relation to research on the subject and its translation into law and wastewater engineering practice. Course conduct is in the seminar-open discussion format which actively involves all student participants. Prereq: Graduate standing or consent of instructor.

5551 Water Quality Management (3) Water quality concepts, objectives, methods and philosophies; water quality criteria; effect of various uses on water quality; receiving water characteristics; assimilation capacity; regulatory standards; economic considerations. Prereq: 3000 or consent of instructor.

5551 Environmental Management of Water Quality (3) Water quality management and the control of contamination. Emphasis on the effects of agricultural, domestic and industrial use upon water quality; legal and administrative aspects, waste assimilative capacity and wastewater allocation; and the engineering management of water quality via nonpoint and point sources of pollution. Prereq: Graduate standing.

5582 Microbiology for Sanitary Engineers (3) A study of microorganisms and microbiological processes which are significant in sanitary engineering, including basic microbiology, detection and identification, enzymes, metabolic reactions, energy transfer, synthesis and growth; aerobic and anaerobic biological treatment processes. Prereq: Graduate standing.

5593 Advanced Sanitary Engineering Laboratory (3) Advanced laboratory techniques and experiments in the analysis of water and wastewater. Application of modern instrumental procedures for the examination of chemical, physical, and biological analysis. Prereq: 4530. 3 labs.

5600 Solid Wastes (3) Magnitude and characteristics of the solid waste problem; methods for the collection and disposal of solid wastes, including sanitary landfill, incineration, composting, proposed new technologies, and recycling. Prereq: Graduate engineering major or consent of instructor.

5610 Solid Waste Disposal (3) Engineering design course in solid waste disposal. Problems in the areas of design and costing, incinerator design and costing, and special topical areas. Prereq: 5600.


5700 Planning and Air Pollution Control (3) The issues in the areas of landfill design and costing, incinerator design and costing, and special topical areas. Prereq: 5600.

5710 Air Pollution Control Engineering (3) Emission control systems for industrial and power generating processes, stack sampling methods, air pollution monitoring, dispersion of pollutants. Prereq: 4700 and Fluid Mechanics.

5720 Air Pollution Particle Collection Theory (3) The mechanics of particles suspended in a gaseous medium including particle motion, coagulation, and aerodynamic capture of particles. Prereq: 4700 and Fluid Mechanics.


5730 Air Pollution Control Device Design (3) Design and evaluation of systems used to control the emissions of gaseous and particulate pollutants. Comprehensive design of specific devices and systems. Prereq: 5720.

5735 Industrial Source Sampling (3) Review and application of sampling techniques for gaseous and particulate air pollution emissions from industrial processes. 2 hrs and 1 lab. Prereq: Graduate standing.

5740 Dynamical and Physical Meteorology (3) Theoretical aspects of the atmosphere. Theoretical and observational study of turbulence with emphasis on mechanics of the atmosphere. Effects of wind and temperature profiles, surface roughness, and the influence of human activities on the atmosphere. Prereq: Graduate standing.

5750 Turbulence in the Atmosphere (3) Present state of our knowledge of turbulence in the atmosphere. Emphasis on the mathematical boundary layer, mean wind and temperature profiles are derived and related to observations. Methods of estimating surface fluxes, energy spectra, and cospectra are outlined. It is shown how the theories can be applied to describe changes in turbulence in air flow over urban areas. Mechanisms of formation of clear air turbulence in shear zones are suggested. Prereq: 5740.

5760 Diffusion in the Atmosphere (3) Movement and dilution of natural or man-made material released into the atmosphere. Basic theory is developed and observations reviewed. Specific topics include the rise of buoyant plumes, the relation between Eulerian and Lagrangian spectra, the differences between instantaneous and ensemble-averaged physical processes. Prereq: Consent of instructor. May be repeated. Max. 9 hrs. S/NC only.

5790 Special Problems in Environmental Engineering (3-12) Study of environmental engineering problems to fulfill the special problem requirement in the non-thesis program. Enrollment limited to environmental engineering students in the non-thesis program. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

5910-20-30 Special Topics (3, 3, 3) Selected advanced problems of current interest in environmental engineering. Prereq: Consent of instructor.

Note: Not all of the above graduate courses will be given in any one year. Prerequisite to all graduate courses: Consent of instructor.

Electrical Engineering

MAJOR DEGREES

Electrical Engineering

M.E., M.S., Ph.D.

Professors: J. M. Googe, Ph.D. Florida; E. L. Hall, Ph.D. Missouri; Y. P. N. Neff, Ph.D. Auburn P.E.; R. C. Gonzalez, Ph.D. Florida; M. O. Pace, Ph.D. Georgia Institute of Technology; T. W. Reddick, Ph.D. Pennsylvania; J. F. Perry, Ph.D. Pennsylvania; W. E. Smith, M.S. Illinois, P.E.; J. D. Trimen, Ph.D. Auburn; C. H. Weaver, Ph.D. Wisconsin, P.E.

Associate Professors: A. O. Bishop, Ph.D. Clemson; R. C. Gonzalez, Ph.D. Florida; E. L. Hall, Ph.D. Missouri; Y. P. N. Neff, Ph.D. Auburn P.E.; M. O. Pace, Ph.D. Georgia Institute of Technology; T. W. Reddick, Ph.D. Pennsylvania; J. F. Perry, Ph.D. Pennsylvania; W. E. Smith, M.S. Illinois, P.E.; J. D. Trimen, Ph.D. Auburn; C. H. Weaver, Ph.D. Wisconsin, P.E.

Assistant Professors: D. Rosenberg, Ph.D. New York; H. M. Scull, Ph.D. New York; P. E. Bishop, Ph.D. Auburn; J. D. Trimen, Ph.D. Auburn; C. H. Weaver, Ph.D. Wisconsin, P.E.

THE MASTER'S PROGRAM

Graduate work leading to the Master of Science degree in Electrical Engineering may be completed during one academic year of full-time study, or the degree may be obtained in two or three years of study in the evening. Graduate assistantships are available for outstanding students, who may obtain the Master's degree in one calendar year.

Specific departmental requirements include:

1. Electrical Engineering 5070-80 and 5710. Electrical Engineering 5710 is normally available in both fall and spring quarters. Students electing courses such as 5650-60, 5720-30, or 5750-60 which require 5710 as a prerequisite should register for 5710 in the fall quarter.

2. Nine quarter hours of graduate credit in mathematics consisting of

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Distinguished Service Professor.

Space Institute, Tullahoma.
work in electrical engineering and 9 quarter hours of 5000-level work in electrical engineering and 9 quarter hours in another approved area.

4. Master's thesis, totaling 9 quarter hours or more.

5. A final oral examination covering the thesis and related course work.

MASTER OF ENGINEERING PROGRAM

A graduate program leading to the Master of Engineering degree is available to qualified graduates of ECPD-accredited undergraduate curricula in electrical engineering or its equivalent.

Specific degree requirements which must be met include:

1. Electrical Engineering 5070-80 and 5710.

2. Nine quarter hours of graduate credit in mathematics consisting of Mathematics 4710, 4550, and 4250, or 4510-20-30. Other approved 4000-5000 level mathematics courses must be substituted for any of the above course material covered in undergraduate work.

3. An additional 18 quarter hours of 5000-level work in electrical engineering or 9 quarter hours of 5000-level work in electrical engineering and 9 quarter hours in another approved area.

4. An additional 18 quarter hours of 5000-level work in electrical engineering or 9 quarter hours of 5000-level work in electrical engineering and 9 quarter hours in another approved area.

5. Master's thesis, totaling 9 quarter hours or more.

6. A final oral examination covering the thesis and related course work.

A minimum of one-third of the program must be in engineering design, and one-third in one of, or a combination of, advanced math, computer sciences, basic sciences, or engineering sciences.

THE DOCTORAL PROGRAM

The Ph.D. degree with a major in Electrical Engineering may be pursued in the areas of circuit theory, electronics, communication theory, electromagnetic theory, plasma engineering, power systems, solid-state electronics, and control systems.

Specific departmental requirements for the Ph.D. degree include the following:

1. A minimum of 72 quarter hours of course work excluding thesis, research, and dissertation credit.

2. A minimum of 36 quarter hours of course work in doctoral dissertation.

3. One foreign language if the student's faculty committee feels that a reading knowledge of a foreign language is crucial to the student's research efforts.

4. Satisfactory performance on both a written and an oral preliminary examination.

5. Participation in departmental seminars.

The 72 quarter hours of course work must satisfy the following requirements:

a. A minimum of 36 quarter hours of work in electrical engineering at the 5000 and 6000 levels.

b. A minimum of 12 quarter hours of 6000-level course work. At least 3 quarter hours of this work must be in an area other than the student's major area.

c. At least 30 quarter hours of mathematics at the 4000-level or above. Mathematics (or Physics) 5810-20-30 is usually required.

Courses required in the electrical engineering undergraduate curriculum cannot be used in either the M.S. or Ph.D. programs. In addition, 4000-level courses in electrical engineering may not be used if 5000-level courses are available in the same area.

Many of the electrical engineering courses are offered in the evening. Engineers working in industry are encouraged to participate in the department's graduate program.

Departmental graduate programs providing special opportunities for academic and research work in areas pertinent to atmospheric and space flight are also available at the Space Institute, Tullahoma.

3010 Transient Analysis (3) Analysis of transient response of systems and networks; use of Laplace transform method for the solution of linear differential equations; methods for system analysis; introduction to feedback theory; stability criteria. Prereq: Circuits III.


3810 Electronics I—Basic Electronic Processes (3) Current conduction in semiconductors and high voltage breakdowns, characteristics of diodes; rectifiers and diode switches. Prereq: Circuits III, 3040 concurrently. 4 labs.

3820 Electronics II—Basic Electronic Devices (3) Characteristics and equivalent circuits of vacuum tubes and transistors with application to amplifier and control circuits. Prereq: 3810. 4 labs.

3830 Electronics III—Basic Electronic Amplifiers (3) Vacuum tube and transistor RC- and RL-coupled amplifiers; tuned amplifiers; basic power amplifiers; bias stability, feedback. Prereq: 3810 and 3820. Coreq: 3720. 4 labs.

4520 Direct Electrical Energy Conversion (3) Basic principles, typical devices and applications for the production of electrical energy by thermoelectric effects, thermionic conversion, magnetohydrodynamics, solar cells, and fuel cells. Laboratory demonstrations. Prereq: 3520, 3190, 3810, and Mechanical Engineering 3530.

4680 Microwave Circuits and Electronics (3) Circuits represented by wave scattering, isolators, gyrotrons, couplers, microwave vacuum diodes and klystrons, crossed field devices, parametric amplifier and oscillator, microwave filters and resonators, varactor semiconductors. Prereq: 3060. 4 labs.

4990 Propagation II (3) Metal tube, dielectric rod, and stripline waveguides. Waveguide resonators and other loading components. Design of structures utilized for microwave power transmission and for microwave integrated circuits. Prereq: 3060. 4 labs.


4200 Electromagnetic Field Transients (3) Pulse propagation on lines, reflection of pulses, line constants, radiation of pulses from antennas. Prereq: 3060. 4 labs.


4410 Power System Components and Control (3) Analysis of power system components and their interconnection. Studies in control of power systems, their transient behavior, as well as voltage and reactive power. Prereq: 3090.

4420 Power Systems Analysis (3) System studies including load flow, faults, and stability. Prereq: 3090.

4430 Transmission, Distribution, and Protection (3) Studies in underground and d.c. transmission; consideration of over-voltages and insulation requirements; system protection against faults. Prereq: 3090.

4460 Bioelectric Instrumentation (3) Nature and origin of bioelectric potentials, transducers, amplifier requirements, recording systems, and noise problems.

4680 Electronic Power Amplifiers (3) Transistor and vacuum-tube power amplifiers; distortion, thermal considerations; r.f. amplifier; regulators. Prereq: 3850. 4 labs.

4690 Communications Electronics (3) Oscillators, modulation and demodulation; basic communication systems. Prereq: 3850. 4 labs.

4700 Switching Circuits (3) Pulse amplification, gating control, and pulse-shaping circuits, trigger circuits. Prereq: 3010 and 3830. 4 labs.

4740 Integrated Circuits (3) Processing and fabrication of active and passive components for monolithic and hybrid circuits. The design of linear and digital monolithic and hybrid circuits packaging, reliability, and large scale integration. Prereq: 3820.


4799 Hardware-Software Interface in Microcomputer and Microprocessor System Design (3) Presents minicomputer and microprocessor interface design. Hardware-software interfacing and trade-off. Priority interrupt structures are discussed and utilized. Telecommunications are developed. Project-oriented course, Completion of two projects, one utilizing a minicomputer and the other a microcomputer, are minimal course requirements. Prereq: 3180 or consent of instructor.

4800 Bioengineering Systems I Models, Systems Analysis and Simulation (3) Modeling techniques applied to physiological systems. Systems properties of resistance, impedance, and storage are investigated. Analog and digital simulation of biological systems. Prereq: 4370 or consent of Instructor.

4810 Discrete-Data Systems (3) Introduction to the analysis and design of discrete data control systems using frequency domain techniques. Real-time digital filtering techniques; application of digital computers in closed-loop feedback systems.

4820 Introduction to Pattern Recognition (3) Role of pattern recognition within the framework of artificial intelligence. Principal topics dealing with the design of learning and adaptive machines. Typical applications of pattern recognition in biological significance. Computer simulation and elementary pattern recognition problems. Prereq: Either 3100 and Computer Science 3150, or Statistics 3450 and Introduction to Computer Science.

530 Basic Requirements for Plasma Fusion (3) An historical study of fusion systems in nature. The Lawson break-even criterion. Inertial fusion systems—the hydrogen bomb, laser fusion, and electron-beam fusion. Magnetically-confined plasma systems, including the tokamak, mirror models, and exotic systems. Confinement, stability, and heating. The possibility of fusion-fission hybrids. Prereq: Consent of instructor or plasma engineering or plasma physics background or employment in fusion work.


5360 Application of Quantum Electronic Devices (3) Coherence properties of laser radiation. Diode lasers, semiconductors, gas lasers, and laser systems. Laser applications in communication and instrumentation systems. Specific application examples: plasma diagnostics for emission spectroscopy, optical harmonic generation, holography, metal-working, and biological and medical applications. Prereq: 5340 and Mathematics 4710 or equivalent.

5370 Advanced Direct Electrical Energy Conversion I (3) Theory, latest devices and applications for production of electrical energy by the solid state means of thermoelectric and photovoltaic effects. Prereq: 4020 or Mechanical Engineering 4150 or equivalent, or consent of instructor.

5420 Fault and Load Flow Studies (3) Analysis of a power system under both shunt and series condition. Computer methods for fault studies are included. The load flow problem is formulated with computer methods emphasized. Prereq: 5410 or consent of instructor.


5440 Distribution Systems (3) Electric power distribution with particular reference to utility systems. System growth and overload analysis, operation, and regulation. Prereq: 4410, 4420, 4430 or equivalent.

5460 Selected Topics in Power Systems (3) Courses will be offered to meet special needs of students. Possible topics: (1) power systems reliability, (2) interconnected system theory, (3) power plant operation, (4) electric, negative-resistance circuits, time-base power system relaying. Prereq: Consent of instructor. May be repeated with consent of department.

5510-20-30 Linear Active Circuits (3, 3) Analysis and design of linear amplifiers; includes a mathematical treatment of active devices and equivalent circuits. Sources of distortion, wide-band and pulse amplifiers, and a detailed treatment of feedback amplifiers using: power-amplifier and root-root techniques. Types include audio, video, pulse, driver, operational, and distributed amplifiers. Coreq: Mathematics 4510 or 4710.

5540 Thick-Film Hybrid Microcircuits (3) Processing and design techniques for prototype production of hybrid thick-film integrated circuits; all aspects from circuit design through packaging. Covers properties of thick-film pastes; consideration of cost-effective design techniques. Project oriented, includes biweekly laboratory.

5570-80-90 Electronic Switching Circuits (3, 3) Switching circuits using active devices; includes clipping circuits, clamping circuits, comparator circuits, logic circuits, multivibrators, and clocking generators. Fundamentals of active and passive networks. Prereq: 5540.


5650-60 Electronic Communication Systems (3, 3) Theory of information transmission in communications systems; mathematical treatment of modulation and demodulation in analog and pulse-type systems. Bandwidth requirements, noise, and effects of noise. All modern systems are considered and compared with emphasis on digital data systems. Prereq: 5710.

5670-80 Pattern Recognition (3, 3) (Same as Computer Science 5640-50.)

5690 Artificial Intelligence (3) (Same as Computer Science 5620.)

5710 Random Process Theory for Engineers (3) Probability and random variables as approaches by set theory. Statistical averages and transformations of random variables. Random processes, stationarity, correlation functions and temporal analysis, power spectrum and spectral analysis as applied to response of systems to random signals.


5740 Digital Processing of Signals (3) Analysis of discrete signals; sampling theorem and its implications: frequency domain design of digital filters; random domain design of digital filters; quantization effects; processing of digital signals; discrete Fourier transform. Prereq: 4100 or equivalent.


5770 System Identification (3) Presentation of various identification schemes including deterministic, stochastic, and hierarchical methods. This course has particular applications in all areas of engineering and science. Prereq: Consent of instructor.

5800 Power Transmission Lines (3) New and unconventional power transmission systems. Transmission and transmission systems. Conventional and underground lines. Corona and radio interference of high voltage transmission. Insulation coordination and comparison of different types for high voltage transmission. Prereq: 4410-20-30 or equivalent.

5810-20 Electromagnetic Fields (3, 3) Vector analysis, Maxwell's equations, special relativity, plane waves, reflections, waves in anisotropic media, guided waves, rectangular and cylindrical wave guides, radiation from current elements. Coreq: Mathematics 4510 or 4710.

5830 Linear Antennas and Antenna Arrays (3) The Hertzian dipole, linear antennas, impedance loop antennas, receiving antennas, linear arrays. Prereq: 5820.

5840 Aperture Antennas (3) Huygens principle, equivalent currents, Fourier transform and optical techniques, Huygens principle, and aperture antennas. Prereq: 5820.

5850 Microwave Electronics (3) Space charge waves on electron beams, coupling between beams and guided waves, Klystrons, magnetron operation, traveling and standing wave oscillators. Prereq: 5820.

5860 Electromagnetic Wave Propagation (3) Supplementary studies in wave propagation in anisotropic and anisotropic media, transmitted power, stored energy, propagating and non-propagating modes, orthogonality properties,
boundary and radiation conditions, sources. Prereq: 5820.

5870 Introductory Microwave Networks (3) Circuit equivalents for n-port, junctions, obstacles, loading and fillings. One way and two way devices, directional devices, parameter measurement, reflection charts. Prereq: 5810. Coreq: 5820.

5940-50 Advanced Small Computer Systems (3, 3) Real-time applications, memory and CPU organization, interface software, and peripheral devices of minicomputer and microprocessor system are studied. Courses are project-oriented and supported by hardware and software interface design. Prereq: 4850 or equivalent or consent of the Instructor. (Same as Computer Science 5940-50.)

6000 Doctoral Research and Dissertation


6760 Coding Theory (3) Presentation of the mathematical systems of encoding and probabilistic codes. Included are coding metrics and bounds, linear codes, linear feedback shift registers, convolutional codes, burst-error-correcting codes and decoding methods. Prereq: 5090 or consent of instructor.


Note: All of these courses will not be offered during any one year.

Engineering Science and Mechanics

MAJOR DEGREES

Engineering Science M.S., Ph.D.


Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy with a major in Engineering Science are available to graduates of recognized curricula in engineering, mathematics, or one of the physical or biological sciences. Program options include solid mechanics, fluid mechanics, biomechanical engineering, and other engineering sciences. In the biomedical and engineering science option, interdisciplinary programs are arranged to meet individual needs or interests. Each applicant will be advised as to any prerequisite courses before entering a program; the student's program of study must be approved by his/her advisory committee, and must comply with the requirements of the Graduate School. The student's major professor may be selected from the Department other than the Department of Engineering Science and Mechanics.

The flexibility and interdisciplinary aspects of the program options are intended to be of particular interest to prospective students currently employed in research, development, or design activities and whose interests in continuing education (either full-time or part-time) lie at one of the interfaces between science and engineering, or can best be met by interdisciplinary study in engineering. The department's course offerings and research activities are also intended to meet the needs of students who seek preparation for employment in engineering areas requiring specialization in mechanics, or in related interdisciplinary studies such as biomechanics.

THE MASTER'S PROGRAM

Two M.S. plans are offered: Plan I requires a thesis, while Plan II does not. The second plan is offered to meet the needs of engineers, or others in industry, or those who plan to teach in community colleges and technical institutes. It will be available, however, to any student who, in the opinion of his/her advisory committee, can benefit from additional course work more than from work on a thesis.

In Plan I a minimum of 45 quarter hours, including the thesis, is required. In Plan II a minimum of 48 hours is required. The requirements include the following:

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Mathematics

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Engineering courses (Major option; may include but is not restricted to courses offered by the engineering science and mechanics department.)

Related courses (May Include additional courses in mathematics, computer science, or the physical sciences, or life sciences as well as engineering courses.)

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12

Thesis

9

*Engineering courses under Plan II may include advanced laboratory work or specific problem work, for example Engineer- ing Science and Mechanics 5910 or analogous courses in other departments. A final examination is required under both plans, covering graduate coursework and the thesis (if any).

THE DOCTORAL PROGRAM

General policies and requirements of the Graduate School relating to admission, residence, language, research examinations, faculty advisory committee, and admission to candidacy apply to this program.

Specific departmental requirements for the Ph.D. degree include:

1. A minimum of 108 quarter hours credit beyond the Bachelor's degree, ex-
3420 Introduction to Clinical Engineering (3)

3430 Perspectives on Medical Ceramics (3)

3440 Biomedical Fluid Mechanics (3)

3450 Biomechanics of Materials (3)

3460 Experimental Stress Analysis (3)

3470 Dynamics (3)

3480 Orthopedic Biomechanics (3)

3490 Medical Ceramics Laboratory (1)

3500 Materials Behavior and Chemical Process Equipment Design (Same as Metallurgical Engineering 3320.)

3510 Intermediate Dynamics (3)

4200 Engineering Aspects of Infection Control (3)

4300 Applied Mechanics for Life Scientists (4)

4430 Orthopedic Biomechanics (3)

4500 Applied Mechanics for Life Scientists (4)

4520 Biomedical Fluid Mechanics (3)

4530 Biomechanics (3)

4550 Applied Mechanics for Life Scientists (4)

4560 Biomechanics of Materials (3)

4580 Biomedical Fluid Mechanics Laboratory (2)

4710 Fundamentals of Vibrations (3)

4780 Engineering Acoustics (3)

4810-20 Engineering Analysis (4, 3)

5130 Introduction to Turbulence (3)

5200 Biomedical Fluid Mechanics (3)

5300 Biomechanics (3)

5450 Statics and Strength of Materials (3)

5470 Finite Element Structural Analysis (3)

5610 Fluid Dynamics (3, 3)

5620 Mechanics of Viscous Flow (3)

5630 Introductory Thermodynamics (3)

5640 Introductory Photomechanics (3)

5650 Elementary Structural Matrix Methods (4)

5660 Elementary Structural Matrix Methods (4)

5670 Dynamics and 3rd quarter Elementary Linear Algebra and Calculus of Several Variables.


5700 Introduction to other stress analysis methods. Preq: Mechanics of Materials, Circuits II, or Electronic Circuits—Circuits and Fields. 2 hrs and a 3-hr lab.

5760 Time Domain Analysis of Structural Systems (3)

5810 Fluid Dynamics (3, 3, 3) Kinematics of fluids, vorticity, rate deformation, plane and axisymmetric problems, and recording of streamlines. The Navier-Stokes equation, exact solutions, creeping flow and boundary-layer approximations; nonviscous flow, potential theory, complex potentials, conformal mapping. Prreq: 5800.

5900 Non-Thesis Graduation Completion (3-15)

5910 Introduction to Turbulence (3) Macroscopic effects, analogies, statistical treatment, correlation function and diffusion equation; application of turbulent jets and pipe flow. Prreq: 5800.

5920 Fluid Mechanics (3)

6100 Mechanics of Viscous Flow (3) Role of viscous forces in flow phenomena; application of the Navier-Stokes equations; emphasis on...
Numerical methods of solutions; introduction to stress-optic methods of laminar flow analysis. Prereq: Mathematics 4610. (Same as Chemical Engineering 5810.)

5320 Non-Newtonian Fluid Mechanics (3) (Same as Polymer Engineering 5230.)


5410-20 Theory of Elasticity (3, 3) Stress, strain, stress-strain; torsion and bending of prismatic bars; isometric stress distribution; stress concentration; plane stress, plane strain. Prereq: 5300.

5430 Thermal Stresses (3) Review of heat conduction; thermoelastic equations; thermal stresses in beams, rings, plates, and shells; thermal buckling problems. Prereq: 5410 or 5310-20-30, and Heat Transfer.

5440 Theory of Linear Viscoelasticity (3) Introduction to the concepts of linear viscoelasticity of solids; quasistatic problems; vibrations problems; dynamic problems; stability problems. Prereq: Mathematics 4610 or Mechanical Engineering 4730 or Mechanical Engineering 5540.

5560 Introductory Finite Element Methods (3) Introduction to the finite element method; variational and Galerkin methods; programing concepts. Applications to stress analysis, heat transfer, fluid flow, and solidification of differential equations. Prereq: 5580 or 5310, or Mechanical Engineering 5540, or consent of instructor.

5910 Special Topics in Engineering Mechanics (3) Mechanics problems related to recent developments. Prereq: Consent of Instructor. May be repeated with consent of department.

6000 Doctoral Research and Dissertation

6110-20 Advanced Topics in Fluid Mechanics and Convective Transfer (3, 3) Critical survey of literature on advanced convective momentum, heat, and mass transfer; boundary layer theory based on the Navier-Stokes equations; boundary layer stability analysis; phenomenological theories of turbulence; turbulent boundary layer flow; high speed flow of phenomena in nonequilibrium and reacting systems. Prereq: 5110-20-30 or equivalent; Mathematics 4610, 4540-50, 4710. (Same as Environmental Engineering and Mechanical Engineering 6110-20.)

6230-40-50 Theory of Turbulence (3, 3, 3) Mathematical description of turbulence; isotropic turbulence; energy spectra, Kolmogoroff's hypothesis, direct and inverse energy flow; body structure by turbulent flows; turbulent diffusion by continuous movement; applications to turbulent jets, wakes, and boundary layers. Prereq: 5110-20-30. Coreq: Mathematics 5610-20-30.

6310 Theory of Plates (3) The classical theory of bending of plates of various shapes; thick plates; plate vibertions; buckling and other large deflection problems. Prereq: 5310-20-30.


6340 Theory of Plasticity (3) Yield conditions; strain hardening; constitutive equations; plastic potential; uniqueness theorems; extremum and variational principles; problems in perfectly plastic finite plastic deformations; piecewise linear plasticity. Prereq: 5410 and Mathematics 4550.

6610 Photoelasticity (3) The stress-optic law in three dimensions and index ellipsoid, rotational effects in three-dimensional photoelasticity, techniques and applications of three-dimensional photoelasticity, scattered light method, dynamic photoelasticity, photothermoelasticity and photoviscoelasticity, recent developments in photoelasticity. Prereq: 5560, 5420 and consent of instructor. 2 hrs and 3 labs.

6710 Impact and Stress Waves in Solids (3) Mechanical properties of solids; wave propagation in elastic solids; impact and waves in elastic rods, beams, and plates; contact problems in impact of elastic bodies; dynamic loading in viscoelastic and plastic materials; dynamic properties and materials. Prereq: 5410. Coreq: Mathematics 5630.

6800 Advanced Continuum Mechanics (3) Prereq: CHEM 5110 or MECH 5410, or METALLURGICAL ENGINEERING 5410, or consent of instructor. (Same as Polymer Engineering 6210.)


6910 Special Topics in Engineering Mechanics (3) Selected advanced problems of current interest in mechanics, worked either as a group or individually. Prereq: Consent of Instructor. May be repeated with consent of department.

Note: Not all of the above graduate courses will be offered in any one year.

**Industrial Engineering**

**MAJOR DEGREE**

**Industrial Engineering**

**M.E., M.S.**

**Professors:**

J. N. Snider (Head), Ph.D., Ohio State, P.E.;

D. C. Doufet, M.S., Tennessee, P.E.;

H. P. Emerson (Emeritus), S. B., Massachusetts Institute of Technology, P.E.;

R. E. S. M., Georgia Institute of Technology, P.E.;

E. L. Deporter, Ph.D., Virginia Polytechnic Institute, P.E.;

E. L. Deporter, Ph.D., Virginia Polytechnic Institute, P.E.;

M. K. Goodman, M.S., Tennessee, P.E.

**THE MASTER'S PROGRAM**

A graduate program leading to the degree of Master of Science is open to graduates of recognized undergraduate curricula in industrial engineering or to graduates of other engineering curricula who take up to 15 quarter hours of prerequisite course work. A non-thesis option with 45 hours of course work plus a 3-hour design project is available.

Graduate work in Industrial Engineering provides for concentrations in operations research, human factors, systems engineering, reliability, work measurement, facility planning and engineering economy. Either one or two minors can be elected in Engineering, Mathematics, Psychology, Business, Computer Science, Statistics or Economics.

**MASTER OF ENGINEERING PROGRAM**

This professional degree program is intended as a culmination year in a five year baccalaureate-master program which emphasizes engineering design and professional practice. Admission requirements include those presented above plus the requirement of a bachelor's degree from an ECPD-accredited engineering program. This 45-quarter hour program requires 18 hours of course work in an industrial engineering core, 9 hours of technical methods electives, 9 hours of industrial engineering design electives and a 9-hour thesis or design project.

**4060 Material Requirements System Design**

A. Theory and applications of forecasting, production planning, inventory analysis, planning, and control, and systems design and implementation. Design of the material require-
4080 Forecasting Methods in Industrial Engineering (3) Application of statistical forecasting techniques to industrial engineering problems. Includes moving averages and exponential smoothing, linear and polynomial regression models, autocorrelated time-series analysis, Delphi methods and other selected indirect forecasting methods. Prereq: 4520.

4150 Project Control with CPM and PERT (3) A study of project planning and control based primarily on "critical path" techniques, including resource allocation, time-cost trade-off algorithms, multi-project control, and computer programs. Prereq: Statistics 3450.


4170 Automatic Process Control (3) Characteristics and applications of automatic process controllers; elementary open and closed loop analysis, and applications to industrial control systems. Introduction to Differential Equations, and Dynamics.

4230 Scheduling Systems (3) Performance measures for job shop and flow shop scheduling, including both static and dynamic conditions. Techniques for generating production schedules. Deterministic and probabilistic dispatching conditions. Prereq: Industrial Operations Research I and II.

4240 Predetermined Time Systems (3) Work design and measuring using a predetermined time system such as methods time measurement, basic motion time-study, or work factor. Theory and application. Prereq: Work Measurement.

4250 Work Measurement Applications (3) Application of learning curves, queuing theory, standard data methods and incentive systems to the design of industrial work situations. Prereq: Work Measurement.

4252 Engineering Economy (3) Methods and principles of evaluating the cost of replacement equipment. Decisions among engineering alternatives, involving capital recovery, economic life, and other factors. Prereq or coreq: Statistics 3450. Not available for graduate credit for industrial engineering students.

4529 Case Studies in Engineering Economy (3) Extension of basic engineering economy principles to actual problems faced by competitive firms and regulated industries. Case studies taken from literature form basis of classroom discussion. Out-of-class assignment is made which involves working with local companies to evaluate, make or buy options, leasing versus cash purchases, equipment replacement studies, energy source economics, etc. Prereq: 4520.

4540 Industrial Development (3) Factors other than mechanical or chemical which enter into the successful establishment of manufacturing enterprise. Cost and location studies and marketing aspects of the commercial feasibility of new plants or projects.

4590 Simulation (3) Generation of outcome of a complex random process by computer. Models of complex systems using available simulation languages including the development of a design tool in industrial systems. Prereq: Computer Science 3150.

4830 Health Systems Engineering (3) A study of statistical techniques and decision models by which they may be improved through the application of modern industrial engineering principles and techniques. Prereq: Work Methods and Design.


5010-20-30 Special Industrial Engineering Topics (3) Open with consent of instructor. May be repeated.

5090 Industrial Safety (3) Development of organization and techniques for prevention of industrial accidents with emphasis on OSHA Rules and Regulations.

5000 Thesis

5002 Non-Thesis Graduation Celebration (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be repeated. S/NC only.

5110 Work Design (3) Advanced methods of analyzing the design and improvement of work systems. Topics include job analysis, worker response and management participation. Prereq: Motion and Time Study or Work Methods and Design.

5210 Advanced Work Measurement (3) Characteristics of some of the better known pre-planning, basic motion time-study, or work factor. Theory and application. Prereq: Work Measurement.


5260 Information Systems Design (3) Systems engineering approach to information systems design. Topics include the system model, analysis and evaluation of information systems, information objectives and design criteria. Use of optimization and simulation in system design will be emphasized.

5340 Applied Decision Theory (3) Application of the theory of decision making to problems in industrial engineering. Approaches to decision making under conditions of incomplete information. Bayesian and Neyman-Pearson statistical decision models, utility functions, value of information, linear and quadratic loss analysis and parallel and sequential decision processes. Prereq: 4520.


5520 Advanced Engineering Economy (3) Review of basic engineering economy principles.

5610 Human Factors Engineering (3) The human operator, his performance characteristics, and his environmental requirements. Emphasis is given to the formal description of the human operator's transfer characteristics through both classical linear models and models describing the operator as an information processor. Prereq: 4810 or 5600.

5700 Optimization Methods in Industrial Engineering (3) An introductory course in operations research. Applications of classical optimization theory. Topics include linear programming, quadratic programming, and dynamic programming. Applications include computer solutions for transportation and transshipment problems. Prereq: Computer Science 3150 and Matrix Algebra.

5710 Linear, Quadratic and Dynamic Programming (3) An introduction to mathematical programming. Topic includes linear programming, quadratic programming, and dynamic programming. Applications include computer solutions to linear programming problems. Prereq: Computer Science 3150 and Matrix Algebra.

5720 Queuing Models, Inventory, and Simulation (3) Waiting line models and the analysis of inventory systems. Development of simulation methods and computer simulations applied to dispatching, inventory models and decision making. Prereq: 5760.


5830 Health Systems Engineering II (3) Specific functions of health systems are analyzed for analysis, control and improvement of the function and the total health system. Prereq: 4830.


5860 Industrial Systems Engineering (3) State variables and simulation of both continuous and discrete systems. Computer methods for systems analysis. Introduction to system optimization techniques. Case studies in systems design. Prereq: 4860 or equivalent.
5900 Design Project (1-9) Study of an industrial engineering topic to fulfill the design project requirement in the nonthesis program. Enrollment limited to industrial engineering students in non-thesis program. May be repeated. Maximum 9 hrs.

5910-20-30 Special Topics in Industrial Engineering (3, 3, 3) Special problems for students who are qualified to do individual or group research projects. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.


6520 Operations Research Models in Engineering Economy Decisions (3) Review of traditional capital planning and budgeting techniques. Analysis and application of operations research approaches to capital budgeting problems with an emphasis on mathematical programming and computer simulation. Interrelated projects, uncertain cash flows, and choice of optimal evaluation criteria are considered. Prereq: 5520, 5710.

6700 Nonlinear Programming (3) Development of optimization techniques for static and dynamic systems subject to various constraints. Emphasis will be given to applying optimization theory to solve nonlinear optimization problems. Topics include variable metric methods, search methods, constrained nonlinear programming, and penalty function methods. Prereq: 5700.

6730 Dynamic Programming (3) Techniques for solving multistage optimization problems as a sequence of single-stage optimization problems. Emphasis will be given to the computational as well as the theoretical aspects of dynamic programming. Decision making under certainty and under risk will be considered. Prereq: 5710.

6740 Advanced Topics in Optimization of Dynamic Systems (3) Advanced topics in multistage optimization theory. Topics include state dependent dynamic programming, adaptive optimization theory, and other selected topics. Prereq: 6730.

6910 Advanced Topics in Industrial Engineering (3) Selected topics of current interest. Topics will cover those not covered in other graduate courses and will provide a forum for advanced graduate students to study individually or in a group as appropriate. Students will act as instructor and graduate assistant. May be repeated with consent of department.

Mechanical and Aerospace Engineering

MAJORS

Aerospace Engineering M.E., M.S., Ph.D.
Mechanical Engineering M.E., M.S., Ph.D.

Graduate courses include those not covered in other undergraduate curricula in recognized undergraduate curricula in mechanical or aerospace engineering and to qualified graduate students who satisfy the necessary prerequisites. Three program options (thesis, course, and problems) are described below. Note that some students may not be eligible for the course option.

THE MASTER'S PROGRAMS

Entrance into the Master of Science program is available to qualified graduates of recognized undergraduate curricula in mechanical or aerospace engineering and to qualified graduate students who satisfy the necessary prerequisites. Three program options (thesis, course, and problems) are described below. Note that some students may not be eligible for the course option.

MASTER'S PROGRAM OPTIONS

Three program options are available:

1. The Thesis Option The requirements of this option are that the student must satisfactorily complete a program of study that includes:

   1. A minimum of 36 quarter hours of course work which includes at least 18 quarter hours of graduate (5000-level or above) courses in mechanical and/or aerospace engineering and normally 9 quarter hours of course work (4000-level or above) in mathematics.

   2. A minimum of 9 quarter hours credit in Selected Engineering Problems (5900). A written report must be presented for each problem investigated.

   3. Participation in the departmental seminar program.

   4. Passing a comprehensive written final examination on all course work submitted for the degree and an oral examination on all work (including problems) submitted for the degree.

2. The Course Option Normally, this program is restricted to those students who have had significant engineering work experience. The evaluation of the work experience and the final selection of the student's program of study are left to the student's committee. The requirements of this option are that the student must satisfactorily complete a program of study that includes:

   1. A minimum of 45 quarter hours of course work which includes at least 27 quarter hours of graduate (5000-level or above) courses in mechanical and/or aerospace engineering and normally 9 quarter hours of course work (4000-level or above) in mathematics. No more than 3 quarter hours of engineering course work may be below the 5000 level.

   2. Participation in the departmental seminar program.

   3. Passing a comprehensive written final examination on all course work submitted for the degree. The student's committee will be of sufficient size to include all the study areas reflected in the course program.

3. The Problems Option The requirements of this option are that the student must satisfactorily complete a program of study that includes:

   1. A minimum of 36 quarter hours of course work which includes at least 18 quarter hours of graduate (5000-level or above) courses in mechanical and/or aerospace engineering and normally 9 quarter hours of course work (4000-level or above) in mathematics.

   2. A minimum of 9 quarter hours credit in Selected Engineering Problems (5900). A written report must be presented for each problem investigated.

   3. Participation in the departmental seminar program.

   4. Passing a comprehensive written final examination on all course work submitted for the degree and an oral examination on all work (including problems) submitted for the degree.

THE DOCTORAL PROGRAM

Admission into the doctoral program will be granted to those applicants who have demonstrated superior achievement in their engineering backgrounds.

The student must satisfactorily complete an approved program of study which normally includes:

1. A minimum of 72 quarter hours credit beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or problems.

2. A minimum of 36 quarter hours credit in doctoral dissertation.

3. A minimum of 18 quarter hours in mathematics in courses numbered 4000 or above.

4. A minimum of 36 quarter hours in mechanical and/or aerospace engineering courses numbered 5000 and above, with at least 12 quarter hours of 6000-level thesis which demonstrates the ability to conduct and report on an independent investigation.

Associate Professors:


Assistant Professors:


GRADUATE STUDY PROGRAMS

Graduate programs in Mechanical Engineering or Aerospace Engineering are available which lead to the degrees of Master of Engineering, Master of Science, and Doctor of Philosophy. In addition to the general policies and requirements of the Graduate School each student must satisfactorily complete a program of study which has been approved by the student's committee. Details of program requirements are given below.

MASTER OF ENGINEERING PROGRAMS

Entrance into the Master of Engineering program is restricted to qualified graduates of ECPD-accredited undergraduate curricula in mechanical or aerospace engineering. At least one-third of the program of study must be classified as engineering design. The student's advisor will assist in planning the program of study to ensure that it includes the necessary design content.

Three program options (thesis, course, and problems) are described below. Note that some students may not be eligible for the course option.

THE MASTER'S PROGRAMS

Entrance into the Master of Science program is available to qualified graduates of recognized undergraduate curricula in mechanical or aerospace engineering and to qualified graduate students who satisfy the necessary prerequisites. Three program options (thesis, course, and problems) are described below. Note that some students may not be eligible for the course option.

MASTER'S PROGRAM OPTIONS

Three program options are available:

1. The Thesis Option The requirements of this option are that the student must satisfactorily complete a program of study that includes:

   1. A minimum of 36 quarter hours of course work which includes at least 18 quarter hours of graduate (5000-level or above) courses in mechanical and/or aerospace engineering and normally 9 quarter hours of course work (4000-level or above) in mathematics.

   2. A minimum of 9 quarter hours credit in Selected Engineering Problems (5900). A written report must be presented for each problem investigated.

   3. Participation in the departmental seminar program.

   4. Passing a comprehensive written final examination on all course work submitted for the degree and an oral examination on all work (including problems) submitted for the degree.

2. The Course Option Normally, this program is restricted to those students who have had significant engineering work experience. The evaluation of the work experience and the final selection of the student's program of study are left to the student's committee. The requirements of this option are that the student must satisfactorily complete a program of study that includes:

   1. A minimum of 45 quarter hours of course work which includes at least 27 quarter hours of graduate (5000-level or above) courses in mechanical and/or aerospace engineering and normally 9 quarter hours of course work (4000-level or above) in mathematics. No more than 3 quarter hours of engineering course work may be below the 5000 level.

   2. Participation in the departmental seminar program.

   3. Passing a comprehensive written final examination on all course work submitted for the degree. The student's committee will be of sufficient size to include all the study areas reflected in the course program.

3. The Problems Option The requirements of this option are that the student must satisfactorily complete a program of study that includes:

   1. A minimum of 36 quarter hours of course work which includes at least 18 quarter hours of graduate (5000-level or above) courses in mechanical and/or aerospace engineering and normally 9 quarter hours of course work (4000-level or above) in mathematics.

   2. A minimum of 9 quarter hours credit in Selected Engineering Problems (5900). A written report must be presented for each problem investigated.

   3. Participation in the departmental seminar program.

   4. Passing a comprehensive written final examination on all course work submitted for the degree and an oral examination on all work (including problems) submitted for the degree.

THE DOCTORAL PROGRAM

Admission into the doctoral program will be granted to those applicants who have demonstrated superior achievement in their engineering backgrounds.

The student must satisfactorily complete an approved program of study which normally includes:

1. A minimum of 72 quarter hours credit beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or problems.

2. A minimum of 36 quarter hours credit in doctoral dissertation.

3. A minimum of 18 quarter hours in mathematics in courses numbered 4000 or above.

4. A minimum of 36 quarter hours in mechanical and/or aerospace engineering courses numbered 5000 and above, with at least 12 quarter hours of 6000-level
GRADUATE CREDIT FOR UNDERGRADUATE COURSES

Junior (3000-level) and senior (4000-level) aerospace engineering courses may be taken for graduate credit by non-mechanical or non-aerospace engineering majors, if approved by the student's major department. Mechanical or aerospace engineering majors may normally use more than one 4000-level course to meet their advanced degree requirements. Non-mechanical or non-aerospace engineering graduate students should consult with instructors regarding prerequisites for undergraduate courses.

Mechanical Engineering

3000 Energy—An Overview (4) Introduction to available energy resources, recovery and utilization; renewable techniques, including conservation schemes; emphasis on the resources-environment-interaction interaction associated with energy; primarily for non-engineering students.

3110 Applied Engineering Thermodynamics (3) Energy and laws governing energy transformations; thermodynamic properties; applications to engineering problems. Prereq: College physics and calculus.

3311 Engineering Thermodynamics (3) Energy and laws governing energy transformations; thermodynamic properties. 3330 Engineering Thermodynamics (3) Properties of gases and gas mixtures; chemical reactions; equilibrium; applications to mechanical engineering problems.

3410 Fluid Flow (3) Development of continuity, momentum and energy principles for fluid systems; applications to mechanical and aerospace engineering problems.

3440 Heat Transfer (3) Heat transfer processes, heat conduction, thermal radiation. 3520-30-40 Thermal Sciences (3, 3, 3) Fundamental principles of thermodynamics and transport phenomena as applied to engineering design. To be taken in sequence.

3610 Mechanics of Machinery—Kinematics (3) Motion, graphs and analytical methods; instantaneous centers; velocities; accelerations. 3620 Mechanics of Machinery—Dynamics (3) Newton's laws; work, energy, impact; single degree vibrating systems.


3650 Introduction to Machine Design (3) Ductile-brittle behavior of materials under static and cyclic loading. Stress concentration, design factors and theories of failure. Changes in material behavior in processing and fabrication. 2 hrs and 1-2 hr lab.

3660 Manufacturing Processes (3) Selection of processes as related to the design of machine parts, including castings, wrought, hot and cold forming, metal removal and welding. Manufacturing tolerances and surface finishes. 2 hrs and 1-2 hr lab.

3910 Engineering Analysis (3) Advanced analysis techniques for problems of aerospace and mechanical engineering. Emphasis on approximate methods.

4140 Energy Conversion Systems (3) Laws governing energy transformations and their application to power plants. 4150 Energy Conversion Systems (3) Operating and design characteristics of new technology energy conversion systems, selected direct conversion techniques.

4160 Energy Conversion Systems (3) Economic and technical design parameters as applied to power plants for public utilities or industrial applications. Selected design and layout problems for systems.

4170 Turbomachinery (3) Basic principles of turbomachinery; systematic methods or analysis, design performance evaluation.

4180 Energy Production and Utilization (3) Thermodynamic constraints on energy production; comparison of power generation methods; evaluation of new energy sources and concepts; energy conservation schemes.

4220 Environmental Noise (3) Basic principles of acoustics—measurement and control of noise in industrial and community environments.

4240 Heat Transfer (3) Heat transfer by free and forced convection, heat transfer in phase change, heat transfer in high speed flow, heat exchanger applications.

4450 Lubrication (3) Hydrodynamic theory of lubrication of sliding bearings; application of Navier-Stokes equations to infinite and finite bearings; analytical and numerical solutions; applications to design.

4471-91 Experimental Mechanical Engineering (3, 3, 3) Experimental methods and measurement of force, length, time, temperature, pressure, transport rates, and physical properties. Planning, conducting, analyzing, and reporting of experimental tests run according to test standards and other specifications.

4510 System Dynamics (4) Analytical models of physical systems, linearization, Laplace transforms, dynamic characteristics and stability of systems, numerical simulations, and analog computer solutions. Not for departmental graduate credit.

4520-30-40 Thermal Environmental Systems (3, 3, 3) Design of heating ventilation and air conditioning systems. 4570 Thermal Environmental Systems (3) Descriptive analysis of air washers, cooling towers and extended surface coils; solar radiation; heat transfer; building heat transmission; physiological effects.

4720 Thermal Environmental Systems (3) Design and fabrication of complete machines; instrumentation including on-site specifications, design calculations, working drawings and cost analysis. Written and oral reports.

4740 Solar Energy Utilization (3) Nature and availability of solar radiation; review of selected heat transfer topics pertinent to solar energy collection and use; design analysis of solar energy collectors and methods of storage selected application. Prereq: Engineering Thermodynamics 3440 or consent of instructor.

4810 Internal Combustion Engines (3) Thermo-chemical phenomena in internal combustion and propulsor engines. Combustion, detonation, equilibrium, dissociation. Analysis of internal combustion engines using ideal and real fluids.


4910-20-30 Selected Topics in Mechanical Engineering (3, 3, 3) Problems related to developments and practice in mechanical engineering.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

5110 Conduction Heat Transfer (3) Analysis of steady state and transient heat conduction by analytical and numerical techniques. Prereq: Undergraduate heat transfer, Engineering Analysis, and Mathematics 3150.

5120 Convection Heat Transfer (3) Equations of control for fluid flow and convection, convection analysis of internal and external flows including the effects of variable heat flux, surface temperature, and fluid properties. Prereq: 3510 or equivalent.


5140 Phase Change Heat Transfer (3) Prereq: 5120.
5210 Classical Thermodynamics (3) A thorough study of macroscopic thermodynamics with emphasis on First and Second Law analysis, error criteria, and the thermodynamics of phase relationships. Prereq: Undergraduate thermodynamics.


5230 Special Topics in Thermodynamics (3) Prereq: Consent of instructor.

5310 Intermediate Fluid Mechanics (3) Vector descriptions in fluid mechanics; derivation of basic equations; dimensionless potential flow; viscous flow with emphasis on boundary-layer theory. Prereq: Undergraduate fluid mechanics.

5410-20-30 Research in Mechanical Engineering (3, 3, 3) Design of experiments; data analysis; experimental investigation.

5510-20-30 Mechanical Engineering Design (3, 3, 3) Design of mechanical engineering units and systems.


5610-20-30 Experimental Stress Analysis (3, 3, 3) Theory of elasticity; experimental methods; photoelasticity, strain gages, lacquer coatings.

5640-50-60 Advanced Machine Design (3, 3, 3) Design of bearings, gears, shafting; lubrication.

5670-80-90 Dynamics of Machinery (3, 3, 3) Dynamics of machinery; vibrations; balancing; fly-wheels and governors.

5710 Metal Machining (3) Analytical approach to the mechanics of machining. Detailed treatment of basic phenomena-plastic flow, fracture, friction and wear. Prereq: Undergraduate metallurgy and materials behavior, and heat transfer.


5840-50-60 Turbomachinery Systems (3, 3, 3) Theory and practice of design, development and systems integration of turbomachinery components. Prereq: First year graduate standing and consent of instructor.

5870 Dynamic Modeling and Simulation (3) Methods of modeling physical systems including mechanical, thermal, hydraulic, pneumatic and electromechanical systems. Techniques for experimentally determining system parameters. Analog and digital computer simulation techniques. Prereq: Undergraduate dynamics, heat transfer, and fluid mechanics.

5900 Selected Engineering Problems (3-9) Selection of a mechanical engineering project to fulfill the requirement of the Problems Program. Enrollment limited to students in the Problems Program. Prereq: Consent of advisor. May be repeated. S/NC only.

5950 Seminars (1) Discussions on all phases of mechanical engineering, including reports on current research at The University of Tennessee.

4260 System Design (3) Synthesis of aerospace system. Design report on the system.

4471-91 Experimental Aerodynamics (3, 3) Experimental methods and measurement of force, length, time, temperature, pressure, transport rates and physical properties. Planning, conducting, analyzing, and reporting experimental research to test standards and other specifications.

4510 Airplane Performance (3) Introduction to airflow and wing characteristics, drag; propellers; static performance and maneuverability; theory and design of control surfaces; stability.

4910 Selected Topics in Aerospace Science (3) Current problems in aerospace science; topics in science and engineering required for an understanding of the several areas of aerospace science.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

5110 Fundamentals of Aerodynamics (3) Kinematics and dynamics of perfect fluids; potential flow about a body; conformal mapping; hodographs. Prereq: Engineering Physics 5310, Mathematics 4250.

5120 Experimental Methods in Fluid Mechanics (3) A study of experimental techniques with laboratory experiments; hot wire anemometry and turbulence measurements, flow visualization, wind tunnel tests (supersonic and subsonic), water tunnel experiments, boundary-layer flow measurements, boundary-layer measurements. Prereq: 4210-20-30 or Mechanical Engineering 5310.


5210-20 Aerodynamics of Compressible Fluids (3, 3) One-dimensional flow; waves; small-perturbation theory, slender body theory; similar rules; method of characteristics. Prereq: 4240 for 5210, and 5210 for 5220.

5240 Dynamics of Viscous Fluids (3) Equations of motion of a viscous fluid; laminar and turbulent flow, transition to boundary-layer theories; exact and approximate solutions. Prereq: Mechanical Engineering 5310 or equivalent.

5250 Introduction to Hypersonic Flow (3) Bluff body flow; similitude; Newtonian theory; blunt body flow; viscous interactions; free molecule and rarefied gas flow. Prereq: 5220.

5260 Selected Topics in Aerodynamics (3) Further study of transonic, supersonic and hypersonic flow theories.


5310 Magnetohydrodynamics (3) Review of electromagnetic field theory; chemical kinetics, thermodynamic and thermophysical properties
of gas plasmas; governing equations and applications. Prereq: 4220 and Mathematics 4710.

5240-50 Atmospheric Entry (3, 3) Motion and heating along ballistic and lifting trajectories; stability of atmospheric and space flight systems. Prereq: 5220. Recommended: 5240.


5540-50 Aerospace Vehicle Stability and Control (3, 3) Introduction to aircraft stability and control. Static and dynamic longitudinal, directional, and lateral stability and control. Coupled modes. Motion with free and fixed control surfaces throughout the flight speed range. Automatic stability and control. Application to missiles. Prereq: 4230 and 5530.


5570 Aerospace Vehicle Flutter and Vibration (3) Dynamics of aerospace structures under aerodynamic and non-aerodynamic loading. One-dimensional and three-dimensional flutter and vibration problems. Stability criteria for airfoils operating under subsonic flow. The study of flutter and three-dimensional flutter of wings, control surfaces, and empennages over a wide flight speed range. Prereqs: 4230 and 5530.


5610 Applied Acoustics (3) Energy flow in acoustics, general equations of sound propagation in a nonhomogeneous moving medium, sound waves due to turbulence, vertical sound, pseudosound, propagation and absorption of sound in ducts, instrumentation and measuring techniques. Prereq: Consent of instructor.

5620 Aeroacoustics I (3) Special topics and recent research results in the field of aeroacoustics. Topics to be covered include: turbulence, stability, combustion, and general theoretical developments, as well as empirical equations. Prereq: 5610.

5810 Aviation Systems: An Overview (3) Aviation systems present and future, analyzed with emphasis upon the systems approach. Consideration of the socioeconomic base, aerospace and propulsion technology, meteorology, air traffic control airport-community interface and technological trends and developments pertinent to the present status and future development of air transportation. For non-aerospace and non-mechanical engineering majors only. Prereq: Aircraft Propulsion 8 Performance.

5820 Air Vehicles (3) Current capabilities and future requirements for air transport vehicles. Consideration of parameters significant for air vehicles of type selection, integration of the vehicle into the aviation system. For non-aerospace and non-mechanical engineering majors only. Prereq: 5810.

5900 Selected Engineering Problems (3-9) Selected problems in aerospace engineering to fulfill the requirement of the Problems Program. Prereq: Consent of instructor. Prereq: Problems Program. Prereq: Consent of advisor. May be repeated. S/NC only.

5950 Seminars (1) Discussions on all phases of aerospace engineering, including reports on current research at The University of Tennessee, Knoxville. May be repeated. S/NC only.

5990 Special Topics in Aerospace Engineering Credit to be arranged; 3 hrs maximum each quarter. Prereq: Consent of instructor.

6000 Doctoral Research and Dissertation

6310 Magnetohydrodynamics I (3) Electromagnetic field equations, motion of a single charged particle, statistical description of a plasma, the Boltzmann equation, conduction and diffusion in ionized gases. Prereq: 5240 or registration therein. Mathematics 5610, Physics 4220.

6320 Magnetohydrodynamics II (3) Continuum magnetohydrodynamic equations. Alfvén shock waves, exact solutions for magnetohydrodynamic channel flows, one-dimensional model of channel flow, the magnetohydrodynamic boundary layer. Prereq: 6310, Mathematics 5620.

6330 Magnetohydrodynamics III (3) Engineering applications of magnetohydrodynamics with particular emphasis on propulsion and power generation. Prereq: 6320, Mathematics 5630.

6410 Physical Gasdynamics (3) The fundamentals of high-speed, high temperature flow of a gas from the molecular point of view; molecular and simple kinetic theory; equilibrium properties of gases and gas mixtures as obtained from statistical kinetic theory, thermodynamics, and statistical mechanics. Prereq: 5220 and Mechanical Engineering 5220.

6420 Physical Gasdynamics (3) Continuation of 6410; flows of gas mixtures in local thermodynamic and chemical equilibrium; physical and chemical basis of rate equations; flow with vibrational and chemical nonequilibrium. Prereq: 6410.

6810 Advanced Boundary Layer Theory (3) Derivation and critical review of the governing equations. Asymptotic solutions; similarity methods; boundary layer transformations. Approximate integral methods to include compressibility and heat transfer. Application to attached and separated flows; shock-wave-boundary layer interaction. Prereq: 5220, Mechanical Engineering 5120, and Physics 5630.

6910 Advanced Topics in Gasdynamics (3) Selected advanced topics in gasdynamics. The selection of topics will be based on the particular interests of the students registering for the course. Representative topics may include nonequilibrium transport phenomena, radiation, reaction, and nonequilibrium flows, advanced kinetic theory, perturbation techniques. Prereq: Consent of instructor.

Nuclear Engineering

MAJOR DEGREES Nuclear Engineering M.E., M.S., Ph.D.

Professors:

Associate Professors:
H. L. Dodds, Ph.D. Tennessee; J. B. Fussell, Ph.D. Georgia Institute of Technology; H. O. Stoll, Ph.D. Tennessee; O. L. Smith, Ph.D. Missouri.

Assistant Professors:
E. W. Katz, Ph.D. Tennessee; L. Miller, Ph.D. Texas A & M, P.E.

THE MASTER'S PROGRAM

A graduate program leading to a degree of Master of Science is available to graduates of recognized undergraduate curricula in engineering and physics. Each applicant will be advised as to the necessary prerequisite courses before he/she enters the program.

The student must complete a program of study of 45 quarter hours which has been approved by the student's advisory committee and which includes the following:

1. A major consisting of a minimum of 18 quarter hours of graduate courses in nuclear engineering.
2. A minor of 9 quarter hours in mathematics.
4. Final examination covering the thesis and graduate course work.

An alternate program is available for the Master of Science degree which involves engineering practice rather than a thesis. The student must complete a program of study which includes the following:

1. Thirty-six quarter hours of course work similar to the requirements for the regular Master of Science program (see above).
2. Twenty-four quarter hours of Nuclear Engineering 5980, Nuclear Engineering Practice. A student usually registers for 6 hours of Nuclear Engineering 5980 each quarter and investigates problems assigned by a member of the faculty. At the end of each quarter the student submits a written report and makes an oral presentation of the work.
3. Final examination covering graduate course work and practice school problems.

MASTER OF ENGINEERING PROGRAM

A graduate program in Nuclear Engineering leading to the degree of Master of Engineering is available to those graduates with an accredited engineering degree or one which satisfies ECPD basic level criteria. In addition to Graduate School requirements the following degree requirements must be met:

3. Nine hours of course work, 18 of which must be in nuclear engineering.
4. A minimum of 9 hours of design project, thesis, or 24 hours of Nuclear Engineering Practice (5980). A satisfactory proof of significant engineering experience may be submitted in lieu of the design project, thesis Nuclear Engineering Practice, but in this case 45 hours of course work are required.

Students in the field of nuclear engineering desiring to study for the degree of Doctor of Philosophy must have a Bachelor
power. Prereq: Mathematics 4610, non-nuclear equations; conduction, convection, and radiation safety, and environmental aspects of nuclear analysis of reactor power plants; economic, time behavior of reactors, heat removal, and control of zero power reactors and power reactor systems. Prereq: Consent of instructor. May be repeated with consent of instructor.

4810 Radiation Shielding (3) Types of radiation sources, gamma ray and neutron attenuation, biological effects of radiation, shield design. Prereq: Physics 3730, Mathematics 4550.

4820 Reactor Kinetics and Controls (3) Derivation of kinetic equations; basic kinetic parameters; transient response with feedback; control and protective systems. Prereq: 4110.

4840 Nuclear Reactor Safety (3) Presentation of reactor safety concepts and criteria; credible accidents; fission product release and transport; containment of reactor accident analysis; engineering safeguards. Prereq: 4120, Coreq: 4270 or consent of instructor.

4930 Nuclear Fuel Management (3) Discussion of problems associated with processing of nuclear materials fuel cycle analysis; burnup calculation. Prereq: 4120.

5000 Thesis (1-15) Research for graduate degree, exclusive of thesis or dissertation credit.

5110-20-30 Transport Processes in Nuclear Engineering (3, 3, 3) Momentum and heat transport; development of conservation equations; elementary theory of turbulence; heat transfer and flow through conduits; conduction; radiation; reactor core thermal analysis. Prereq: 4720 or equivalent, Mathematics 4710, 4550.

5210 System Dynamics (3) Transient analysis, Laplace transforms, frequency response, stability (linear and nonlinear), and sensitivity analysis by numerical and analytical methods. Dynamic analysis of distributed systems. Prereq: Consent of instructor.

5220 Reactor System Dynamics (3) Application of methods of general system dynamics to reactor systems. Analysis of fission and non-neutronic processes. Dynamics, stability, and control of zero power reactors and power reactor systems. Prereq: 5210, 4130 or equivalent.


5240 Reactor Instrumentation (3) Principles and applications of instrument components and systems for the operation, control, and safety of nuclear reactors; role of instrumentation in public health and safety; engineered safeguards for nuclear power plants. Prereq: 4920, or consent of instructor.

5310-20-30 Nuclear Systems Reliability (3, 3, 3) Principles of system reliability analysis as applied to nuclear systems. Both qualitative and quantitative methods are included. Coreq: Statistics 3450.

5510-20 Nuclear Systems (3, 3, 3) Detailed study of nuclear power systems including various reactor types; flow diagrams, thermo-
College of Home Economics

Lura M. Odland, Dean
Grayce E. Goertz, Associate Dean
Virginia S. Anagnost, Assistant Dean

Graduate study programs lead to the degree of Master of Science in Child and Family Studies; Consumer Studies and Housing; Public Policy; Crafts, Interior Design, and Housing; Food Science; Food Systems Administration; Home Economics Education; Nutrition; and Textiles and Clothing. Graduate study programs lead to the degree of Doctor of Philosophy in Home Economics with three options: interdisciplinary, food science, and nutrition. Graduate programs provide advanced specialized training needed for college and university teaching, for leadership positions in governmental and professional agencies, in the various professions in business, for secondary school and adult teaching, for research and for extended services.

GENERAL REQUIREMENTS FOR GRADUATE STUDENTS

Requirements for graduate study are prescribed by the Graduate School and by the student's major department. Students lacking adequate preparation may be required to take additional courses at the undergraduate level as prerequisites to graduate study. A student deficient in English may be required to take courses as necessary to remove the deficiency.

APPLICATIONS FOR ADMISSION

Two copies of the student's transcript and an application for admission are submitted directly to the Graduate School. In addition, a College of Home Economics application and three letters of reference are sent to the Associate Dean of the College of Home Economics. (Forms may be obtained from the college.) The Graduate Record Examination scores for the aptitude test including the quantitative, verbal and analytical sections are required for the application for admission in the interdisciplinary doctoral program and the Master's program in Child and Family Studies.

In submitting applications for admission to graduate study in home economics, students are requested to indicate choice of major area of study.

GRADUATE ASSISTANSHIPS AND FELLOWSHIPS

Information and application forms regarding graduate assistantships, fellowships and general requirements for admission to graduate study may be obtained from the department head in the area of the student's major interest or from the Associate Dean of the College of Home Economics for the interdisciplinary doctoral program.

PROGRAMS LEADING TO THE DEGREE OF MASTER OF SCIENCE

Thesis Option:

Majors and minors are offered in the following areas:

- Child and Family Studies
- Consumer Studies and Housing: Public Policy*

* Requirements include Crafts, Interior Design, and Housing 5615 or Child and Family Studies 5170; Child and Family Studies 5700 or Planning 6100 or Economics 5340 or Agricultural Economics 4320; and Home Economics 5600. Three-hour course in research methods or statistics. Twenty-four hours in consumer studies or housing to include 8 hours of Child and Family Studies 5000 or Crafts, Interior Design, and Housing 5000.

Non-Thesis Option:

- Consumer Studies courses to be selected from Child and Family Studies 5140, 5170, 5180, 5700, 5800, 5900; Crafts, Interior Design, and Housing 5120; Food Science 4040; Textiles and Clothing 5180; Agricultural Economics 4710; Economics 4340, 5350-60; Finance 5210-30; Political Science 5641, 5610-30. Nine hours may be used to meet more than one requirement but all minimum requirements will need to be met.

Non-Thesis Option:

- Crafts, Interior Design, and Housing 5615; Food Science; Food Systems Administration; Nutrition, Textiles and Clothing.

Major (includes minimum of 9 hours of 5000 courses) ............... 18 hrs
Thesis 9 hrs
Collateral area(s) of study (includes minimum of 6 hours of 5000 courses) ............... 18 hrs
(Minimum of 18 hours of 5000-level courses exclusive of thesis.)

Total 45 hrs

In some instances two related collateral areas may be selected with 9 hours in each area and a minimum of 9 hours of a 5000 course in each.

Collateral area(s) of study may be chosen in an area other than in home economics with the approval of the appropriate professors. An oral examination is required. Note: Nine hours is the maximum credit allowed for special problems work and seminar work in any one area of home economics.

Non-Thesis Option:

The non-thesis option is available for all majors listed under the thesis option and is the only option available for public health nutrition.

In addition to the regulations of the Graduate School, the non-thesis program of study for all majors except Consumer Studies and Housing: Public Policy**

** Requirements include those listed under the thesis option for the major in Consumer Studies and Housing: Public Policy except that 21 hours are needed in consumer studies or housing to include Home Economics 5680 (6 hours), or Child and Family Studies 5050 or Crafts, Interior Design, and Housing 5060.

In some cases additional collateral courses may be selected. Note: Nine hours is the maximum credit allowed for special problems work and seminar work in any one area of home economics.

The non-thesis option is available for all majors listed under the thesis option and is the only option available for public health nutrition.

In addition to the regulations of the Graduate School, the non-thesis program of study for all majors except Consumer Studies and Housing: Public Policy**

** Requirements include those listed under the thesis option for the major in Consumer Studies and Housing: Public Policy except that 21 hours are needed in consumer studies or housing to include Home Economics 5680 (6 hours), or Child and Family Studies 5050 or Crafts, Interior Design, and Housing 5060.
shall consist of 45 credit hours
with a minimum of 24 hours in the major
field and 18 hours at the 5000 and 6000
level. A minimum of 27 hours of 5000- and
6000-level courses is required in the pro-
gram. Some majors may require 9
hours in one collateral.
Request for the non-thesis option must be
made in writing by the student to the
department head not later than the end
of the first term in residence.

DOCTORAL PROGRAMS

The doctoral program in Home Eco-
nomics provides three options for study:
Interdisciplinary, food science, and nutri-
tion. The interdisciplinary option is
available in all departments in the College.
The doctoral program with a major in
Home Economics requires:
(1) A minimum of 96 quarter hours in
courses beyond the Bachelor's de-
gree exclusive of credit hours for the
Master's thesis to include a minimum of 12 quarter hours of
6000-level courses.
(2) Selection of an option and fulfill-
ment of the requirements as superv-
sed by the faculty committee.
(3) The faculty committee for each
doctoral student shall determine
whether a reading knowledge of a
foreign language is required.
(4) Written preliminary examinations.
(5) Doctoral research and dissertation
(minimum 36 hours; maximum 48
hours) may be included in the 96
hours presented for the degree.
(6) A final examination.
Option Requirements:
Interdisciplinary option:
(1) Home Economics 6110-20, 6210.
(2) Twenty-four to 36 hours from at least
two departments in the College of
Home Economics representing one of
the four concentrations: Individual and Family Behavior as
related to development and change
throughout the human life cycle.
Emphasis may be on:
normal developmental processes, in
individuals and families;
socialization through childhood,
adolescence, and adulthood;
behavior in diverse environmental
and cultural settings;
interaction processes within families;
community services and planning
for meet development needs of
individuals and families.
Physiological Development and
Well-being in humans throughout the
life cycle. Emphasis for particular
age groups may be on:
physiological response to nutrient
intake, improvement of nutritional
status through informed community
action; cultural, economic
and technological influences on food
selection.
Environmental Factors in design,
housing, food service systems,
clothing, textiles, and crafts as they
relate to human needs. Emphasis
may be on the impact of:
cultural, sociological, psychological,
and economic change; technological
developments; aesthetics in improving the quality
of the environment.
Consumers' Economic and Social
Well-being throughout the life cycle.
Emphasis may be on:
the relationship between family structure and
decision-making processes in the
use of human resources; the
effects of social, macro- and
microeconomics and political
development on consumption patterns
and other behavior; community
programs to meet the socioeconomic
needs of consumers.
(3) Fifteen to 24 hours in cognitive or
supporting courses (mainly from de-
partments in other colleges in the
University) including courses to give
sufficient competence in statistics or
research methods needed for
dissertation research. Additional
courses will complement the option
emphasis and dissertation research area.
(4) Doctoral research and dissertation
will be based on a problem within
the interdisciplinary option concen-
tration.
Food science option and food science
with concentration in food systems administration:
(1) Three hours in research methods
from Food Science 5510 or 5520 or
Food Systems Administration 5210;
6 hours from Food Science 5610-
20-30-40, 6110, Food Systems Ad-
ministration 6110; and Zoology 5350
(Biometry) or equivalent.
(2) Twenty-four hours in 5000- and
6000-
level courses in food science or in
food systems administration.
(3) Nine hours in a collateral area (upon
approval of student's faculty com-
nittee, 4000, 5000, and 6000
courses in collateral area may be substituted
for 5000 and 6000 courses in food
science or in food systems ad-
ministration).
(4) Minimum of 4 hours of credit in
document seminar.
Nutrition option:
(1) Thirty hours of 5000 or 6000 courses
in nutrition exclusive of research
and Zoology 5350 (Biometry) or
equivalent.
(2) Nine hours in a collateral area (upon
approval of student's faculty com-
nittee, 4000, 5000, and 6000
courses in collateral area beyond the 9
hours may be substituted for 5000
and 6000 courses in nutrition).
(3) Minimum of 4 hours of credit in
document seminar.

SPECIAL WORKSHOPS

Workshops on special topics of current
interest are offered periodically by the
different departments in the College of
Home Economics. These are of special
interest to those desiring to work for ad-
vanced degrees. Announcements are sent
upon request.
Each summer the craft workshop pro-
gram in Gatlinburg, Tennessee, is made
possible through cooperative efforts be-
tween the Crafts, Interior Design, and
Housing Department and the Pi Beta Phi
Arrowmont School of Crafts. The program
provides advanced instruction in designer-
created crafts through classes taught by
nationally known craftspersons. Cooper-
tion with national and local craft organiza-
tions has so stimulated the work of
craftspersons throughout the area that
their work has gained national recognition.
See also page 92.

GRADUATE PROGRAMS FOR
HOME ECONOMICS EXTENSION

Graduate programs at both the doctoral
and Master's levels are available for
students interested in home economics
extension. At the doctoral degree level,
programs of study may be planned in the
interdisciplinary or in the food science
or the nutrition options. A Master's
degree major in Consumer
Studies and Housing: Public Policy is
particularly suitable for students interested
in home economics extension, although
Master's programs may be planned in any
subject matter area of Home Economics
with agricultural extension education as
collateral area. Additionally, four-week
courses are offered in February each
year for students particularly interested
in home economics extension. Students
Interested in a graduate program and/or
the four-week courses should contact the
Associate Dean of the College of Home
Economics.

Departments of
Instruction

Numbers in parentheses following the
course titles indicate quarter hours
credit offered.

Child and
Family Studies

MAJORS DEGREES
Consumer Studies
M.S.
Home Economics
Ph.D.

Professors: R. L. Hightower, Ph.D. Iowa; J. L. Kuipers
(Head), Ph.D. Michigan State;

Associate Professors: J. L. Cunningham, Ph.D. Michigan State;
D. B. Eastwood, Ph.D. Tufts;
V. M. Nordquist, Ph.D. Tennessee;
R. M. Swagler, Ph.D. Ohio State;

Assistant Professors: M. F. Kainowski, Ed.D. Massachusetts;
B. C. Miller, Ph.D. Minnesota;
M. L. Rawlings, Ph.D. Pennsylvania State;
H. M. Reed, M.S. Tennessee; P. Scott, Ph.D. Tennessee;
L. Southworth, Ed.S. Tennessee; S. Twardosz, Ph.D. Kansas.

4110 Student Teaching in Preschool Settings
(6) Increasing responsibility for planning and
guiding groups of young children under supervision
of head teacher; includes 2 hr weekly seminar.
Prereq: Introduction to Early Educa-
tion, Program Planning for Preschool Children,
Creative Experiences for Preschool Children,
5530 Research Methods in Child and Family Studies (3) Survey and study of research procedures used in study of child and family behavior; basic methodology of the behavioral sciences. Prerequisites: Consent of instructor and to beginning thesis work in this area. Prereq: 9 hrs child and family studies.

5540 Preschool Curriculum Models (3) Analysis and evaluation of curriculum program models for young children. Prerequisites: Child and Family Studies or preschool education.

5550 Supervision in Preschool Programs (3) Emphasis on guidance of students working in nursery school administration. Guiding students through seminar discussion, individual conferences and various evaluation techniques. Prerequisites: 5540. 3 hrs and 1 lab (2 hrs).

5610 Theories of Management in the Family Environment (3) Examination of fundamental management concepts, their development and application to current family situations.

5620 Nursery School Administration (3) Organization and operating schools and play groups for preschool children. Housing, staff, schedules, programs, financing. Prerequisites: 4110 or equivalent.

5630 Seminar in Infant Development (3) Theory and research relating to development during infancy. Prerequisites: 4230.

5640 Teaching Child and Family Studies (5) Seminar and practicum in techniques for teaching child and family studies, family relationships and family life education programs and family relationships. Prerequisites: Consent of instructor. S/N only.


5680 Family Planning Programs (3) Community and family planning programs. Internship in planned parenthood programs and clinic. May be repeated. Maximum 9 hrs.

5690 Family Planning Programs (3) Community and family planning programs. Internship in planned parenthood programs and clinic. May be repeated. Maximum 9 hrs.

5700 Seminar in Child and Family Studies (1-3) Current trends in family living and implications of recent developments and research relating to children and families. Prerequisites: Consent of instructor. May be repeated. Maximum 9 hrs.

5760 Seminar in Child Development, Family and Consumer Studies (3-6) Current trends in family living and implications of recent developments and research relating to children and families. Prerequisites: Consent of instructor. May be repeated. Maximum 9 hrs.


5800 Seminar and Practicum in Techniques for Teaching Child and Family Studies (3) Current trends in family living and implications of recent developments and research relating to children and families. Prerequisites: Consent of instructor. May be repeated. Maximum 9 hrs.


5820 Seminar and Practicum in Techniques for Teaching Child and Family Studies (3) Current trends in family living and implications of recent developments and research relating to children and families. Prerequisites: Consent of instructor. May be repeated. Maximum 9 hrs.


6150-20 Applied Behavior Analysis in Natural Settings (6) Individual supervision in the application of applied behavior analysis in natural settings. Prereq: 5210, 5540 or equivalent.

6710 Elements of Consumer Choice (3) Analysis of consumer decision making, beginning with the theory of consumer choice, impact of affluence on consumers and consideration of dynamic aspects of consumer behavior, including the roles of aspirations, expectations, uncertainty and information. Prereq: 5170 or consent of instructor.

6720 Consumer Protection (3) Consumer protection, including regulatory agencies, standards, information disclosure and other consumer protection legislation. Assumptions involved in these efforts and relative success of the theories and concepts. Prereq: 5410 or consent of instructor.

Crafts, Interior Design, and Housing

MAJORS DEGREES
Crafts, Interior Design, and Housing M.S.

Consumer Studies and Housing

Public Policy M.S.

Home Economics Ph.D.

Professors:
R. G. Blakemore (Head), Ph.D. Florida State; J. Palenski, M.A. Illinois State.

Associate Professors:
W. Moran, M.S. Wisconsin; R. Pierotti (Director, Pi Beta Phi Arrowmont School of Crafts), M.M. Utah.

Assistant Professors:

Lecturers:

To be admitted to the Graduate School in the craft program a student must have a professional knowledge of media and technique. Work with creative design concepts is emphasized at the graduate level; media and technique are important only in so far as the experimentation with these concepts contributes to a more realistic and creative orientation of the designer-craftsperson. Courses are, therefore, based on theory or philosophical concepts in order to facilitate the development of visual sensitivity in relation to design. Major emphasis will be on the visual image as a personal interpretation of the media. Because the philosophical orientation of the student varies widely, progression from one level to another is based on the understanding and communication of visual concepts.

A student's course of study includes intensive training in the chosen areas of specialization such as metalwork, ceramics, weaving, textile design, or interior design as well as courses dealing with the broader aspects of design. All student programs include: Seminar in Design (5040), Advanced Design Studio (5050), and research methods; in addition, crafts majors include Exhibition Design (4140).

An interdisciplinary program in Consumer Studies and Housing: Public Policy is available to students with interest in the social science approach to housing. Courses dealing with the design aspects of housing may be elected.

PI BETA PHI ARROWMONT SCHOOL OF CRAFTS

Graduate students in the area of crafts have an unique opportunity to participate in the summer program at the Pi Beta Phi Arrowmont School of Crafts, Gatlinburg, Tennessee; credit is granted through the University of Tennessee, Knoxville. Instructions at the school are nationally and internationally recognized designer-craftspersons who offer, in many instances, different approaches to those of the resident faculty; this enriches the student's program of study. Craft courses are not offered on the Knoxville campus in the summer quarter. Therefore, students attending UT during the summer for crafts study are required to attend the Pi Beta Phi Arrowmont School of Crafts and to pay the additional registration, tuition, and laboratory materials fees required by that school.

ACQUISITIONS AND EXHIBITIONS

For crafts and interior design majors, the department reserves the right of acquisition and exhibition of work completed in its studios under the guidance of the faculty. Prospective graduate students should submit a portfolio of their under-graduate studio work to the department. This portfolio may include slides or original work.

4110 Home Wiring and Lighting Requirements (3) Service of electricity in modern homes; evaluation of lighting and wiring plans in terms of family desires and need for equipment: 1 hr and 2 labs.

4130 Contemporary Design (3) Furnishings and interiors; economic, technological and sociological influences on the development of design; changing living conditions; interrelation of architecture and furnishings. Significant designers and their work.

4140 Exhibition Design (4) Display of craft and interior design problems in relation to materials, props and special exhibition areas. Emphasis on knowledge and application of the design problems; text and color; design and creative orientation, design construction, display and evaluation for two- and three-dimensional displays. Annual student craft and interior design exhibition in spring quarter. Prereq: Introduction to Related Arts or equivalent.

4155 Interior Space Planning I (6) Analysis, planning and design of the office environment; includes contract specifications.

4156 Interior Space Planning II (6) Studio problems involving large scale nonresidential interior spaces such as restaurants, transportation facilities, stores, institutions. Prereq: 4155 or consent of instructor.

4310 Crafts in America (3) Craft movement; factors that contributed to growth and development. Educational, social, economic, recreational and theatrical values of crafts. Place of craftsperson in society as producer, teacher, designer for industry.

4320 Family Housing Problems (3) Housing requirements of families. Reading and judging house plans; effective use of space; maintenance problems; housing regulations and restrictions; site selection and neighborhood development; financing procedures. Prereq: Principles of Economics.

4330 Care and Repair of Household Equipment (3) Care of equipment to give maximum service in relation to operation and service cost; understanding of common repair problems. Prereq: Equipment in the Home. 1 hr and 2 labs.

4410 Craft Media (4) Possibilities and limitations of craft media; understanding educational and social values of craft work. Designing and executing craft problems using inexpensive materials and tools. 3 labs.

4420 Leather Design (4) Relationship of design to function, techniques and materials. Creating leather objects of original design. 1 hr and 2 labs.

4430 Plastics (4) Possibilities and limitations of various plastics; methods of fabrication; relation of design to function, processes, types of material and use of tools. 1 hr and 2 labs.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used towards degree requirements. May be repeated. S/N only.
5040 Seminar in Design (3) Intensive reading, discussion and critical evaluation of twentieth century design concepts, the personalities, the motivation and the creative components leading to visual innovation.

5050 Advanced Design Studio (4) Studio experience planned to explore strengths, structures and potentials of design materials, searching for aesthetic potential in depth.

5060 Practicum (1-12) Field experience in selected agencies and organizations that focus on situations or problems in housing.

5120 Historic Interior Design (3) Emphasis is placed on research studies of historic design developments. A variable content course with emphasis on interior design, furniture and/or accessories for England, Scandinavia, Mediterranean area and/or America. May be repeated. Maximum 18 hrs.

5210 Furniture Appreciation (3) Aesthetic qualities of past and present styles. Study of significant structural and formal characteristics.

5310 Interior Design (3) Advanced problems in the planning and design of interior space; includes application of research information in making design decisions. Prereq: Consent of instructor.

5330 Craft Design (3) Fine design in international crafts; designing in basic craft media. 1 and 2 labs.

5341-5661 Wood Design I, II, III (4, 4, 4) Initial development of theory for investigation of aesthetic concepts in two- and three-dimensional forms in wood design. 5351—Advanced experimentation using aesthetic concepts in the development of two- and three-dimensional forms in wood. 5361—Experimentation in unifying aesthetic concepts in preparation for the graduate exhibition. Prereq: Previous work in wood design and consent of department head. Each course may be repeated one time.

5342-5262 Weaving I, II, III (4, 4, 4, 4) Initial development of theory for investigation of aesthetic concepts in two- and three-dimensional forms in fiber constructions. 5352—Advanced experimentation using aesthetic concepts in the development of two- and three-dimensional forms in metal design. 5362—Experimentation in unifying aesthetic concepts in preparation for the graduate exhibition. Prereq: Previous work in metal design and consent of department head. Each course may be repeated one time.

5343-5363 Textile Design I, II, III (4, 4, 4, 4) Initial development of theory for investigation of aesthetic concepts for the surface decoration of textiles. 5353—Advanced experimentation using aesthetic concepts in the surface decoration of textiles. 5363—Experimentation in unifying aesthetic concepts in preparation for the graduate exhibition. Prereq: Previous work in textile design and consent of department head. Each course may be repeated one time.

5344-5464 Wood Design I, II, III (4, 4, 4, 4) Initial development of theory for investigation of aesthetic concepts in two- and three-dimensional forms in wood design. 5354—Advanced experimentation using aesthetic concepts in the development of two- and three-dimensional forms in wood. 5364—Experimentation in unifying aesthetic concepts in preparation for the graduate exhibition. Prereq: Previous work in wood design and consent of department head. Each course may be repeated one time.

5355-5565 Enameling I, II, III (4, 4, 4, 4) Initial development of theory for investigation of aesthetic concepts in two- and three-dimensional forms in enameling. 5355—Advanced experimentation using aesthetic concepts in the development of two- and three-dimensional forms in enameling. 5356—Experimentation in unifying aesthetic concepts in preparation for the graduate exhibition. Prereq: Previous work in enameling and consent of department head. Each course may be repeated one time.

5346-5666 Plastics I, II, III (4, 4, 4, 4) Initial development of theory for investigation of aesthetic concepts in two- and three-dimensional forms in plastic. 5356—Advanced experimentation using aesthetic concepts in the development of two- and three-dimensional forms in plastic. 5366—Experimentation in unifying aesthetic concepts in preparation for the graduate exhibition. Prereq: Previous work in plastics and consent of department head. Each course may be repeated one time.

5347-5767 Ceramics I, II, III (4, 4, 4, 4) Initial development of theory for investigation of aesthetic concepts in two- and three-dimensional forms in ceramics. 5357—Advanced experimentation using aesthetic concepts in the development of two- and three-dimensional forms in ceramics. 5367—Experimentation in unifying aesthetic concepts in preparation for the graduate exhibition. Prereq: Previous work in ceramics and consent of department head. Each course may be repeated one time.


5368 Ceramics—Glaze Calculation (4) Experimentation with various types of clay bodies and glazes for reduction and oxidation firing atmospheres. Prereq: Previous work in ceramics and consent of department head. May be repeated. Maximum 8 hrs.

5369 Ceramics—Kiln Construction (4) Investigation and design for and construction of various sizes and types of kilns and burner systems which promote reduction and oxidation firing atmospheres in ceramic work. May be repeated. Maximum 8 hrs.

5410 Advanced Problems (3) Individual development of techniques and appreciation. Prereq: Previous work in and consent of department head. Each course may be repeated one time.

5510 Environmental Factors in Interior Design (3) Study of human factors and associated research techniques as they relate to the design of interpersonal and architectural environments—emphasis on the derivation of design implications from anatomy, physiology, anthropometry, and the sciences. Prereq: 6 hrs behavioral science, and 6 hrs natural science or consent of instructor.

5520 Environmental Factors in Interior Design (3) Study of systematic design methodology as applied to the design of microenvironments using human factors information. Prereq: 6 hrs behavioral science, and 6 hrs natural science or consent of instructor.

5530 Environmental Factors in Interior Design (3) Human factors and associated research techniques as applied to the design of interior architectural environments—emphasis on the derivation of design implications from anatomy, physiology, anthropology, and the sciences. Prereq: 6 hrs behavioral science, and 6 hrs natural science or consent of instructor.


5613 Housing Management (3) Role and function of research-oriented interior architectural environments—emphasis on investigations of the motivation and the creative components leading to visual innovation.

5614 Housing Regulations and Controls (3) Function of regulations and other control practices and mechanisms as determinants of the nation's available housing in local communities by various user groups. Prereq: 4320 or consent of instructor.

5615 Housing Programs and Policies (3) Analysis of public and public programs and policies designed to promote realization of suitable homes and living environments for families. Economic and social problems related to multidisciplinary research data and methods. Prereq: 4320 or consent of instructor.

5620 Experimental Methods in Household Equipment (3) Research methods and techniques used in determining performance of household equipment. Prereq: Equipment in the Home or consent of instructor. 1 hr and 2 labs.

5630 Environmental Requirements for Family Work Centers (3) Trends in planning work center areas such as for kitchens and laundry; evaluation in terms of adequacy, convenience, surface treatment, facilities and costs; problems of installation and remodeling.

5810 Crafts (1-4) Advanced study in crafts. Hours and credit arranged. Prereq: Consent of department head and professor in charge of investigation. May be repeated. Maximum 8 hrs.

5820 Interior Design (1-3) Advanced study in interior design. Hours and credit arranged. Prereq: Consent of department head and professor in charge of investigation. May be repeated. Maximum 9 hrs.

5830 Problems in Housing (1-3) Advanced study in housing. Hours and credit arranged. Prereq: Consent of department head and professor in charge of investigation. May be repeated. Maximum 9 hrs.

5910-20-30 Seminar (1-4, 1-4, 1-4) Hours and credit arranged. Prereq: Consent of instructor.

6110 Contemporary Housing Issues and Problems (3) Individual study and group discussion of various issues and problems related to housing. Prereq: Consent of Instructor.

6120 Advanced Topics in Housing Research (3) Examination of various concepts, theories and principles of housing as employed in housing research. Prereq: Consent of instructor.

6210 Environmental Design Analysis (3) Advanced methodology in the psychology of environmental design with particular attention to multidisciplinary research data and methods. Prereq: 5510-20-30.

6320 Role of Crafts in Society (3) Comprehensive individual study and group discussion of advanced concepts and current problems in crafts. Prereq: 4310, 5040, 6 hrs of graduate level sociology, or consent of instructor.

6410 Conceptual Development in Craft Design (3) Advanced concepts in the use of visually perceived design elements as demonstrated in handcrafted objects. Prereq: 5040, 6 hrs of graduate level psychology, or consent of instructor.

6420 Perspectives in Crafts and Interior Design (3) Historical influences as related to contemporary concepts and theory. Prereq: 5040, 6 hrs of graduate level art history, or consent of instructor.

Courses offered periodically only at the PI Beta Phi Arrowmont School of Crafts, Gatlinburg, Tennessee. Courses may be repeated.
Food Science

4000 Origin of Food and Foodways (3) Tracing of food and the development of individual and group food habits. Prereq: 6 hrs social science or humanities.

4010 Introductory Experimental Food Science (3) Use of physical and sensory evaluation in experimental studies with fats, high protein foods, and batter and dough systems. Prereq: Nature of Foods II.

4020 Experimental Food Science (3) Individual experimentation and its relation to the research laboratory. Prereq: 4010. Recommended: Nutrition 3320.

4040 Food in Contemporary Society (3) Consumer's options, responsibility and potential influence with respect to food supply.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-18) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

5140 Foods and Nutrition: Physiochemical Principles (3) Introduction to thermodynamics; physical and chemical properties of proteins, carbohydrates, hydrolysates and lipids; chemistry of the colloidal state; chemical kinetics; specialized kinetics of enzymatic processes. Prereq: Nutrition 3330 and College Algebra equivalent.

5510 Food Texture (3) Classification of foods according to textural parameters; use of instrumentation in the evaluation of textures. Prereq: 4010 or Food Technology 4920; statistics; or consent of instructor.

5520 Food Sensory Testing Methods (3) Principles and methodology of sensory evaluation of food; application of the methods; analysis of sensory data. Prereq: 4010; statistics; or consent of instructor.

5530 Advanced Experimental Food Science (3) Application of research methods to individual problems. Prereq: 5510-20 or consent of instructor.

5550 Food Behavior of the Individual (3) Development of and changes in the choices of food and in food habits of the individual. Prereq: 4000, 3 hrs of nutrition, or consent of instructor.

5560 Foodways in the United States (3) Current foodways of selected subcultures in the United States and the historical basis for their development. Prereq: 4000, 3 hrs of nutrition, or consent of instructor.

5570 Foodways in the United States (3) Current foodways of selected subcultures in the United States and the historical basis for their development. Prereq: 4000, 3 hrs of nutrition, or consent of instructor.

5610-20 Advanced Food Science (3, 3) Biochemical and biophysical interactions in food. Must be taken in sequence. Prereq: 4010; Nutrition 3320 or equivalent, or consent of instructor.

5630 Carbohydrates and Fats in Relation to Food Science (3) Physical and chemical characteristics of sugars, starches and fats with emphasis on their behavior in food. Prereq: 4010; Nutrition 3320-30 or equivalent.

5640 Proteins in Relation to Food Science (3) Physical and chemical characteristics of the proteins of milk, eggs, flour and meat with emphasis on their behavior in food. Prereq: 4010; Nutrition 3320-30 or equivalent.

5700 Current Programs and Trends in Food Science (1-3) Recent advances in food science, their impact on curricular considerations, and their implications for teachers, extension workers, and dietitians. Prereq: Consent of instructor. May be repeated.

5800 Problems in Food Science (1-3) Advanced study from the field of food science. Prereq: Consent of department head and professor in charge of investigatory. May be repeated.

5850 Field Experience (3-9) Experience in a food-related industry or agency under the supervision of a faculty member. Prereq: Consent of instructor.

5900 Seminar in Food Science (1-3) Prereq: Consent of instructor. May be repeated.

6000 Doctoral Research and Dissertation

6110 Advanced Topics in Food Science (3) Comprehensive individual study and group discussion of topics related to current problems in food science. Prereq: Consent of instructor. May be repeated.

6210 Food Dispersion (3) Physical characteristics of solutions, colloidal dispersions, and suspensions in relation to treatments applied. Prereq: 5530.

6310-20 Structure of Food Plants and Animal Tissues (3, 3) Histological structure of food plants and animal tissues as related to physical characteristics and chemical properties of their components. Prereq: 5630-40.

6510-20 Food and Sociocultural Change (3, 3) Critical evaluation of factors and interrelations affecting food intake and consumption patterns. Must be taken in sequence. Prereq: 5550 or 5560; or consent of instructor.

6900 Seminar (1-3) May be repeated. S/NC only.

Nutrition

3310 Organic Chemistry (4) Emphasis on subjects leading to 3320-30 and Textiles and Clothing 3520. Prereq: General Chemistry. 3 hrs and 1 lab. Not for graduate credit for food science, nutrition and food systems administration majors.

3320 Food Analysis (4) Elementary quantitative analysis; typical food analyses. Prereq: 3310 or equivalent. 3 hrs and 1 lab. Not for graduate credit for food science, nutrition and food systems administration majors.

3330 Physiological Chemistry (3) Metabolism of carbohydrates, lipids, and proteins. Prereq: 3320 or equivalent. Not for graduate credit for food science, nutrition and food systems administration majors.

3339 Physiological Chemistry Laboratory (1) Prereq: 3320. Coreq: 3330. 1 lab. Not for graduate credit for food science, nutrition, and food systems administration majors.

4010 Reproductive and Developmental Nutrition (3) Nutritive requirements for expectant mothers, infants, and preschool children. Prereq: 6 hrs of nutrition. 2 hrs and 1 lab.

4020 Nutrition for Children, Adolescents and Adults (3) Application of basic principles and research findings to good nutrition for children, adolescents and adults. Prereq: 6 hrs of nutrition. 2 hrs and 1 lab.

4030 Community Nutrition (3) Introduction to nutrition problems and services in the community; supervised field experiences are an integral part of the course. Prereq: 6 hrs of nutrition.

4110 Introduction to Nutrition Research (3) Discussion of principles and laboratory experiences. Prereq: 6 hours of nutrition. 2 hrs and 1 lab.

4230 Nutrition in Disease (4) Nutrition problems in diseases influenced by diet. Prereq: 5 hrs Science of Nutrition. 3 hrs and 1 lab.

4231 Clinical Experience in Dietetics (1) Planned clinical experiences applying principles of nutrition in disease. Coreq: 4230.
4240 Nutrition in Disease II (3) Interdisciplinary lectures and discussions on the metabolic processes of normal and diseased organs and/or tissues and the dietary or behavior modifications required. Prereq: 4230. Designed for senior students in the coordinated undergraduate program in dietetics.

4430 Diet and Drug Therapy (3) Effect of drug therapy on absorption and utilization of nutrients, and effect of diet on absorption, utilization and toxicity of drugs. Prereq: Science of Nutrition or consent of instructor.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

5110 Advanced Physiological Chemistry I (4) Bioenergetics and related metabolism of nutrients. Prereq: 5330 or equivalent. 5 hrs and 1 lab.

5120 Advanced Physiological Chemistry III (3) Nutritional factors in relation to body fluids, gas transport and endocrine function. Prereq: 5330.

5140 Foods and Nutrition: Physicochemical Principles (3) Introduction to thermodynamics; physicochemical properties of proteins, carbohydrates and lipids; chemistry of the colloidal state; chemical kinetics; specialized kinetics of enzymatic processes. Prereq: Nutrition 5330 and College Algebra or equivalent.


5230 Experimental Methods in Nutrition I (3) Use of small animals in experimental nutrition. Prereq: 5325-30. 5 hrs Science of Nutrition. 2 hrs and 1 lab.


5310 Community Nutrition I (3) Nutrition problems and practices in the community: supervision of field work for 5 hrs Science of Nutrition: consent of instructor. 3 labs.

5320 Community Nutrition II (3) Observations and participation in nutrition programs of local and state agencies. Prereq: 5310 and consent of instructor. 3 labs.

5330 Community Nutrition III (3) Nutrition programs of state and federal agencies; preparation of material for nutrition education; supervised field work. Prereq: Consent of instructor. 3 labs.

5340 Field Study in Community Nutrition (1-12) Personal participation in and analysis of a state or regional community nutrition program. Location of the in-depth study to be selected in consultation with the instructor. Prereq: 5320 and consent of instructor. S/NC only.

5350 Mental Retardation or Other Developmental Disorders of Childhood (3) Multidisciplinary core course required of all full-time students in training at the Child Development Center, UT Center for the Health Sciences, Memphis. Prereq: Consent of the department head.

5410-20 Human Nutrition I, II (3, 3) Functions of carbohydrates, proteins, fats, minerals and vitamins. Nutritional requirements of man throughout the life span and practical problems in meeting requirements. Prereq: 5 hrs Science of Nutrition; 5110.

5430 Physiological Bases for Diets in Disease (3) Developments in the dietary treatment of disease in which nutrition plays a major role. Prereq: Consent of instructor.


5450 Survey Methods in Human Nutrition (3) Food consumption, food practices and nutritional status of population groups. Prereq: 5210 or 5410-20. 2 hrs and 1 lab.

5460 World Food Supply and Human Nutrition (3) Food supplies and food practices as related to human nutrition throughout the world. Regional, national and international agencies concerned with food and nutrition problems. Prereq: 5210 or 5410-20.

5470 Nutrition and Aging (3) Nutritional problems of the aging individual. Emphasis on nutritional requirements, dietary intakes and the effect of nutrition on the rate of biological aging. Prereq: 5210 or consent of instructor.

5610 Nutrition in Mental Retardation and Developmental Disorders (1-12) Orientation to observation of and participation in the interdisciplinary diagnosis and treatment of the developmentally-handicapped child. Emphasis placed on nutrition to the role of the nutritionist; includes clinical experience and lectures at the Child Development Center, Center for the Health Sciences, Memphis. Prereq: Consent of department head.

5700 Current Programs and Trends in Nutrition (1-3) Discussion of selected recent developments in field of nutrition and their implications for the worker, dietitian, public health nutritionist, and others in related fields. May be repeated. Maximum 9 hrs. Prereq: Consent of instructor.

5800 Problems in Nutrition I (1-3) Advanced study selected from the field of nutrition and their implications for the worker, dietitian, public health nutritionist, and others in related fields. May be repeated. Maximum 9 hrs. Prereq: Consent of instructor.

5900 Seminar in Food Systems Administration (1, 1) May be repeated.

6000 Doctoral Research and Dissertation

6110 Proteins and Amino Acids (3) Lectures, reports and discussions. Prereq: 5410-20.

6120 Mineral Metabolism (3) Lectures, reports and discussions of functions of minerals in physiological processes. Prereq: 5410-20.

6130 Lipid Metabolism (3) Lectures, reports, and discussions. Prereq: 5410-20.

6140 Vitamin Metabolism (3) Lectures, reports and discussions. Prereq: 5410-20.

6210 Advanced Topics in Nutrition (1-3) Discussion of recent advances, concepts, research techniques and current problems. Prereq: 5410-20 or consent of instructor.

6900 Seminar (1-3) May be repeated. Maximum 9 hrs. S/NC only.

Food Systems Administration

4130 Food Systems Administration (3) Functions of management applied to food service systems. Prereq: Quantity Food Procurement, Production and Service.

4140 Food Systems Personnel Development (3) Development of training programs for food systems personnel. Prereq: 4130 or consent of instructor.

4150 Design and Layout of Food Service Systems (3) Physical facilities equipment for food service systems based on needs of the system. Procedures for purchasing equipment. Prereq: Quantity Food Procurement, Production and Service, or consent of instructor.

4250 Food and Lodging Managerial Cost Control (3) Cost analysis for control. Use of financial statements for decision making for food service enterprises. Prereq: 4150; Fundamentals of Accounting.

4260 Food and Lodging Physical Plant, Planning and Maintenance (4) Feasibility, planning, development, and construction of food and lodging physical plant and maintenance. Electrical, mechanical, heating, plumbing, air conditioning and illumination systems. Types of building materials and construction. Interdisciplinary with home economics and architecture. Prereq: Quantity Food Procurement, Production and Service; 4150; or consent of instructor, 3 hrs and 1 lab. (Same as Architecture 4260)

4270 Food and Lodging Information Systems (3) Qualitative and quantitative analysis of information systems for decision making in food and lodging operations. Prereq: 4150, 4250, and Electronic Data Processing.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

5110-20 Experimental Quantity Food Study (3, 3) Analysis of food systems, environment, and service problems related to quality of food prepared in volume. Use of management resources. Prereq: 4130; Quantity Food Procurement, Production and Service, or consent of instructor.

5210 Methods of Food Systems Research (3) Research methods applicable to food systems administration. Prereq: 4130, Statistics 5211 or equivalent.

5220 Experimental Design of Food System Facilities (3) Experimental approach to environment in which food is prepared, held, and served in volume. Prereq: 4130.

5230 Food Systems Evaluation (3) Evaluation of management resources in food systems. Standards for control. Prereq: 4130, or consent of instructor.


5310 Administration of Food Service Delivery Systems (3) The roles and responsibilities of the administrator in maintaining desired qualitative and quantitative standards in a food service delivery system. Prereq: Quantity Food Procurement, Production and Service or consent of instructor.

5500 Clinical Training in Health Care Agencies (3) Instructional and supervisory techniques utilized in clinical settings by nurses and dietitians for the training of entry-level health care providers. Prereq: Management of Health Care or 4140 or consent of instructor.

5700 Current Programs and Trends in Food Systems Administration (4) Recent advances in food systems administration and their implications for dietitians, school food service directors and others in related fields. Prereq: Consent of instructor. May be repeated.

5800 Problems in Food Systems Administration (1-3) May be repeated.

5850 Field Experience (3-9) Planned administrative experience in a food service system. Prereq: Consent of instructor.

5900 Seminar in Food Systems Administration (1-3) May be repeated.
Home Economics

MAJOR

Home Economics

DEGREE

Ph.D.

Professors:

L. M. Odlend (Dean), Ph.D. Wisconsin, D.Sc. Rhode Island; G. E. Goerz (Associate Dean), Ph.D., Kansas State.

Associate Professor:

J. L. Cunningham, Ph.D. Michigan State.

Assistant Professor:

V. S. Anagnost (Assistant Dean), M.S. Tennessee.

5000 Practicum (1-12) Field experience in selected organizations that focus on interdisciplinary solutions to multilevel problems of society. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

5100 International Studies (1-15) Student- or staff-initiated course for study in a foreign country of topic(s) pertinent to field. Topic to be determined by student and instructor with department and college approval. May be repeated. Maximum 15 hrs.

5210 History and Philosophy of Home Economics (3) Historical development of home economics; survey of concepts and philosophy of present disciplines and analysis of current programs; emphasis on projection of future developments.

5220 Development of Community Services Programs (3) (Same as Agricultural Extension 5216.)

5230 Evaluation of Community Services Programs (3) Purposes of evaluation, clarification of objectives and procedures for determining progress.

5600 Home Economics in the Community (3) The role of home economists in the community and how interactions among professionals of all community resources can facilitate finding solutions for and/or solving problems of individuals, families and communities as related to the quality of life. Prereq: Advanced study selected from the field of sociology, psychology, economics.

5700 Current Programs and Trends in Human Resources Development (1-3) Current developments in area related to human resources and their impact on society through community service programs and other programs for education, business, and government. May be repeated. Maximum 9 hrs. Prereq: Consent of instructor.

5900 Problems in Community Service (1-3) Problems in Community Service. May be repeated. Consent of instructor.

5900 Seminar in Human Resource Development (1-3) May be repeated. S/NC only.

6000 Doctoral Research and Dissertation

6110-20 Theoretical Issues in Human Resource Development (3, 3) Interdisciplinary approach to the development and use of human resources in the solution of family and consumer problems. Prereq: 12 hrs of 5000-level courses representing 2 areas of home economics.

6210 Professional Issues in Human Resource Development (3) Role and philosophy, and administrative procedures for human resource development. Prereq: 12 hrs of 5000-level courses representing 2 areas of home economics.

6310 Advanced Topics (3) Comprehensive individual study and group discussion of individual and family behavior, physiological development and well-being, environmental factors, and economic and social well-being. Prereq: 6110. May be repeated.

6500 Methodological Issues in Home Economics (3) Advanced methodology in home economics, with particular attention to interdisciplinary research methods and issues. Prereq: 1 graduate-level course in research methodology or consent of instructor.

6900 Seminar (1-3) May be repeated. S/NC only.

Home Economics Education

Graduate study in home economics education provides for an M.S. in Home Economics Education and opportunity for participation in the Ed.D. program in Vocational-Technical Education in the College of Education. (See page 62 for staff and course offerings.)

Textiles and Clothing

MAJORS

DEGREES

Textiles and Clothing

M.S.

Home Economics

Ph.D.

Professor:

A. J. Treese (Head), Ph.D. Ohio State.

Associate Professors:

M. J. Freg (Chair), Ph.D. Pennsylvania State; B. G. Goswami, Ph.D. Manchester (England); C. J. Noel, Ph.D. Notre Dame.

Faculty Associate:

T. L. Vigo, Ph.D. Tulane.

Assistant Professors:

R. P. Dowlen, M.S. Tennessee; M. F. Miller, Ph.D. Pennsylvania State.

Lecturer:

A. L. Bullock, B.S. Mississippi College.

4210 Elementary Textile Microscopy (3) Introduction to microscopic techniques as applied to the study of textile fibers and fabrics. Prereq: Textiles II; Textile Chemistry, 1 hr and 2 labs.

4240 Design Analysis II (3) Creative interpretation of design using techniques in finished garments developed through the media of draping, 1 hr and 2 labs.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise fulfilling degree requirements. Each student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

5110 Textile Testing and Methods of Research in Textiles (3) Physical and chemical testing. Research methods. 3 labs.

5120 Advanced Problems in Textiles and Clothing (3) Refresher course; emphasis on new developments in textiles. Aids in selecting fabrics, agencies aiding consumer, and individual problems which students have met in the textile field. 2 hrs and 1 lab.

5130 Advanced Tailoring (3) Comparison of hand and machine tailoring to include making suits, coats, or costumes. 3 labs.

5150 Principles of Design Analysis (3) Application of flat pattern theory to garment design incorporating relationships of fabric geometry, texture, hand, and surface ornamentation to design. Prereq: Consent of instructor. 1 hr and 2 labs.

5160 Review of Literature (3) Intensive survey and evaluation of recent literature; implications for further research.

5170 Social, Psychological and Economic Aspects of Clothing (3) Clothing as it relates to human behavior. Prereq: 6 hrs or equivalent from one of the following areas: sociology, psychology, economics.

5180 Advanced Textile Economics (3) Economic problems or problem areas of current importance in the textile and apparel industries—production, consumption and government policy. Prereq: 3420, 6 hours of economics or consent of instructor.

5210 Evaluation of Instructional Materials in the Field of Textiles and Clothing (3) Evaluating instructional materials to be used in communicating information in the various areas of textiles and clothing. 1 hr and 2 labs.

5220 Historic Textiles (3) Development of the textile industry in the world with emphasis on fibers used, design and color.

5240 Practicum (1-9) Off-campus experience with business, industry, governmental agencies and civic groups; preplanned; supervised. Prereq: Consent of advisor and department head. May be repeated. Maximum 9 hrs. S/NC only.

5250-60-70 Problems in Textile Chemistry (4, 4, 4) Theoretical and experimental study of chemicals of textiles including polymerization, reactions, dyeing, and finishing. 5250 must be taken first, 5260 and 5270 need not be taken in sequence. Prereq: Structure—property relationships and reactions of fibers, 5260-11, or 5270—Dyes and dyeing, 2 hrs and 2 labs. Prereq: 3420 or equivalent, one quarter of organic chemistry.

5310 Fashion Analysis (3) Fashion as a social and economic force; evolutionary theme of fashion operation. Prereq: 6 hours each of sociology and economics.

5320 Problems in Historic Costume (3) A variable content course with emphasis on the flow of styles in relation to cultural determinants. Prereq: 3480 or consent of instructor. May be repeated. Maximum 9 hrs.

5710-20-30 Current Programs and Trends in Textiles and Clothing (1-3, 1-3, 1-3) Pertinent developments and trends in textiles and/or clothing and their implications for new types of programs, techniques, TV, and other approaches. Content and emphasis will vary according to changes in the field and needs of groups serviced. Prereq: Consent of instructor.

5800 Problems in Textiles and Clothing (1-3) Advanced study selected from the field of textiles and clothing. Prereq: Consent of department head and permission in charge of investigation. May be repeated. Maximum 9 hrs.
5900 Seminar in Textiles and Clothing (1-3)  
Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

6010 Advanced Studies in Textiles and Clothing (3)  
Independent analysis of major philosophies, theories, methods, and research.  
Prereq: 5160 or consent of instructor. May be repeated. Maximum 6 hrs.

6110 Selected Issues in Textiles and Clothing  
(3) In-depth investigation of advanced topics of current significance. Prereq: Consent of Instructor. May be repeated. Maximum 6 hrs.

6140 Selected Behavioral Theories in Clothing  
(3) Role of clothing in the functioning of people, utilizing behavioral theories. Prereq: 5170, 6 hrs of graduate level sociology or psychology, or consent of instructor.

6150 Social-Psychological Theories of Clothing Consumption (3)  
Analysis and evaluation of social science theories of consumer behavior in relation to the areas of textiles and apparel. Prereq: Child and Family Studies 5170, 6 hrs of graduate level sociology or psychology, or consent of Instructor.

6160 Textile Flammability (3)  
Factors affecting textile flammability as a consumer issue. Standards, regulations, test methods, economic impact. Prereq: 5120, 5180, 5250, or consent of instructor.

6170 Physical Performance Behavior of Textile Structures I (3)  
Fundamentals of yarns and fabric structures; relationship of structure to physical characteristics of textile materials. Prereq: 5120, or consent of instructor.

6910 Seminar in Textiles and Clothing (1-3)  
May be repeated. Maximum 6 hrs.
Aviation Systems

MAJOR

Aviation Systems

DEGREE

M.S.

Professors:
B. H. Goethert, Ph.D. Berlin; E. C. Huebschmann, Ph.D. Texas; R. S. Sleeper, M.A. Harvard; M. A. Wright, Ph.D. Wales; J. M. Wu, Ph.D. California Institute of Technology; R. L. Young, Ph.D. Northwestern.

Associate Professor:
S. N. Chaudhuri, Ph.D. Indian Institute.

The University of Tennessee Space Institute offers this program leading to the Master of Science with a major in Aviation Systems. The Aviation Systems program is designed for those who possess Bachelor's degrees in engineering or science and who wish to study under a "systems philosophy" toward careers in research and development or administration in various phases pertinent to aviation. The program features 18 quarter hours major field credit in various aspects of aviation systems, 6 or more quarter hours credit in each of the areas of research, development and administration, and electives which permit further specialization in either area.

To qualify for admission to this program, the applicant must possess a Bachelor's degree in engineering or science from a recognized institution, show evidence of ability to pursue and benefit from the program, and fulfill The University of Tennessee Graduate School admission procedures and grade point standards. Subject matter prerequisite to the program includes basic knowledge of computer utilization as represented by Computer Science 3150 or equivalent, a background in statistics as represented by Statistics 3450 or equivalent, a basic understanding of aerodynamic fundamentals, aircraft propulsion and performance as represented by Aerospace Engineering 4110 and Aerospace Engineering 4120 or equivalent, a background in accounting as represented by Accounting 5710 or equivalent basic accounting courses, a basic knowledge of economics as represented by Introductory economics or equivalent.

The thesis and non-thesis programs are available for fulfilling the requirements of the program. The thesis program involves satisfactory completion of the following minimum requirements:

1. Eighteen quarter-hour credits in the major field of aviation systems.
2. For the research and development area, 6 quarter hours in Industrial Engineering 5700 and Industrial Engineering 5710 and for the administration area, 6 quarter hours in Economics 5070 and Accounting 5810, for a total of 12 quarter hours.
3. Six quarter hours of electives selected from the major field, engineering and/or the areas in item 2.
4. Nine quarter hours in Aviation Systems 5000, Thesis, hence demonstrating the ability to conduct and report on an independent investigation.

The non-thesis program will be permitted in special circumstances and involves satisfactory completion of the following minimum requirements:

1. Eighteen quarter-hour credits in the major field of aviation systems.
2. For the research and development area, 9 quarter hours in Industrial Engineering 5700, Industrial Engineering 5710, and Industrial Engineering 5720 and for the administration area, 9 quarter hours in Economics 5070, Accounting 5810 and Finance 5510, for a total of 18 quarter hours.
3. Six quarter hours of electives in one of the areas in item 2.
4. Six quarter hours of electives in the major field, engineering and/or the areas of item 2.
5. Satisfactory completion of 3 quarter hours in Aviation Systems 5100, Project in Aviation Systems.
6. Satisfactory completion of a comprehensive final written examination on all course work submitted for the degree and defense of the project course paper.

The thesis program involves 45 quarter-hour credits minimum while the non-thesis program involves 51 quarter-hour credits minimum.


Electives typical of those suitable for credit in the area of Aviation Systems, Research and Development include: Aerospace Engineering 5150-60-70; Computer Science 3510-20, 4520 and 5655-65-75; Industrial Engineering 4060, 4150, 4230, 5720, 5730, 6700, 6730; Mathematics 4220-30, 4510-20-30; Metallurgical Engineering 5810-20-30; and Statistics 3550. Electives typical of those suitable for credit in the area of Aviation Systems, administration include: Accounting 5620; Business Law 5110; Economics 5080; Finance 5100; Industrial Management 5130; Marketing 5100; Transportation 5100, 5130, 5210-20, and 5910.

5000 Thesis

5070 Airports and the Community (3) Structure of airports and their communities. Technology and economics of cargo, baggage, ticket and passenger handling. Airport management, economics and logistics. Interfaces with the com-
munity, collection and distribution, demand requirement analyses, types of developments and their projections. Prereq: Aerospace Engineering 5810.

5080 Collection and Distribution (3) Capabilities of the textile industry, programs and developments for collecting and distributing passengers and freight to and from various types of airports, water, air and mixed transportation modes, present and future; requirements analysis, and model analysis of the system. Prereq: Aerospace Engineering 5810.

5090 Governmental Policies for Aviation (3) Theoretical and legal basis for economic and governmental regulation of aviation. Historical and legislative development of aviation regulatory agencies, organizational structure and administrative and enforcement procedures. Prereq: Aerospace Engineering 5810.

5100 Project in Aviation Systems (3) In-depth study and formal report on an aviation systems topic, normally performed during the last quarter of work toward degree in non-thesis program. For aviation systems degree candidates only.

5210-20 Experimental Flight Mechanics (3, 3) Consideration of flight mechanics with emphasis on experimental techniques. Specialized, equipped airborne laboratory allows active student participation in a series of experiments demonstrating the principles of flight test data. Tests will be conducted covering a broad range of aircraft performance, stability and control characteristics. In addition to the development of the theory necessary to support the class experiments, test techniques, instrumentation and data reduction methods will also be the subject of the series of lectures included in the course. 5210 emphasizes performance and 5220 emphasizes stability and control. Prereq: Aerospace Engineering 4120.

5970 Special Topics in Aviation Systems (3) Current problems in aviation systems. Prereq: Consent of instructor. May be repeated with consent. See also course descriptions for Aerospace Engineering 5810, 5820, and Industrial Engineering 5840.

Cybernetics and Bionics

Professors: T. C. Halvey (Emeritus), D.Sc.H.C., University of the Atlantic*; R. S. Sleeper, M.A. Harvard.*

5110 General Systems and Cybernetics Fundamentals (3) Fundamentals of the theories of cybernetics and bionics. Interdisciplinary and system-oriented approaches are presented with a review of the theories of information, automatic and human control, and computers, which are necessary for the understanding of the main topics.

5120 Cybernetic Biophysics (3) Interdisciplinary and systems aspects of the mechanism of the human body are presented which include the topology, chemistry, physics, and mental functions. Course presents primarily the engineering aspects of vision; useful elective of all engineering programs.

5130 Applied Cybernetics and Bionics (3) Utilization of cybernetics and bionics for communication and control in large human systems and in the approach to man-machine symbiosis. Recommended for those having participated in 5110 and 5120; persons primarily interested in an overview of systems dynamics may take with the instructor's consent.

5140 Cybernetics of Human Behavior (3) Aspects of human behavior with emphasis upon open and closed feedback loop interactions with the environment. Systems aspect of cognition and control, mental functions, second order interaction in interpersonality communication. Recommended for engineers and persons interested in man-machine interactions.

5990 Cybernetics Seminar (3) The Graduate Program in Ecology offers Master of Science and Doctor of Philosophy degrees. This interdepartmental program provides advanced courses in contemporary ecology for students from undergraduate programs in biology, agriculture, engineering, and applied ecology. The program is intended to prepare students for academic careers as well as professional positions in industry or government. The Environmental Sciences Division of the Oak Ridge National Laboratory and the Tennessee Valley Authority provide advisors and research facilities. The Great Smoky Mountains, Cumberland Plateau, valley and ridge topography, the Tennessee River, and 14 rivers provide locally a spectrum of natural habitats and consequent ecological diversity which is truly unique. In addition, faculty research programs provide opportunities for student participation elsewhere on this continent and abroad.

ADMISSION REQUIREMENTS

Requirements for admission to this program are: (1) admission to the Graduate School; (2) at least 12 quarter hours of college chemistry, 9 quarter hours of college mathematics, and 4 quarter hours of ecology at the upper division level. Candidates for the doctoral degree are expected to take the Graduate Record Examination.

Application forms for admission should be obtained from the Graduate School. Inquiries concerning the admission requirements should be addressed to the Director, Graduate Program in Ecology, University of Tennessee, Knoxville, Tennessee 37916.

ADVISORS

Advisors are selected from ecologists in several departments of the University who have competence in the area in which the student expects to work. Entering students should consult early with the Director of the program on the choice of a faculty advisor who will become the chairman of the student's faculty committee.

THE MASTER'S PROGRAM

The minimum 45 quarter hours of graduate credit shall include 18 hours of ecology courses (exclusive of thesis), of which 6 hours shall be in Ecology 5210-20 and at least 8 additional hours in ecology courses numbered above 5100; 9 hours of thesis in Ecology 5000, and 18 additional hours in ecology or supporting courses. To insure an interdepartmental program, the required minimum of 45 hours shall include no more than 18 hours of non-thesis courses from any one department of Instruction.

The general requirements for this Master's degree are listed on page 19. A minor in ecology shall include Ecology 5210-20-30 (6 hours) and at least 3 additional hours in approved ecology courses.

THE DOCTORAL PROGRAM

The requirements for this degree are in general the same as those of the Graduate School with the following two exceptions: (1) each student's faculty committee shall consist of at least two members from the department in which the dissertation is being supervised and at least two from outside this department; (2) this doctoral program must include Ecology 5210-20-30 and a minimum of 9 quarter hours of courses numbered above 6000. A student may elect predoctoral instruction until the research proposal has been discussed and approved by the doctoral committee.

Shared Faculty


Courses

The following courses are those offered directly by the Ecology Program and those which, although listed in other departments, have been approved to satisfy Master's degree requirements. Additional ecology
courses are described elsewhere in the catalog under the departments identified in the following list.

Agricultural Biology
4010 Biology of Soil Microorganisms (4)
4510 Freshwater Fishery Biology (4)
4520 Management of Lakes and Ponds (4)

Agricultural Economics and Rural Sociology
4330 Land Economics (3)
5420 Advanced Land Economics (3)
5490 Rural Population Analysis (3)

Anthropology
4360 Field Work in Physical Anthropology (3-5)
4840 Zoarcheology (3)
4980 Primate Paleontology (3)
4970 Human Paleontology (3)
5970 Emergence and Early Evolution of Man (3)

Botany
4310 Plant Ecology (4)
5340 Plant Geography (4)
5350 Analysis of Plant Communities (4)
5510-20-30 Systems Ecology (3, 3)
5830 Field Methods in Plant Ecology (4)
6320 Ecosystems of the World (3)

Ecology

...
Two separate applications must be completed: one application for admission to the Graduate School and one application for admission to the Industrial and Organizational Psychology program. Deadline: For fall entrance, all materials should be received by the Vice Chancellor for Graduate Studies and Research no later than March 15 if you wish financial assistantship consideration.

Standards: At least 9 quarter hours of college mathematics and one course in statistics are required. Ordinarily, an undergraduate grade-point average of 2.5 or above is required, with no evidence of special weakness in mathematics and physical sciences. Test scores of 500 or above also are necessary on the Graduate Management Admission Test, or on each section of the aptitude portion of the GRE. The advanced section for psychology is required.

THE DOCTORAL PROGRAM

I. Course Requirements

A. Minimum course requirements

1. Industrial Management or Psychology 5170, 5180, 5190 (Proseminar in Industrial and Organizational Psychology)
2. Statistics 5050-60-70 (Behavioral Statistics), Exemption by petition
3. Psychology 5070 (Academic Practicum)
4. Minimum of three 6000-level seminars to be selected from Psychology or Industrial Management 6250, 6260, 6270, and Industrial Management or Psychology 6380*
5. 36 hours of Psychology or Industrial Management 6000 (Doctoral Dissertation)

B. Recommended electives

1. For preparation for advanced section (81) GRE: Psychology Proseminar
2. For students who require preparation in psychometrics: Applied Psychometrics
3. For students who require preparation in management: Industrial Management 5110, 5120, 5230 (the latter is the same as Psychology 5450)
4. For students who wish to pursue special research interests aside from their dissertation: Industrial Management 5250, 5260, 5270 (Readings in Organizational Psychology) Industrial Management or Psychology 6000 (Supervised Field Research)
5. Courses available in areas related to industrial and organizational psychology:
   a. Through College of Business Administration: Wage and Salary Administration (Industrial Management 5220)

B. Recommended electives

1. Seminar in Personnel Research (Industrial Management 5240)
2. Economics
3. Through College of Liberal Arts: Psychology 6450, 6460, 6470
4. Industrial Sociology

II. Program Requirements**

A. Attainment of a B average in the Proseminar in Industrial and Organizational Psychology
B. Completion of a comprehensive examination in general psychology within no more than two years of entry by attaining a score of 650 on the GRE Advanced Test in Psychology.
C. Completion of a general preliminary examination in scientific methodology before beginning the third year of study. This examination covers the following specific areas: statistics, psychometrics, experimental design
D. Completion of a special preliminary examination in the area of the student's major research and professional interests. A student is expected to take this examination by the end of twelve quarters. This examination may be repeated once, normally no later than six months after the first attempt, at the discretion of the student's doctoral committee.
E. By the end of nine quarters a student is expected to choose a major advisor (Chairperson of Doctoral Committee).
F. Completion of an oral examination following the preparation of a doctoral dissertation. This examination covers the field of the doctoral research and related topics, and must be passed at least four weeks prior to the awarding of the degree.
G. Maintenance of at least 3.0 grade point average.

THE MASTER'S PROGRAM

I. Course Requirements

A. Industrial Management or Psychology 5170, 5180, 5190 (Proseminar in Industrial and Organizational Psychology)
B. Statistics 5050-60-70 (Behavioral Statistics) and Applied Psychometrics, 3 hours
C. Eighteen hours of additional course work to be selected primarily from among the 5000-level course offerings in industrial management and psychology (e.g., Industrial Management 5110, 5120, 6230; Psychology 5080 [Current Topics in Applied Psychology])

**Any student in the doctoral program may be required to prepare a Master's thesis by the Industrial and Organizational Psychology Committee. This policy will be implemented by the Committee at such time as a review of the student's record suggests that additional data on the qualifications for pursuing a Ph.D. are required.

Management Science

Major

Management Science

M.S.

Committee:
C. E. Bell (Chairperson), Management Science; R. W. Boling, Industrial Management; J. S. Bradley, Mathematics; R. L. Church, Civil Engineering; R. S. Garfinkel, Management Science; R. E. Rosenthal, Management Science; S. Selkow, Computer Science; G. C. Thibben, Statistics

THE MASTER'S PROGRAM

The M.S. program in Management Science is designed as preparation for a career in the application of quantitative techniques for the solution of management problems in large organizations. The program's flexibility also makes it appropriate as preparation for doctoral study in Management Science.

Management Science course work will expose students to both the theoretical development of quantitative techniques and their application to managerial decision making. In addition to the development of sufficient mathematical maturity for creative use of quantitative skills, the program allows concentrated study in an area of application within the College of Business Administration. With the widespread application of management science technology, the student may (with the approval of the Management Science Committee) choose an applied concentration in a field outside the College of Business Administration.

Applications are encouraged from all majors, but mathematical background equivalent to the completion of at least two years of college calculus and proficiency in a computer language (e.g., Computer Science 3150) is required. The program is designed to be completed in one calendar year of full-time study, but applications are also encouraged from prospective part-time students.

Course Requirements

<table>
<thead>
<tr>
<th>Quarter Hours</th>
<th>Management Science 5310-20-30-40</th>
<th>Applied Concentration Area (approved by advisor)</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Statistics 5110</td>
<td>Statistics elective (5000 level or above)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Mathematics (4000 level or above)</td>
<td>Electives selected from mathematics, statistics, computer science, and/or management science</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Electives in any area approved by advisor</td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>

Total 48
A thesis option is available which substitutes 9 hours of thesis credit for the following 12 hours of course work:
Management Science 5340, one 3-hour course in the applied concentration area and 6 hours of electives in any area.
The Management Science Committee will work closely with the student in tailoring a program to his/her needs.
The committee must approve a tentative overall program during the student's first quarter and must approve all courses on a quarter-by-quarter basis.
Recognizing the diverse backgrounds and needs of Management Science M.S. students, the Management Science Committee is prepared to waive some of the above requirements on an individual basis. For example, an undergraduate mathematics major with a strong background may be allowed to take 6 additional hours of electives in place of the mathematics requirement. On the other hand, a student lacking experience in rigorous senior-level mathematics courses will be asked to take such courses to fulfill the 6-hour mathematics requirement. The total course load will remain 48 hours for all non-thesis students and 45 hours for all thesis students; however, the number of hours of electives can be reasonably expected to vary between 6 and 18 as a function of prior background.

Prerequisites for Management Science Courses: The Management Science Program is interdisciplinary and students in other degree programs are encouraged to enroll in management science courses. Course prerequisites are designed to indicate the level at which courses are taught. Interested students whose prior course work does not match the prerequisites are encouraged to seek the instructor's guidance and consent to enroll.

For course listings and description of the Ph.D. program in Management Science, refer to the Department of Management Science, College of Business Administration.

University Studies
(Non-Departmental)
University Studies deal with important contemporary topics which are sufficiently comprehensive to require the study and attention of students and faculty from more than one college. They are open to all qualified members of the university community.

4100 Energy Needs and our Environment (3)
Not allowed for graduate credit for ecology majors.

Water Resources Development
MAJOR
Water Resources Development
DEGREE
M.S.
Floyd C. Larsen, Director,
Water Resources Research Center
Specific requirements for admission to this program are a Bachelor's degree in law, engineering, or one of the physical or social sciences from an accredited college or university, and evidence of ability to do work of graduate quality, as ascertained by undergraduate records. Also considered will be work record, if any, and letters of recommendation. The general policies and requirements of the Graduate School apply to this program.
The degree of Master of Science requires 45 quarter hours of graduate studies, including 9 hours of thesis work. The exact curriculum of each student is decided in consultation with a faculty committee, depending on the background and field of interest. If during the undergraduate work the student has, in the opinion of the faculty committee, sufficient training and education in one or more of the required courses, the student may substitute other elective courses. Electives will consist of advanced work in the student's specialty or in a related field.

3410 Principles of Ground Water Geology (3)
(Same as Geology 3410.)
3565 Introduction to Public Administrative Organization & Management (4)
(Same as Political Science 3565.)
4110 Managerial Economics (3)
(Same as Economics 4110.)
4810 Water Law (3)
(Same as Environmental Engineering 4810.)
5000 Thesis
5130 Planning Research Methods I (3)
(Same as Planning 5130.)
5160 Planning and Utilities (3)
(Same as Environmental Engineering 5160 and Planning 5160.)
5200 Water Resources Systems (3)
(Same as Environmental Engineering 5200.)
5330 Descriptive Hydrology (3)
(Same as Environmental Engineering 5330.)
5340 Hydrology of Agricultural and Forest Lands (3)
(Same as Agricultural Engineering 5340.)
5410-20-30 Interdisciplinary Seminars (3, 3, 3)
Problems relating to comprehensive water resource development including flood management, hydroelectric power, navigation, recreation, alternatives in water resource planning, tomorrow in today's planning, project formulation and justification, direct and indirect economic consequences, state and local participation, and municipal and industrial uses of water developments.
The College of Liberal Arts offers programs leading to eight advanced degrees. See page 9 for degrees and majors.

### Departments of Instruction

Numbers in parentheses following the course titles indicate quarter hours credit offered.

### Anthropology

<table>
<thead>
<tr>
<th>MAJOR</th>
<th>DEGREE</th>
<th>ANTHROPOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M.A., Ph.D.</td>
<td></td>
</tr>
</tbody>
</table>

Professors:
- W. M. Bass (Head), Ph.D. Pennsylvania
- C. H. Feuikner, Ph.D. Indiana
- A. K. Guthe, Ph.D. Michigan
- P. W. Parmalee, Ph.D. Texas

Associate Professors:
- I. E. Harrison, Ph.D. Syracuse
- R. L. Jantz, Ph.D. Kansas

Assistant Professors:
- J. M. Bishop, Ph.D. California (Berkeley)
- W. E. Klippel, Ph.D. Missouri
- M. H. Logan, Ph.D. Pennsylvania State
- G. F. Schnoedl, Ph.D. Washington State
- F. H. Smith, Ph.D. Michigan

THE MASTER'S PROGRAM

The formal requirements for the Master's degree include:

1. A minimum of three quarters of residence at the University of Tennessee.
2. A minimum of 45 quarter hours for graduate credit, including preparation of thesis. Thirty-six of these 45 hours must be in anthropology, 9 hours may be taken in closely related disciplines (at least one-half of the courses must be at the 5000 level).
4. A thesis. In addition to the two (2) copies required by the Graduate School, one bound copy of the thesis is to be presented to the department and one bound copy to the student's thesis advisor.

THE DOCTORAL PROGRAM

Although there is no minimum credit hour requirement for the Ph.D. degree, students in this program should plan to devote to its attainment no less than 3 years beyond the B.A. level, and to complete the following requirements:

1. Admission to Ph.D. program through passing the Graduate Evaluation Examination at completion of first year of study, or through departmental acceptance of a previously earned M.A. degree in Anthropology.
2. Formation of an advisory committee and establishment in consultation with that committee of a program of study. Delineation of field(s) of competence by the student and committee and subsequent presentation to graduate advisor.
3. Demonstration of competence in a foreign language as determined by the student's committee.
4. Successful completion of oral and written comprehensive examinations and admission to candidacy.
5. Successful completion of the dissertation and final oral examination.

<table>
<thead>
<tr>
<th>COURSE</th>
<th>TITLE</th>
<th>HOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3510</td>
<td>Peoples and Cultures of Mainland Asia (3)</td>
<td>Ethnographic survey of the cultures of mainland Asia. Cultural diversity and human ecology in areal perspective. Prereq: Human Culture recommended.</td>
</tr>
<tr>
<td>3520</td>
<td>Peoples and Cultures of Africa (3)</td>
<td>Ethnographic survey of the aboriginal cultures of sub-Saharan Africa. Cultural diversity and human ecology in areal perspective. Prereq: Human Culture recommended.</td>
</tr>
<tr>
<td>3530</td>
<td>Peoples and Cultures of Mainland Asia (3)</td>
<td>Ethnographic survey of the cultures of mainland Asia. Cultural diversity and human ecology in areal perspective. Prereq: Human Culture recommended.</td>
</tr>
<tr>
<td>3540</td>
<td>North American Indian (3)</td>
<td>An ethnographic survey of the cultures of the Arctic, Southwest, Plains and Eastern Areas. Emphasis on the cultural differences of peoples occupying these areas during the precontact period. Prereq: Human Culture recommended.</td>
</tr>
<tr>
<td>3555</td>
<td>Cherokee Ethnohistory (3)</td>
<td>Survey of sociopolitical aspects of internal affairs and external relationships from first European contact to present. Emphasis on eighteenth and nineteenth centuries.</td>
</tr>
<tr>
<td>3560</td>
<td>Prehistoric Archaeology (3)</td>
<td>Survey of prehistoric peoples north of Mexico from initial occupation to European contact. Prereq: Human Culture recommended.</td>
</tr>
<tr>
<td>3570</td>
<td>Archaeology of United States and Canada (3)</td>
<td>Survey of prehistoric peoples north of Mexico from initial occupation to European contact. Prereq: Human Culture recommended.</td>
</tr>
<tr>
<td>3610</td>
<td>European Prehistory I (3)</td>
<td>Cultural development during the Paleolithic, Mesolithic, and Neolithic. Prereq: Prehistoric Archaeology recommended.</td>
</tr>
<tr>
<td>3620</td>
<td>European Prehistory II (3)</td>
<td>Cultural development during the Metal Ages. From the close of the Neolithic through the Iron Age. Prereq: Prehistoric Archaeology recommended.</td>
</tr>
</tbody>
</table>
3540 Ancient Civilization of Mesoamerica (3) Introduction to the archaeology of areas of advanced Indian culture in Mexico and Central America beginning with the earliest cultures and proceeding to contact with Europeans. Prereq: Human Culture recommended.

3660 Prehistory of Tennessee (3) History of archaeological research in Tennessee and survey of prehistoric American Indian cultures identified through this research.

3870 Principles of Archaeology (3) Research strategies in archaeological excavation, interpretation, and explanation. Prereq: Prehistoric Archaeology or consent of instructor.

3700 Forms of Folklore (4) An introduction to the anthropological study of folklore.

3710 European Folk Cultures (3) Traditional aspects of European life, as expressed in technology, beliefs, art, and folklore, under changing historical and socioeconomic conditions.

3800 Language and Culture (3) Relationship between linguistic categories and patterns of culture. Prereq: Introduction to Linguistic Anthropology or consent of instructor. Recommended: Human Culture.

3811 Introduction to Mesoamerica (3) (Same as Art 3911).

3900 Human Osteology (4) Intensive examination of the human skeleton. Prereq: Human Origins and consent of instructor. 3 hrs and 1 lab.


3930 The Biology of Races of Man (3) Processes of racial differentiation; criteria of significant differences among existing stocks; influence of biology and culture in race formation; analysis of studies concerning blood groups, race mixture, constitution, growth and nutrition. Prereq: Human Origins recommended.

3950 Human Identification (3) Introduction to techniques used in identification of human skeletal material in forensic medicine.

4200 Contemporary North American Indian (3) Survey of Indian cultures from initial Euro-American contact through emphasis on cultural change, U.S. Government Indian policy, reservation life; contemporary Southeastern Indian life; and historical problems. Prereq: Human Culture or consent of instructor.

4210 Ethnographic Research Techniques (3) Methods of collecting, ordering and utilizing data. Prereq: Consent of instructor.

4240 Applied Cultural Anthropology (3) Applications of anthropological theory and methods and findings in programs of community and national development, public health, international aid, and military assistance. Examination of the roles of anthropologists, questions of values and ethics in intervention schemes, and of the organization of planned changes in applied programs. Intensive analysis of selected case studies. Prereq: Human Culture or consent of instructor.

4250 Medical Anthropology: Lecture (3) A survey of medical anthropology. Emphasis is on ways in which anthropology contributes to understanding of human biology, disease, treatment, death, and related concepts. Focus is on analyses and descriptions of anthropological fieldwork.

4259 Medical Anthropology: Laboratory (3) Fieldwork in medical anthropology. Emphasis is on cultural aspects of health, disease, and death in industrial societies and the folklore systems which coexist with Western, technical medicine. Prereq or coreq: 4250.

4300 Readings in Anthropology (1-9) Intensive reading, problem oriented. Prereq: Consent of instructor.

4340 Field Work in Archaeology (3-9) Practicum fieldwork surveying, excavating, processing, and interpreting data from and the developing of archaeological projects. Prereq: 3 quarters of introductory anthropology and consent of instructor. May be repeated. Maximum 9 hrs.

4350 Field Work in Cultural Anthropology (3-9) A practicum fieldwork course in the application of anthropological fieldwork reporting, survey and interview techniques, and the devising and carrying out of fieldwork projects. Prereq: 3 quarters of introductory anthropology and consent of instructor. Strongly recommended: 4210. May be repeated. Maximum 9 hrs.

4360 Field Work in Physical Anthropology (3-9) Practicum in the collection and analysis of human biological data. May include either skeletal or living populations. Prereq: 3 quarters of introductory anthropology and consent of instructor. May be repeated. Maximum 9 hrs.

4400 Cultural Ecology (3) Survey of concepts and methods in studying the dynamic interaction between cultures and their environments. Topics include ecological theory, methods of analysis, and application from selected case studies. Prereq: Human Culture, Human Origins or consent of instructor.

4410 Non-Western Education: Anthropological Approaches (3) Analysis of problems resulting from application of Western models of education in developing societies and in aboriginal communities within industrialized societies (e.g. American Indians).

4420 Dynamics of Culture (3) Culture change: innovation, diffusion and acculturation; cultural continuity and stability. Prereq: Human Culture or consent of instructor.

4430 Personality and Culture (3) Analysis of relations among individual, society, and culture. Application of psychological techniques in cross-cultural studies. Consideration of influence and their group behavior. Prereq: Human Culture or consent of instructor.

4440 Urban Anthropology (3) Survey of theoretical and methodological issues anthropologists encounter researching cross-cultural urban settlements. Focus is on anthropological perspectives on the planning and problems of urban culture. Prereq: Consent of instructor.

4480 Current Trends in Anthropology (3) An analytical integrative review in symposium of the current debates, research directions, theories, fieldwork methods, and general assumptions of the four subfields of anthropology: archaeology, physical anthropology, linguistics, and cultural anthropology.

4490 Cross-cultural Survey of Sex Roles and Behavior (3) Examination of sex roles and sex behavior from cross-cultural and diachronic viewpoints. Draws disparate and scattered studies together and attempts to arrive at conclusions on questions as how sex roles are learned, the parameters of acceptable sexual behavior and degrees of tolerance for sexual deviation in various cultures.

4500 Peoples of China I: Chinese Society Before 1839 (3) An anthropological survey of Chinese society and culture during the pre- and early Western contact periods. Prereq: Human Culture or consent of instructor. Recommended: 3510 or an East Asian course.

4510 Peoples of China II: Chinese Society After 1839 (3) An anthropological survey of Chinese society and culture in the period of intense Western contact, rejection of the West, and development of modern, communist Chinese society and culture. Prereq: Human Culture, or consent of instructor. Recommended: 4500, or an East Asian course.

4550 Indians of the Southeastern United States (3) Survey of prehistoric and historic Indian cultures; emphasis on aboriginal adjustment to environment; lifeways of Southeastern Amerind groups prior to contact; relations of American Indian and European cultures; U.S. Government Indian policy, reservation life; contemporary Southeastern Indian life; and historical problems. Prereq: Human Culture, 3540, or consent of instructor.

4560 Cherokee Ethnology (3) Intensive survey of ideology and material aspects of Cherokee culture existing at time of first European contact.

4570 Peoples of Southeast Asia (3) Survey of representative ethnic groups and indigenous cultures of mainland and island Southeast Asia. Problems of contemporary culture changes. Prereq: Human Culture, or consent of instructor, or an East Asian course.

4580 Asians in the Americas Since 1800: Anthropological Perspectives (3) Character, factors, and motivations in Asian immigration to North, Central and South America. Assimilation of immigrants and effect of minorities on dominant society. Major topics is United States.

4590 Peoples of Japan (3) An analysis of the cultural diversity and unity of the people of Japan. Prereq: Human Culture or consent of instructor, recommended 3510 or an East Asian course.

4600 Method and Theory in American Archaeology (3) The historical development of New World archaeology with emphasis on key issues and field techniques. Prereq: Prehistoric Archaeology or consent of instructor.

4610 African Prehistory (3) Survey of cultural history in Africa, from earliest evidence for human occupation through cultural developments. Prereq: Consent of instructor.

4640 Zooloanthropology (3) Basic osteological studies of vertebrate classes; emphasis on aboriginal man's utilization of native animals in his subsistence and culture. Identification, analysis and interpretation of archaeologically derived molluscan and vertebrate remains.

4650 Archaeology of Southeastern United States (3) Intensive study of the prehistoric American Indian. Special emphasis on Tennessee prehistory. Prereq: 3510 or consent of instructor.

4720 American Folklore (3) Anthropological perspectives on the folklore of geographical regions and ethnic groups of the United States. Prereq: 3700 or consent of instructor.

4740 Southern Appalachian Folk Culture (4) Research-oriented course dealing with wide range of traditional culture in Southern Appalachian: settlement patterns, folk housing, economy, clothing, belief, speech, art, song, dance, and oral traditions and customs. Prereq: Consent of instructor. May be repeated.

4750 Mexican Folklore (3) Anthropological perspectives on the folklore of Mexico and the Spanish-speaking southwestern United States. Prereq: 3700 or consent of instructor and a reading knowledge of Spanish.

4870 Cherokee Language (3) Linguistic survey of structure of the Cherokee language.

4930 Physical Growth and Constitution (3) Comparative growth patterns throughout the life cycle of man, skeletal and dental maturational differences in growth; human constitutional types. Prereq: First quarter general anthropology. Strongly recommended: General Genetics or consent of instructor.

4950 Primate Studies (3) Survey of field and laboratory methods of study of primate anatomy and nonhuman primate behavior. Prereq: Human Origins or consent of instructor.
Art

MAJOR       DEGREES
Art            M.A., M.F.A.

Professors:

Associate Professors:
W. O. Kennedy, M.F.A. Wisconsin; R. LeFevre, M.F.A. Rochester Institute of Technology; P. R. Livingston, M.F.A. Wisconsin; F. Martinson, Ph.D. Chicago; F. Moffat, Ph.D. Chicago; D. Peacock, M.F.A. Iowa; L. Smythe, Ph.D. North Carolina; F. C. Stewart, M.F.A. Claremont; R. P. Young, M.A. Columbia.

Assistant Professors:

Instructors:
E. Evans; M.B. Goldenstein, M.F.A. Nebraska; B. R. Wells, M.F.A. Indiana; W. R. Wells, M.F.A. Indiana.

The Art Department offers two graduate degree programs: Master of Arts and Master of Fine Arts. In order to become a candidate for either of these degrees, the applicant must first be admitted to the Graduate School and be accepted by the Art Department. The general requirements are that the applicant must have an undergraduate major in art or present evidence of outstanding proficiency. In addition to the general admission requirement, Art Department acceptance is based on recommendations and a portfolio of work.

MAJOR OF ARTS

Major areas consist of painting, communication design, printmaking, and sculpture. One year of residence is required.

Curriculum:
Thesis ......................................................... 9 hrs
Major area ................................................. 12 hrs
Drawing and composition ................................ 3 hrs
Art history ................................................ 9 hrs
Electives .................................................... 12 hrs
Total .......................................................... 45 hrs

The thesis is a critical essay relevant to the field of concentration. The M.A. thesis may not be used to fulfill the project in lieu of thesis requirements for the M.F.A. A graduate exhibition is required. Final examination is oral.

MAJOR OF FINE ARTS

The Master of Fine Arts is the terminal degree in studio art. Residence of at least five quarters beyond the baccalaureate degree is required. Residence is defined by the Art Department as (1) a minimum enrollment of 6 hours per quarter, and (2) use of Department of Art facilities, so that discussion and criticism is available to students.

Curriculum:
Projects in lieu of thesis
5011-21-31 ................................................. 9 hrs
Major area .................................................. 27-33 hrs
Seminar in art history .................................. 3 hrs

* Art history .............................................. 6-12 hrs
** Seminar in art criticism ............................. 3 hrs

* Art electives ............................................. 9-15 hrs
total ......................................................... 63 hrs

Major areas consist of painting, communication design, printmaking, and sculpture. The candidate must complete a coherent body of work (project in lieu of thesis).

A graduate exhibit is required. Final examinations are oral.

List of graduate courses for M.A. and M.F.A. candidates:
5011-21-31, Projects in Lieu of Thesis (3, 3, 3)
5110-20-30-40-50-60, Drawing and Composition (3, 3, 3, 3, 3, 3)
5210-20-30-40-50-60, Oil Painting (3, 3, 3, 3, 3, 3)
5310-20-30-40-50-60, Watercolor Painting (3, 3, 3, 3, 3, 3)
5410-20-30-40-50-60, Sculpture (3, 3, 3, 3, 3, 3)
5510-20-30-40-50-60, Communications Design (3, 3, 3, 3, 3, 3)
5610-20-30, Intaglio (3, 3, 3)
5611-21-31, Lithography (3, 3, 3)
5612-22-32, Screen Printing (3, 3, 3)
5770-80-90, Seminar in Art History (3, 3, 3)
5900 Seminar in Art Criticism (3)

GRADUATE MINOR IN THE HISTORY OF ART

A graduate minor in art history may be arranged with the consent of the student's committee, the instructors involved, and the Graduate School. Prerequisites is an undergraduate art history minor, or its equivalent, and reading knowledge of French, German, or Italian, unless waived by the art history faculty.

Classification of Art Courses

A. Studio Art:
3516, 3517, 4015, 4115, 4215, 4315, 4415, 4515, 4615, 4616, 4617.

B. Art History:
3715 Early Italian Renaissance Art: 1300-1500
3726 History of Medieval Art in Europe and America: 1475-1600
3735 History of Nineteenth-century Painting in Europe and America: 1840-1900
3745 History of Modern Architecture in Europe and America: 1900-1945
3755-56-57 Studies in Art History (4, 4, 4)

* Six to 12 hours to be decided by the student's committee on the basis of the undergraduate preparation. Any reduction from the 12 hours in art history would be added to the basic 9 hours of art electives.

**Electives must be outside the departmental major area and may be any course offered by the University for graduate credit.

3765, 3775-76-77, 3811, 4855-56-57, 4875-76-77.

3766 History of Twentieth-century American Art (4) Analysis of developments in architecture, painting, sculpture, and design from prehistory to 1900.
3767 History of Twentieth-century American Art (4) Analysis of developments in architecture, painting, sculpture, and design from 1900.
3775 Art of Indian Asia (4) History of Indian art with consideration of art of Central Asia and Southeast Asia.
3776 Chinese Art (4)
3777 Japanese Art (4)
3811 Introduction to Museology (3) Concepts, practices and historical development of museum work, museum studies, art, anthropology, and science. (Same as Anthropology 3811)
4015 Individual Problems (4) May be repeated. Maximum 12 hrs. Prereq: Consent of instructor.
5510-20-30-40-50-60
5615 Intaglio IV (4) Color problems with Intaglio lithography. May be repeated. Maximum 12 hrs.
5616 Lithography IV (4) Color problems in lithography. May be repeated. Maximum 12 hrs.
5617 Advanced Screen Printing (4) May be repeated. Maximum 12 hrs.
5855-56-57 Reading and Research in Art History (2, 2, 2)
5900 Seminar in Art Criticism (3) Theory and practice. intended for majors in studio art.

Audiology and Speech Pathology

MAJORS

Speech and Hearing Sciences

Ph.D.

Speech Pathology

M.A.

DEGREES

Professors:

H. L. Lander (Head), Ph.D. Ohio State; S. Adler, Ph.D. Ohio State; C. W. A. Ph., Ph.D. Ohio State; D. M. Lipscomb, Ph.D. Washington; H. A. Peterson, Ph.D. Illinois; B. Silverstein, Ph.D. Purdue.

Assistant Professors:


Assistant Professors:

S. B. Burchfield, Ph.D. Michigan State; W. M. Collins, Ph.D. Missouri; T. O. Davidson, M.A. Tennessee; C. J. Farrell, M.A. Tennessee; E. Ireland, Ph.D. Iowa.

THE MASTER'S PROGRAM

A major is offered in Audiology or in Speech Pathology. A minor is offered in each of the two areas when approved by the department.

The intent of each major program is to provide the student with the scholarly and professional skills necessary for functioning as an independent professional clinician in any clinical environment. Within this broad coverage of speech pathology or audiology, it is possible for a student to specialize to some extent. For example, in the M.A. in Audiology program, a student may emphasize audiological assessment, aural habilitation-rehabilitation, medical or pediatric, or industrial audiology. Within the M.A. in the Speech Pathology program, a student may emphasize language disorders, cultural language differences, or speech disorders such as aphasia or stuttering. Students interested in specializing beyond the typical broad M.A. program should consult the department office or their advisor for lists of suggested courses, practica and independent studies.

Students majoring in the two areas are expected to complete the academic requirements for clinical certification from the American Speech and Hearing Association, including the required number of clock hours of clinical practicum.

An exception to this rule needs approval of the Department Curriculum Committee. Enrollment in clinical practicum courses is required for all clinical experience. If the undergraduate preparation does not include sufficient course work in speech pathology, audiology, psychology, and related fields, the student may be required to make up such deficiencies.

Students may select either the thesis program or the non-thesis option. Students in both programs are required to take 5110 and 5119. The Master's program with the thesis will include a minimum of 45 quarter hours of approved graduate credit, including 9 quarter hours of 5000 level credit in the preparation of an acceptable thesis representing original independent work, and a final oral examination. At least one-half of these total courses must be at the 5000 or 6000 level, no more than 9 hours of which may be thesis courses. Students in the non-thesis option program must present a total of 48 quarter hours of approved graduate credit and pass a final written examination. A minimum of 24 quarter hours must be at the 5000 or 6000 level. The decision as to choice of the thesis or non-thesis program is normally made following completion of 5110 and a conference with the student's advisor.

THE DOCTORAL PROGRAM

The Ph.D. program in Speech and Hearing Sciences seeks to develop individuals for research or college teaching careers in the field of speech pathology, audiology, or speech and hearing science. This degree program is research oriented, with primary emphasis upon developing the scientific and cognitive skills which allow individuals to identify and independently study important questions concerning the human act of oral and aural communication. Students will be expected to master the accumulated knowledge in the area of:

1. Basic speech, hearing and language processes;
2. Speech, hearing and language disorders;
3. Related disciplines providing insight into human communication processes;
4. Technical skills in instrumentation and experimental design which enable the student to investigate problems pertaining to speech and hearing processes.

The program will normally consist of up to two or more calendar years of graduate study beyond the Master's degree with the first year being devoted primarily to formal course work and the last year to full-time research culminating in the doctoral dissertation.

Specific programs of study will be determined by the student in consultation with his faculty committee. In addition to the general Graduate School requirements, specific requirements for the degree of Doctor of Philosophy in Speech and Hearing Sciences will include:

1. Successful completion of course work in the study of one or more research tools, or other specific scientific methodological vehicles pertinent to the research interests of the candidate. The choice of research tool(s) is subject to departmental approval.
2. A minimum of 9 quarter hours of graduate credit obtained in course work in a cognate field outside the Department of Audiology and Speech Pathology. These hours are in addition to those required in Item 1 above.
3. Sufficient course work within the department but outside the area of specialization to give a broad foundation and understanding.
4. A comprehensive examination to demonstrate a general knowledge of the bases of audiology, speech and
4040 Appraisal of Speech and Language Disorders (4) Diagnostic procedures for children and adults with speech and language problems including observation and practice with diagnostic test. Prereq: Phonetics. (Same as Special Education 4040.)

4060 Speech Science II (3) Speech production; clinical applications of speech science research. 2 lectures and 1 2-hr lab per week. Prereq: Speech Science I.

4070 Free Association (4) Oral and written free association as a process for diagnosing and treating communication disorders. Includes a didactic self-analysis.

4190-200 Speech Development of the Hearing Impaired (3, 3) (Same as Special Education 4190-200.)

4210-20 Language Development of the Hearing Impaired (3, 3) (Same as Special Education 4210-20.)

4250 Introduction to the Education and Psychology of the Hearing Impaired (3) (Same as Special Education 4250.)

4310 Stuttering (4) Nature and treatment. Review and integration of various theories. (Same as Special Education 4310.)

4320-30-40 Clinical Practice in Speech Pathology (1-6, 1-6, 1-6) Prereq: Introduction to Speech Pathology, Phonetics, Articulation Disorders, 4040, and consent of instructor. 4320 may be repeated. S/NC only. (Same as Special Education 4320-30-40.)

4400 Voice Disorders (4) Etiology, diagnosis and treatment of organic and functional voice disorders. Prereq: Speech Science II. (Same as Special Education 4400.)

4450-60-70 Clinical Practice in Audiology (1-6, 1-6, 1-6) Prereq: 4720, 4930, or 4940. S/NC only. (Same as Special Education 4450-60-70.)

4520 Speech Pathology (3) Independent study of special problems in speech pathology. Prereq: Consent of instructor.

4550 Problems in Speech Pathology (1-6) Prereq: Consent of instructor.

4560 Problems in Audiology (1-6) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.


4850 Speech and Language of the Culturally Different Child (3) Discussion of speech and language differences of children of different ethnic and class membership and from different geographic regions; their causes, and their effects upon educational attainment.

4700 Audiology for Educators of the Deaf (4) Fundamental aspects of hearing, including physics of sound, anatomy and physiology of the ear, audiology and rehabilitation of hearing loss and basic audiometric techniques. May not be used to satisfy requirements of major in Audiology and Speech Pathology.

4720 Audiology II (4) Etiology and rehabilitation of hearing loss including pediatric and geriatric aspects, medical treatment and diagnostic audiometry. Prereq: Audiology I. (Same as Special Education 4720.)

4750 Noise in the Environment (3) Discussion of the extent to which the noise problem exists, introduction to methods of noise measurement, basic techniques in sound and vibration analysis, acoustical factors, and physiological concomitants in noise stimulation. A knowledge of acoustics is advisable.


4930 Aural Rehabilitation: Speechreading and Auditory Training (4) Speechreading as a receptive language process and development of maximum use of residual hearing in the acoustically handicapped. (Same as Special Education 4930.)

4938 Laboratory in Aural Rehabilitation (1) (Same as Special Education 4938.)

4940 Advanced Aural Rehabilitation: Acoustic Training (4) Development of maximum use of residual hearing in the acoustically handicapped. (Same as Special Education 4940.)

5000 Thesis (1-6) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

5050-07 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

5040 Advanced Clinical Practice in Audiology Study and Practice (1-6) Prereq: Consent of instructor may be repeated. Maximum 12 hrs. S/NC only. (Same as Special Education 5040.)

5045 Practicum in Hearing Aid Orientation and Communication Counseling (1-6) Practical exposure to counseling the hard of hearing and their family members concerning use and expectations of hearing aids as well as suggestions for better use of communication skills. Prereq: Consent of instructor, 4720. May be repeated. Maximum 9 hrs. S/NC only.

5050 Practicum in Aural Habilitation (1-6) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

5051 Practicum in Aural Habilitation (1-6) Enrollment by consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

5060 Anatomy and Physiology of Speech (3) Structure and function of the neuromuscular system involved in breathing, phonation, respiration, and articulation. Prereq: Speech Science II.

5070 Anatomy and Physiology of Hearing (3) Structure of the human ear, pathology of hearing impairment, and psychoacoustics of audition. Prereq: 4710.

5071 Physiological Audiology (3) Techniqules for electrophysiological measurement of auditory sensitivity and sound transmission by the ear, including the ear, distortion in the ear, and the ear as an analytic mechanism. Prereq: 4710, 4720, Speech Science II, or approval of the instructor.

5100 Comparative Anatomy of the Peripheral Auditory Structures (3) Tutorial laboratory course in the embryology of the temporal bone employing microscopic dissection techniques. Prereq: 5070 or consent of instructor.

5110 Introduction to Research in Speech and Hearing (3) Analysis of research techniques, application of statistics, and completion of a pilot research project.

5117 Instrumentation in Audiology and Speech Pathology (2) Principles of instrumentation used in audiology and speech pathology. Prereq: Basic Audioscience in Speech and Hearing.

5119 Laboratory in Instrumentation in Audiology and Speech Pathology (1) Laboratory assignments designed to familiarize the student with instrumentation in speech and hearing processes. Prereq: 5117.

5200 Seminar on Stuttering (3) Current significant research in the problem of stuttering. Prereq: 4310 or consent of instructor.

5201 Aphasia (3) A historical review of aphasia literature including the role of brain functioning, aphasic classification and terminology, tests and rationale for testing, etiology, therapy considerations and prognosis for recovery. Prereq: 4360 or equivalent or consent of instructor.

5230-30-40 Advanced Clinical Practice in Speech Disorders (1-6, 1-6, 1-6) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

5350-60-70 Advanced Clinical Practice in Speech Diagnosis (1-6, 1-6, 1-6) Prereq: 4040, 4540 or equivalent. S/NC. May be repeated. Maximum 9 hrs. S/NC only.

5360 Cerebral Palsy I (3) Study of cerebral palsy with emphasis on neurological foundations and speech and language training. Prereq: Articulation Disorders. (Same as Special Education 5360.)

5380 Cleft Palate I (3) Etiology, diagnosis and clinical management of cleft palate speakers with emphasis on speech. Prereq: Articulation Disorders. (Same as Special Education 5380.)

5440 Hearing Aid Evaluation (3) Study of the procedures involved in assessing the need for amplification of sound for the acoustically handicapped. The pertinent research in the areas of evaluation methods, binaural vs. monaural, prescription fitting, will be reviewed. Prereq: 4720.

5450 Sound Measurement and Analysis in Hearing Conservation (3) Study of noise measurement systems and a survey of factors in military and industrial audiology, and study of the role of the audiologist in industrial programs. Prereq: Consent of instructor.

5460 Differential Diagnosis of Auditory Disorders (3) Theory and practice of advanced pure tone and speech audiometry; instrumentation and interpretation of audiometric findings with special reference to differential diagnosis. Prereq: 4720.

5470 Impedance Measurement in Audiology (3) Theoretical considerations behind the emergence of impedance measurement in the clinical measurement of hearing. The course will include practical experience in using several impedance measuring devices. Prereq: 4710, 4720, 5060 or consent of instructor.


5500 Seminar in Audiology (3) Study of significant research in various areas of audiology. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

5503 Seminar in Advanced Audiological Procedures (3) Theoretical and practical considerations of audiological procedures used for differentiating between cochlear and retrocochlear auditory lesions, identifying central auditory lesions, and for identifying nonorganic hearing loss.
5505 Special Problems in Audiology (1-6)
PreReq: 4720 or equivalent and consent of instructor. May be repeated. Maximum 6 hrs.

5520 Seminar in Speech Pathology (3) Special study of current significant research in speech pathology. Topics vary from quarter to quarter. PreReq: 12 hrs in speech pathology. May be repeated with consent of department. Maximum 12 hrs.

5540 Seminar in Language Pathology (3) Nature, etiology and treatment of retarded language development in children. PreReq: 4710 or equivalent. (Same as Special Education 5640.)

5550 Special Problems in Speech Pathology (1-3) PreReq: Consent of instructor. May be repeated. Maximum 6 hrs.

5560 Independent Study in Speech Pathology (1-3) PreReq: Consent of instructor. May be repeated. Maximum 6 hrs.

5600 Independent Study in Audiology (1-6) Special reading, consultation, and research activities in the field of audiology. May be repeated. Maximum 6 hrs.

5610 Practicum: Language Pathology in Children (3) A combination seminar and/or practicum involving the discussion and utilization of the tools and analyses of habilitative philosophies, specialties and techniques. PreReq: Consent of instructor. May be repeated. Maximum 6 hrs.

5651 Seminar in Language Differences (3) Study of significant research relevant to language differences of culturally different children.

5730 Seminar in Medical Audiology (3) Advanced study of auditory disorders commonly encountered in a medical environment with emphasis on etiology, pathology and etiological processes used to differentiate lesions of the auditory mechanism. Field trips may be required. PreReq: 4720 or equivalent.

5740 Seminar in Pediatric Audiology (3) Advanced study of the theoretical and practical considerations of procedures used to evaluate the hearing of infants and small children. PreReq: 4720 or equivalent.

5790 Seminar in Psycholinguistic Concepts in Speech and Language (3) Psycholinguistic concepts and information theory utilized in studying the normal acquisition of language and certain disorders of language. PreReq: Speech and Language Development, Psychology 5510 or equivalent. (Same as Psychology 5780.)


6009 Doctoral Research and Dissertation

6010 Experimental Phonetics (3) Principles involved in acoustical and physiological analyses of speech production and perception. PreReq: 5119 or consent of instructor.


6069 Applied Anatomy and Physiology of Speech Mechanism (3) Dissection and related readings. PreReq: 5060 or equivalent.

6070 Experimental Techniques in Cochlear Physiology and Neurophysiology (3) PreReq: 5070 or equivalent.

6080 Seminar in Speech Science (3) Advanced study of areas such as speech physiology, acoustic analysis, recognition, perception and intelligibility of speech, communication theory, and psycholinguistic measurement of speech and language. Topics vary from quarter to quarter. PreReq: 6010 or consent of instructor. May be repeated. Maximum 9 hrs.

6090 Seminar in Hearing Science (3) Advanced study of various topics of the perception of the non-speech acoustic signal; detectability, pitch, loudness, differential threshold, adaptation, and fatigue. PreReq: 6020 or consent of instructor. May be repeated. Maximum 9 hrs.

6110 Experimental Design in Speech and Hearing Science (3) Analysis of experimental design in theses and related journals. Psychophysical methods for data acquisition. Generation of experimental designs based on parametric and nonparametric statistics. PreReq: 5110 or equivalent and consent of instructor.

6117 Theories of Hearing (3) The physiological process basic to the classical theories of hearing as related to sensitivity; loudness; pitch; and discrimination of acoustic stimuli. PreReq: 5070 or consent of instructor.

6119 Advanced Instrumentation in Speech and Hearing Science (3) Selection, use and calibration of instrumentation used in speech and hearing research. PreReq: 5117, 5119 or equivalent.

6500 Advanced Seminar in Audiology (3) PreReq: Consent of instructor. May be repeated.

6520 Advanced Seminar in Speech and Language (3) Topics vary from quarter to quarter but include advanced study of specific topics related to aberrations of voice, articulation, speaking time and rhythm, language development or use, and language symbolization. PreReq: Consent of instructor. May be repeated.

6560 Directed Research (1-6) Participation in on-going or non-dissertation research. PreReq: Consent of instructor. May be repeated. Maximum 12 hrs.

6570 Directed Study in Speech Pathology (1-3) May be repeated. Maximum 9 hrs.

6580 Directed Study in Audiology (1-3) May be repeated. Maximum 9 hrs.

6590 Directed Study in Speech Science (1-3) May be repeated. Maximum 9 hrs.

6600 Directed Study in Hearing Science (1-3) May be repeated. Maximum 9 hrs.

Biochemistry

MAJOR

DEGREES

Biochemistry

M.S., Ph.D.

Professors:

K. J. Monty (Acting Head), Ph.D. Rochester; J. E. Churchich, Ph.D. Sheffield (England); T. F. Stahl, Ph.D. Michigan; J. R. Toter, Ph.D. Iowa State.

Associate Professor:

S. W. Hawkinson, Ph.D. Chicago; J. G. Joshi, Ph.D. Poona (India).

Assistant Professors:

R. Bryant, Ph.D. Illinois; R. H. Feinberg, Ph.D. California (Berkeley); L. Huang, Ph.D. Michigan State.

THE MASTER'S PROGRAM

Candidates usually should offer an undergraduate major in either biology or chemistry. Departmental requirements consist of the satisfactory completion of 45 credit hours of graduate work and the mastery of the subject matter of the following courses:

1. Introductory Organic Chemistry with laboratory (at least one quarter of analytical chemistry), and a minimum of three quarters of approved physical chemistry.
2. A minimum of 12 hours of approved biology courses beyond the introductory level.
3. Biochemistry 4110-20, 5310-20-30, and at least two of the following: Biochemistry 5110, 5120, 5130, 5220, 5230.
4. At least 9 hours of advanced lecture-seminar courses from the following: Biochemistry 6410-20-30, 6110, 6120, 6130, 6210, 6220, 6230, 6310, 6320, 6330.
5. Between 9 and 18 hours of Master's research and a thesis.
6. A final comprehensive examination which will cover both the thesis endeavor and the subject matter of the course requirements.

THE DOCTORAL PROGRAM

An incoming student must present an undergraduate major in either chemistry or biology. Departmental requirements for the awarding of the Ph.D. include mastery of the subject matter indicated in the following list of courses. Course content listed in 1 and 2 are prerequisite to taking preliminary examinations; applicants usually should expect to complete these requirements within the first two years of graduate school.

1. Introductory Organic Chemistry with laboratory (at least one year)*, Inorganic Quantitative Analysis* (e.g., at least one quarter of analytical chemistry), Organic Qualitative Analysis* (e.g., Chemistry 4510), Introductory Physics*, Differential and Integral Calculus*; at least three quarters of approved graduate courses in chemistry or physics, for example: Organic Reaction Mechanisms (e.g., Chemistry 5110-20-30-35), Quantum Chemistry (e.g., Chemistry 5340), Advanced Physics (Physics 5210-20-30), Infrared and Raman Spectroscopy (Physics 5440), Radiation Chemistry (Physics/Chemistry 5460), Advanced Thermodynamics and Statistical Mechanics (Physics 5110-20-30); plus minimum of three quarters of approved physical chemistry (e.g., Biochemistry 4210-20-30, Chemistry 3410-20-30) and at least 18 hours of biology beyond the introductory level.

3. Participation in Biochemistry 6410-20-30 and in the advanced biochemistry seminars during the entire period of residence.
4. Preliminary examinations are administered preferably at the beginning of the fall quarter of the student's third year and are designed to test in comprehensive fashion the mastery of the required formal course work listed in 1 and 2.
5. A dissertation reporting the results of original and significant research carried out during the term of candidacy.
6. A final examination which will be

* Though completion of these courses or the equivalent is required, they may not be taken for graduate credit.
least three letters of recommendation from academic or professional persons, a short statement describing probable areas of interest in botany, and the following specific requirements.

**Note:** Graduate School requirements are denoted by an asterisk. These requirements should be interpreted as minimal educational and specific stipulations or requirements such as additional foreign languages, additional oral preliminary examinations may be required by the individual student's faculty committee.

**THE DOCTORAL PROGRAM**

1. Satisfactory preparation of a written formulation and an oral defense to the student's committee of a research proposal suitable for a thesis problem. Must be completed before enrollment in Botany 5000.

2. Satisfactory performance on an examination in a modern foreign language or an A or B in French 3020 or German 3030 (can also be applied to the doctoral program).

3. Satisfactory completion of 2 credit hours at the 6000 level.


5. Presentation of a 30-minute departmental seminar.

6. Educational service is required of each graduate degree candidate and such service will include teaching and/or ancillary services performed in the department related to the instruction of courses.

**THE DOCTORAL PROGRAM**

1. Satisfactory presentation of a written formulation and oral defense to the student's committee of a research proposal suitable for a dissertation problem. Must be completed before enrollment in Botany 6000.

2. Satisfactory performance on a written comprehensive preliminary examination in the instruction of courses.

3. Presentation of one or more cognate areas outside of the department totaling 9 graduate credit hours with at least a B average.

4. Satisfactory performance on an examination in one modern foreign language or an A or B in French 3030 or German 3030.

5. Satisfactory completion of 9 credit hours at the 6000 level (excluding dissertation).


7. Presentation of a one-hour departmental seminar near the end of the doctoral program.

8. Educational service is required of each graduate degree candidate and such service will include teaching and/or ancillary services performed in the department related to the instruction of courses.

**Note:** Not for graduate credit for botany majors.

**THE MASTER'S PROGRAM**

1. Satisfactory preparation of a written formulation and an oral defense to the student's committee of a research proposal suitable for the thesis problem. Must be completed before enrollment in Botany 5000.

2. Satisfactory performance on an examination in one modern foreign language or an A or B in French 3020 or German 3030 (can also be applied to the doctoral program).

3. Satisfactory completion of 2 credit hours at the 6000 level.


5. Presentation of a 30-minute departmental seminar.

6. Educational service is required of each graduate degree candidate and such service will include teaching and/or ancillary services performed in the department related to the instruction of courses.

**Note:** Not for graduate credit for botany majors.
5910-20 Developmental Plant Morphology (3, 1) Developmental morphology of plants from the aspect of the phenomena of morphogene-
sis-correlations, polarity, symmetry, differentiation, regeneration, tissue mixtures, abnor-
mal growth, environmental and genetics factors. Prereq: 3010-20 or 4120, and 3210 or 5210 for 5910; 5910, 5920, 2 hrs and 1 lab for 5910; 1 lab for 5920.

6000 Doctoral Research and Dissertation

6010 Advanced Topics in Morphology of Vascular Plants (3) Needs of the student determine content. Topics will be selected from the broad categories of experimental anatomy, morphology, systematics, and system development. Prereq: 3020-30, 4120, 5910-20 or consent of instructor. May be repeated with consent.

6020 Advanced Topics in Cryptogamic Botany (2-4) Advanced studies and current research in experimental phycology, mycology, bryology, pteridology, or developmental morphology of cryptogams. May be repeated with consent of the department.

6210 Photobiology (3) The interaction of non-ionizing radiation with living systems. Prereq: Elements of Physics or equivalent. Biochemistry 4110.

6310 Advanced Topics in Cytology and Cell Biology (1-6) Requirements and interests of the students would determine topics. such as actions of chemotherapeutics on actively dividing cells, current ultrastructural research on selected cytoplasmic organelles and cellular systems, experimental cytology, cellular control of nuclear acid and biogenesis. Prereq: 5750, Zoology 4310; General Genetics; Biochemistry 4110-20. May be repeated with consent.

6320 Ecosystems of the World (3) Classification and characterization of the world's regional ecosystems. Interrelations of climate, topogra-
phy, soils, vegetation, and fauna. Prereq: 5340.

6420 Advanced Topics in Genetics (2-4) Literature survey of selected topics from all areas of genetics. Prereq: General Genetics; Biochemistry 4110-20. May be repeated with consent.

6620 Seminar in the History of Botany (2)

6630-40 Radiation Ecology (2, 2) Use of radioisotopes for delineation of food chains, and estimation of energy flow and other eco-
logical processes. Relations of ionizing radiation and other stresses on populations and communities. Principles of radiation and microorgan-
isms. Field study of biogeochemical cycles and dosimetry of isotopes released to air, lands, and waters. Coreq: 8 hrs of ecology or Chemistry 3810 or Physics 4710.

6820 Advanced Topics in Plant Physiology (2-4) Requirements of the student determine content, including such topics as growth and

6830 Advanced Topics in Ecology (2-4) Needs of the student determine the content, including such topics as: community analysis; bioge-
ography; bioclimatic genera and paleo-
ecology; radiation ecology; and system ecology. Prereq: 4310, 5340, 5350. May be repeated with consent of the department.

6830 Advanced Topics in Systematic Botany (2-4) Needs of the student determine the content, with such possible subjects as: mor-
phology and evolution of vascular plants; bibliographic literature for morphology and the code of nomenclature; experimental taxonomy; current research in systematics; systems of classification. Seminars or lectures and labs depending on subject. Prereq: 3020-30, 5031. May be repeated with consent of department.

5290 Quaternary Problems (4) (Same as Geology 5290.)

5310-20 Special Problems in Botany (1-8, 1-6)

5340 Plant Geography (4) Distribution of eco-
systems. Relations of ionizing radiation and other stresses on populations and communities. Principles of radiation and microorganisms. Field study of biogeochemical cycles and dosimetry of isotopes released to air, lands, and waters. Coreq: 8 hrs of ecology or Chemistry 3810 or Physics 4710.


5780 Plant Cytogenetics (4) Changes in chromo-
somes and genes with relation to mutations, hy-
bridization, speciation, and phylogeny. Prereq: General Genetics: 5780, or Zoology 4310. 2 hrs and 2 labs.

5810 Cytogenetics (4) Changes in chromo-
somes and genes with relation to mutations, hy-
bridization, speciation, and phylogeny. Prereq: General Genetics: 5780, or Zoology 4310. 2 hrs and 2 labs.

5850-21-22-23-24 Methods and Instrumenta-
tion for Botanical Research (1, 1, 1, 1, 1) A laboratory course providing project experience and theoretical background in various areas of plant research methods. These areas include ion-exchange resins, adsorption spectrometry, disc electrophoresis, polarography, zonal and ultracentrifugation, gas chroma-
tography, automatic analyzers, microscopy, culture methods, use and detection of radio-
Isotopes, and others. Prereq: A course in plant physiology, Organic Chemistry or equiva-
 lent. Elements of Physics or equivalent. S/NC only.

5830 Field Methods in Plant Ecology (4) Analysis of plant communities and their environ-
ments, including field experience. Prereq: 4310, 5340, 5350. 2 hrs and 2 periods (field trips).

5850-51-52-53-54 Methods and Instrumentation in Field Investigations (1, 1, 1, 1, 1) Intensive field work, using appropriate methods and instru-
m entation. Topics will vary according to the needs of the students. May be repeated with consent of instructor. S/NC only.

5870 Advanced Plant Genetics (4) Genetics of plants stressing molecular aspects and includ-
ing mechanisms of gene action, controlling elements, translocations, cytoplasmic inheri-
tance, and adaptation. 3 hrs and 1 lab. Prereq: General Genetics and Chemistry 3231.
1. Research and thesis to give 9 to 18 hours of graduate credit (5000).
2. Chemistry 4160-70, 5531, 5140-50, Polymer Engineering 4910.
3. Sufficient additional graduate course work in chemistry and/or related fields to make an overall total of 45 hours.
4. Participation in Chemistry Seminar (5911-21-31) and the Polymer Seminar Program during the entire period of graduate study.
5. A final oral examination.

For the Ph.D. degree in Chemistry with specialization in environment or energy, the following requirements are needed:

1. Research and a dissertation to give at least 36 hours of graduate credit (6000).
2. Chemistry 4160-70 and two of the following: 5511, 5521, 5531.
3. Participation in seminar (5911-21-31) during the entire period of graduate study.
4. Thirty-nine hours of additional graduate course work including 6 hours at the 6000 level and one of the following groups: (a) for analytical, 5250-60-69-70-79; (b) for inorganic, 5420-71-20-30; (c) for organic, 5110-29-30-35 and at least 9 hours from the following courses: 5250-60-70, 5340-50-60, 5410-20-30-30, 5710-20-30; (d) for physical, 5340-50, 5410-20-30-30; (e) for theoretical, 5340-50-60, 5410-20-30-30, Physics 5210. Graduate course work in related fields may be used for undesignated course work in this requirement upon approval of the student's faculty committee.
5. A comprehensive advanced examination in the field of specialization.
6. Demonstration of a reading knowledge of one of the following languages: French, German, Russian, or an approved alternate.
7. A final oral examination.

For the Ph.D. degree in Chemistry with specialization in polymer science, the following requirements are needed:

1. Research and a dissertation to give at least 36 hours of graduate credit (6000).
2. Chemistry 4160-70, 5531, 5140-50, 5160 or 5170, Chemical Engineering 4910.
3. Participation in Chemistry Seminar (5911-21-31) and the Polymer Seminar Program during the entire period of graduate study.
4. Thirty hours of additional graduate course work, including at least 6 hours at the 6000 level and at least 12 hours from the Department of Chemistry offerings.
5. A comprehensive advanced examination in polymer science.
6. Demonstration of a reading knowledge of one of the following languages: French, German, Russian, or an approved alternate.
7. A final oral examination.

For the Ph.D. degree with specialization in polymer science, the following requirements are needed:

1. Research and a dissertation to give at least 36 hours of graduate credit (6000).
2. Chemistry 4160-70 and two of the following: 5511, 5521, 5531.
3. Participation in seminar (5911-21-31) during the entire period of graduate study.
4. Thirty-nine hours of additional graduate course work including 6 hours at the 6000 level. For emphasis in environment, these additional courses must include Chemistry 5250-60-69-70-79, Polymer Engineering 3000, and Mechanical Engineering 4140. All course selections must be approved by the appropriate departmental committee.
5. A final oral examination.

For the Ph.D. degree in Chemistry with specialization in environmental engineering, the following requirements are needed:

1. Research and a dissertation to give at least 36 hours of graduate credit (6000).
2. Chemistry 4160-70 and two of the following: 5511, 5521, 5531.
3. Participation in seminar (5911-21-31) during the entire period of graduate study.
4. Thirty-nine hours of additional graduate course work including 6 hours at the 6000 level and one of the following groups: (a) for analytical, 5250-60-69-70-79; (b) for inorganic, 5420-71-20-30; (c) for organic, 5110-29-30-35 and at least 9 hours from the following courses: 5250-60-70, 5340-50-60, 5410-20-30-30, 5710-20-30; (d) for physical, 5340-50, 5410-20-30-30; (e) for theoretical, 5340-50-60, 5410-20-30-30, Physics 5210. Graduate course work in related fields may be used for undesignated course work in this requirement upon approval of the student's faculty committee.
5. A comprehensive advanced examination in the field of specialization.
6. Demonstration of a reading knowledge of one of the following languages: French, German, Russian, or an approved alternate.
7. A final oral examination.

For the Ph.D. degree in Chemistry with specialization in polymer science, the following requirements are needed:

1. Research and a dissertation to give at least 36 hours of graduate credit (6000).
2. Chemistry 4160-70 and two of the following: 5511, 5521, 5531.
3. Participation in seminar (5911-21-31) during the entire period of graduate study.
4. Thirty-nine hours of additional graduate course work including 6 hours at the 6000 level and one of the following groups: (a) for analytical, 5250-60-69-70-79; (b) for inorganic, 5420-71-20-30; (c) for organic, 5110-29-30-35 and at least 9 hours from the following courses: 5250-60-70, 5340-50-60, 5410-20-30-30, 5710-20-30; (d) for physical, 5340-50, 5410-20-30-30; (e) for theoretical, 5340-50-60, 5410-20-30-30, Physics 5210. Graduate course work in related fields may be used for undesignated course work in this requirement upon approval of the student's faculty committee.
5. A comprehensive advanced examination in the field of specialization.
6. Demonstration of a reading knowledge of one of the following languages: French, German, Russian, or an approved alternate.
7. A final oral examination.

For the Ph.D. degree in Chemistry with specialization in polymer science, the following requirements are needed:

1. Research and a dissertation to give at least 36 hours of graduate credit (6000).
2. Chemistry 4160-70 and two of the following: 5511, 5521, 5531.
3. Participation in seminar (5911-21-31) during the entire period of graduate study.
4. Thirty-nine hours of additional graduate course work including 6 hours at the 6000 level and one of the following groups: (a) for analytical, 5250-60-69-70-79; (b) for inorganic, 5420-71-20-30; (c) for organic, 5110-29-30-35 and at least 9 hours from the following courses: 5250-60-70, 5340-50-60, 5410-20-30-30, 5710-20-30; (d) for physical, 5340-50, 5410-20-30-30; (e) for theoretical, 5340-50-60, 5410-20-30-30, Physics 5210. Graduate course work in related fields may be used for undesignated course work in this requirement upon approval of the student's faculty committee.
5. A comprehensive advanced examination in the field of specialization.
6. Demonstration of a reading knowledge of one of the following languages: French, German, Russian, or an approved alternate.
7. A final oral examination.
mechanisms. Recommended for chemistry majors.

1 yr of organic chemistry.

4550 Organic Reaction Mechanisms (3) Theory
have completed 4610.

3529-39 Organic Chemistry Laboratory (1, 1) Experiments on topics discussed in 3221-31. Similar to 3229-39 except designed for students who have need for operating knowledge of various spectroscopic and chromatographic techniques. Corresponding lecture (3221-31) is a corequisite for students not having credit for the lecture.

3810 Radioactivity and Its Applications (2) Radioactive materials in tracer and therapeutic applications. Radioactive decay, detection apparatus and techniques, tracer procedures and safety precautions in agriculture, biology, medicine, nutrition. Not for credit by chemistry or physics majors or minors. Prereq: 1 yr of general mathematics or equivalent, 1 yr of general chemistry, 2 hrs and 1 lab.


4119 Physical Chemistry Laboratory (1) Solutions, phase equilibria, reaction kinetics and spectroscopy. The corresponding course 4110 is coreq.

4160-70 Intermediate Physical Chemistry (3, 3) (Designed for entering graduate students who have had one year of physical chemistry.) 4160—Introduction to three laws of thermodynamics, phase equilibrium and solutions, and chemical equilibria. 4170—Gases and kinetic theory, chemical kinetics, molecular spectroscopy, and introduction to chemical statistics.

4210 Advanced Analytical Chemistry (3) Chemical separations including chromatography, ion exchange and solvent extraction; spectrophotometric techniques. Prereq: Analytical chemistry.

4219 Advanced Analytical Chemistry Laboratory (1) Experiments on topics discussed in 4210. Coreq: 4220.

4220 Advanced Analytical Chemistry (3) Electroanalytical methods of analyses (including potentiometry, coulometry, polarography, and voltammetry); development, evaluation, and mass spectrometry; X-ray absorption and fluorescence techniques. Prereq: Analytical chemistry. Recommended: 5420 or 4920.

4229 Advanced Analytical Chemistry Laboratory (1) Experiments on topics discussed in 4220. Coreq: 4220.

4420 Physical Inorganic Chemistry (3) The fundamental theoretical concepts leading to an understanding of inorganic chemistry; the quantum theory of the atom, principles of molecular structure, and elementary nuclear chemistry. Prereq: 3410-20-30, 4110.

4430 Intermediate Inorganic Chemistry (3) Detailed application of theoretical concepts of the inorganic elements, their chemical states, and their reactions. Prereq: 4420.

4510 Organic Qualitative Analysis (3) Identification of pure organic compounds and mixtures. Prereq: 3211-21-31, 3219-29-39 or 3219, 3258-39. 3 labs. Not open to students who have completed 4610.

4580 Organic Reaction Mechanisms (3) Theory of bond formation and reaction mechanisms. Prereq: 1 yr of organic chemistry.

4610-20 Advanced Chemical Experimentation (2, 2) Laboratory course in application of modern experimental techniques to solution of chemical problems. Introduction to organic and inorganic compounds with emphasis on independent study using advanced techniques. Prereq: 3251-39 or 3531-39, 3450-39, 4250-39. Not open to students who have completed 4510.

4640 Electronics for Chemists (4) Electronics in design and construction of chemical instrumentation. Prereq: 1 yr of physics.

4910-20-30 Biophysical Chemistry (3, 3, 3) Physicochemical principles with application to biological systems. Recommended for chemistry students. Not open to students having 3410-20-30, 4910 —Gas laws; first, second and third laws of thermodynamics; equilibrium. 4920 —Solution chemistry; electrochemistry; kinetics; nuclear chemistry. 4930 —Elementary quantum chemistry; optical and magnetic spectroscopy; light scattering; macromolecular properties. Prereq: General chemistry, or equivalent; 1 yr of mathematics.

5000 Thesis

5110-20-30 Advanced Organic Chemistry (3, 3, 3) Structural and mechanistic aspects of organic chemistry. Prereq: 4150 or Physics 4610, 4720-30. (Same as Physics 5110.)

5129 Advanced Organic Chemistry Laboratory (3) Synthesis of organic compounds illustrating modern techniques. Prereq: 1 yr of organic chemistry.

5140 Introductory Polymer Chemistry (3) Fundamental principles, stressing the role of chemistry in the interdisciplinary field of polymer science; relation of molecular structure to bulk properties of polymers. Prereq: 1 yr each undergraduate organic and physical chemistry.

5150 Kinetics of Polymerization (3) Kinetics of formation and molecular weight distributions of polymers, homogeneous and heterogeneous step growth and chain growth polymerizations. Prereq: 5140 and 4160-70 or equivalent.

5160 Organic Chemistry of Polymers (3) Synthesis of monomers; mechanism, stereochemistry, and sequence distribution of polymerizations. Formation of block, graft, and network polymers. Reactions on polymers; including degradation. Prereq: 5140 and 5531.

5170 Physical Chemistry of Polymers (3) Rubber elasticity; solution properties of macromolecules; structural, configurational, and conformational analysis. Prereq: 5130.

5240 Electronics for Chemists (4) Includes the material of Chemistry 4640 plus a special project. Prereq: Consent of instructor.

5250-60-70 Advanced Analytical Chemistry (3, 3, 3) 5250 —Absorption and emission spectrophotometry, structure elucidation by IR, NMR, UV, and mass spectra; 5260 —Chemical separation methods: solvent extraction, chromatography, electrophoresis; radiochemical methods; fluorescence; X-ray methods; 5270 —Electroanalytical, magnetic and thermal analytical methods; computer-aided analysis. Prereq: 1 yr of physical chemistry.

5259-69-79 Advanced Analytical Chemistry Laboratory (1, 1, 1) Experiments in the use of chemical separation methods and instrumental methods covered in the concurrent lecture course. Prereq: 1 yr of physical chemistry. Prereq or coreq: 5250 for 5259; 5260 for 5269; 5270 for 5279.

5280-90 Clinical Chemistry (3, 3) Introduction to clinical chemistry. Clinical significance of physiologic parameters, electrolytic balance, metabolic dysfunctions, analytical methodology, data processing, problem areas. Prereq: Biochemistry 4110; 1 yr of instrumental and separation methods of analysis. Coreq: Biomedical chemistry 5140.

5299 Clinical Chemistry Laboratory (1) Techniques of handling physiologic samples, analytical methods and special problem areas. Prereq or coreq: 5260.

5310-20-30 Research in Chemistry (3, 3, 3) Supervised research. (Not applicable to formal course requirements.)

5340 Quantum Chemistry (3) Postulate approach to the fundamental principles of quantum mechanics. Approximate solutions to the Schrödinger equation (ab initio and semiempirical) molecular orbital methods; calculation of molecular properties.

5350 Quantum Chemistry (3) Electronic excited states; introduction to group theory; perturbation theory; reactivity of organic molecules. Prereq: 5340.

5410-20-30 Advanced Physical Chemistry (3, 3, 3) 5410 —Classical thermodynamics. 5420 —Molecular spectroscopy and structure. 5430 —Chemical kinetics. Prereq: 4110 or 4160-70.

5440 Experimental Methods of Infrared and Raman Spectroscopy (3) (Same as Physics 5440.)


5460 Radiation Chemistry (3) Interaction of high-energy radiation with matter with emphasis on the development and application of nuclear chemistry. Mechanisms of radiation damage; stopping phenomena; loss spectra; secondary processes and transient intermediates; diffusion models in the radiation chemistry of water and aqueous solutions; gas-phase radiolysis; liquid organic compounds; solid state studies. Prereq: 5450 or Physics 4610, 4720-30. (Same as Physics 5460.)

5511 Survey of Inorganic Chemistry (3) Atomic structure, the wave mechanical atom, ionic and covalent bonding, periodic relationships of the elements, inorganic stereochemistry, coordination chemistry, and the descriptive chemistry of the elements.

5521 Survey of Analytical Chemistry (3) Volumetric and gravimetric analysis; acid-base, oxidation-reduction, complexation and precipitation equilibria; spectrophotometric, electroanalytical, and separation methods.

5531 Survey of Organic Chemistry (3) Bonding in organic molecules, chemistry of hydrocarbons, aliphatic compounds and conformation analysis, monofunctional oxygenated derivatives, carboxyl compounds, stereochemistry, aromatics, and spectral analysis of organic molecules by infrared, ultraviolet, nuclear magnetic resonance and mass spectral techniques.

5710-20-30 Theoretical Inorganic Chemistry (3, 3, 3) 5710 —The nature of chemical bonding; ionic, covalent, metallic; 5720 —Coordination compounds. Prereq: 4170 —Theoretical methods of structural inorganic chemistry. Prereq: 1 yr of physical chemistry.

5810 Nuclear Chemistry (3) Nuclear properties, radioactivity, nuclear reactions, nuclear structure and models, nuclear reactions, radiations and matter, radiation detection. Prereq: 1 yr of physical chemistry.

5911-21-31 Chemistry Seminar (1, 1, 1) Discussion of departmental interest, current research activities, and future topics. May be repeated. Registration required each quarter except summer for resident graduate students. S/NC only.

6000 Doctoral Research and Dissertation

6111 Selected Topics in Organic Chemistry (3) Subject matter varies among important
Cyclades Islands, Greek mainland, and Crete. Emphasis on palaces of Crete and Mycenae, Tiryns, and Pyllos, their fall, the following Dark Age, and rebirth of Greek civilization. Illustrated lectures.

3320 Art and Archaeology of Archaic and Classical Greece (3) Survey of development of Greek sculpture, painting, and architecture from 850 B.C. to death of Alexander. Illustrated lectures.

3350 Art and Archaeology of Hellenistic Greece and Rome (3) Hellenistic Greek, Etruscan, and Roman sculpture, painting, and architecture with attention to city planning. Illustrated lectures.

3340 Cities of the Greek and Roman World (4) Archaeological survey of Greek and Roman cities from 3000 B.C. to 500 A.D. with emphasis on development of city planning and quality of life. Such cities as Mycenae, Athens, Priene, Alexandria, Rome, and Lepcis Magna will be studied.

3350 Shrines and Sanctuaries of the Greek and Roman World (4) Survey course with emphasis on archaeological remains such as Olympia, Sparta, Ephesus, Pergamum, Paestum, Cumae, Freestate, and Baalbek.

4010 Greek Drama in English Translation (3) Survey of dramatic masterpieces of Greek.

4210 The Teaching of Latin (3) Carries no language credit. Purposes, techniques, materials, and evaluation; directed observation in public schools; preparation of teaching plans and materials.

4220 Seminar in Classical Studies (3) Special problems in the literatures and the other arts of Greece and Rome. May be repeated with consent of department.

4230 Classical Mythology and Its Uses (3) An intensive review and survey of Greek and Roman mythology. Emphasis on the uses of classical mythology in literature, music, and the plastic arts, especially of modern times.

4510 Selected Readings in Latin Literature in Translation (3) Content varies; may be repeated with consent of department.

5620 Problems in Old World Archaeology (3) (Same as Anthropology 5630.)

Comparative Literature

H. C. Rutledge, Chairperson

4012-22-32 Special Topics in Comparative Literature (3, 3, 3) Content varies; may be repeated.

4050-60-70 Dante and Medieval Culture (3, 3, 3) Readings and lectures in English for students majoring or minoring in other departmental studies. (Same as Italian 4050-60-70.)

5012 Comparative Theories of Literature (3) Croce, Richards, Fyfe, Wellk, and others. Prereq: Completion of three literature courses in a foreign language above 3000, or the equivalent.

5022 Approaches in Comparative Literature (3) The French and American schools: "comparative literature" vs. "general literature"; Van Gennep, Sausboeuf, Baudou, Wellek. Prereq: 5012; completion of three literature courses in a foreign language above 3000, or the equivalent.

5032 Studies in Comparative Literature (3) Independent research problems. Prereq: 5012 and 5022.

Computer Science

MAJOR

Degree Computer Science M.S.

Professors:

R. T. Gregory (Head), Ph.D. Illinois; F. Donatson,* Ph.D. Texas; R. J. Piemmons, Ph.D. Auburn (Mathematics); G. R. Sheman, Ph.D. Purdue (Director of Computing Center).

Associate Professors:

R. M. Aiken, Ph.D. Northwestern; T. Feagin,* Ph.D. Texas (Aerospace Engineering); R. C. Gonzalez, Ph.D. Florida (Electrical Engineering); E. L. Hall, Ph.D. Missouri (Electrical Engineering); C. E. Hughes, Ph.D. Pennsylvania State; S. M. Selkow, Ph.D. Pennsylvania.

Assistant Professors:

A. M. Davis, Ph.D. Illinois; W. S. Havens, Ph.D. British Columbia; C. P. Huang, Ph.D. SUNY (Buffalo); S. R. Jordan, Ph.D. Wisconsin; J. M. Marshall, Ph.D. Ohio State; C. P. Pfeiffer, Ph.D. Pennsylvania State; D. W. Straight, Ph.D. Texas; M. G. Thomason, Ph.D. Duke.

ENTRANCE REQUIREMENTS TO M.S. PROGRAM

Upon admission to the Graduate School, students who wish to enter the Master's degree program in Computer Science should have the following background:

1. Mathematical maturity at least equivalent to that of a student who has completed the calculus sequence through one year of Multivariable Calculus and Matrix Algebra.

2. Computer Science 3155 or an equivalent introductory numerical algorithms course.

3. A basic statistics and probability course such as Statistics 3450 (statistics for engineering) or Mathematics 3050 or 4650.

4. Computer Science 3715 or an equivalent introductory course in discrete structures and logical foundations of computer science.

5. Computer Science 3510 and 3520 or equivalent courses in advanced FORTRAN programming, machine organization and assembler language programming.

THE MASTER'S PROGRAM

All students must receive departmental credit for or exhibit proficiency in the following courses:

1. Computer Science 4550 and 4510
2. Electrical Engineering 5615-25-35
3. One of the three courses Computer Science 4710, Computer Science 4035, or Computer Science 4225

The student may then select either Plan A or Plan B.

Plan A: Thesis Option

1. Complete 36 hours of courses at the 4000 level or above, including at least 18 hours at the 5000 level, exclusive of Electrical Engineering 5615-25-35.
2. Complete at least 9 additional hours of thesis credit, Computer Science 5000.

Pass an oral examination by a committee of at least three faculty members.

Plan B: Non-Thesis Option

1. Complete 45 hours of courses at the 4000 level or above, including at least 27 hours at the 5000 level, exclusive of Electrical Engineering 5815-25-35.
1. Pass written and oral comprehensive examinations.

Under either plan, courses which are taken from a department other than computer science must have the approval of the Computer Science department.

3150 Introduction to Numerical Algorithms and Programming (3) Roots of equations, systems of linear equations, least-squares data fitting, numerical integration, numerical methods for ordinary differential equations. Introduction to programming in FORTRAN. 3150 and 3155 may not both be taken for credit. Prereq or coreq: Multivariable Calculus and Matrix Algebra. (Same as Mathematics 3150.)

3155 Introduction to Numerical Algorithms (3) Roots of equations, systems of linear equations, least-squares data fitting, numerical integration, numerical methods for ordinary differential equations. 3150 and 3155 may not both be taken for credit. Prereq: Introduction to Computer Science or consent of instructor. Prereq or coreq: Multivariable Calculus and Matrix Algebra. (Same as Mathematics 3155.)


3570 Programming Languages (4) Comparison and analysis of programming languages and their features. Languages to be discussed will include SNOBOL, LISP, APL, and PASCAL. Prereq: Structured Programming in PL/I.

3715 Discrete Structures (3) Introduction to discrete structures useful in computer science. Sets, set logic, relations, functions, proof techniques, graph theory, Boolean algebras. Prereq: Introduction to Computer Science and Multivariable Calculus and Matrix Algebra or equivalent. (Same as Mathematics 3715.)

4035-45 Introduction to Numerical Linear Algebra (3, 3) Floating-point numbers and arithmetic on modern digital computers; numerical algorithms for solving systems of linear equations; linear least-squares methods and eigenvalue computations. Prereq: 3150 or 3155. (Same as Mathematics 4035-45.)

4225-35 Introduction to Numerical Analysis (3, 3) (Same as Mathematics 4225-35.)

4310 Computation in Statistical Analysis (3) Use of digital computer in standard statistical analyses, such as frequency tabulations, percentiles, and regression, analyses of variance. (Not for credit for Computer Science majors.) Prereq: Probability and Statistics or equivalent. An elementary knowledge of a procedure-oriented language such as FORTRAN is also assumed.

4330 Independent Study in Computer Science (1-3) Special project in area of student's primary interest. To be directed by Computer Science faculty, perhaps jointly with student's faculty advisor. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

4510 Data Structures and Non-numeric Programming (3) Study of data structures and algorithms for their manipulation, Arrays and orthogonal lists; stacks, queues, rings, doubly-linked lists, trees, dynamic storage allocation,
organization of files; programming languages for scientific computing; data bases; and/or numerical optimization. May not be used toward degree requirements. May be repeated. S/NC only.

5010 Computer-assisted Instruction (3) Study of the history and development of CAI systems. Emphasis on development and failure of major projects as well as investigating future role CAI will assume in education. Research projects involving design of a CAI program in a language to implement a CAI course. Prereq: 3510 or consent of instructor.

5020 Computer Modeling and Simulation of Physical Systems (3) (Same as Electrical Engineering 4820.) Programming model and simulation. Inputs, driving functions, errors, outputs, interactive simulations as applied to various physical systems. Models to represent spatial relationships. Prereq: 3150 or 3520 and Statistics 3450.

5210 Artificial Intelligence (3) Study of the simulation of intelligent processes by computer. Techniques of representation, search, and manipulation for various areas: problem solving, game playing, pattern perception, theorem proving, semantic information processing. Computer simulation of AI problems. Prereq: 4510 or consent of instructor. (Same as Electrical Engineering 5980.)

5250 Medical Computing (3) A study of the achievements and problems associated with the application of computer technology to the field of health care. Use of computer and software computing will be covered, including laboratory data systems, patient monitoring systems, diagnostic assistance, disease records, and hospital administration systems. Prereq: 4510.

5430 Theory of Compilers (3) Traces development of major components of a compiler using the constructs provided by formal language theory. Recognizers, symbol tables, semantic routines, allocation of storage, code optimization. Prereq: 4510 or consent of instructor.

5455 Finite Difference Methods for Partial Differential Equations (3) (Same as Mathematics 5455.)

5465 Mathematical Aspects of the Finite Element Method (3) (Same as Mathematics 5465.)

5655-65-75 Numerical Mathematics (3, 3, 3) (Same as Mathematics 5655-65-75.)

5670-80 Advanced Operating Systems (3, 3) Theory and implementation of operating systems. Synchronization and deadlocks. Analysis of operating systems using mathematical models, simulation, and computer-aided software monitors. Comparison of good heuristic scheduling algorithms with best possible schedules; scheduling and multiprogramming in memory systems. Analysis of page swapping and placement strategies. Prereq: 4810 or equivalent and consent of instructor.


5730 Computability and Computational Complexity (3) Computability and decidability; Turing machines and the halting problem. Register machines. Recursive and recursively enumerable subsets; partial and total recursive functions. Time and space bounded computations; space, P vs. NP problem. Prereq: 4710.

5750 Theory of Formal Languages (3) Phrase-structure languages, their generators and processors. Type 0, 1, 2, and 3 languages; operations on languages and grammars; deterministic context-free languages. Theory of translation. Prereq: 4710.

5810 Information Organization and Retrieval (3) A study of the organization, storage, searching, and retrieval of information. Study of implementation of IR systems from off-line to modern on-line operations. Information analysis and dictionary construction and operations. Search and matching procedures; retrieval process. Information dissemination systems. Data base retrieval systems. Prereq: 4510 or 4560.


5910-20-30 Special Topics in Computer Science (1-3, 1-3, 1-3) May be repeated. Maximum 9 hrs.

5940-50 Advanced Small Computer Systems (3, 3) (Same as Electrical Engineering 5940-50.)

5970 Independent Study in Computer Science (1-12) (Special under faculty guidance. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.)

Cultural Studies

Asian Studies

4010-20-30 Readings in Asian Literature (4, 4, 4) Prereq: Mastery of intermediate level of Japanese, Chinese, or Sanskrit and consent of instructor.

4012 Selected Topics in Asian Studies (4) Content varies. May be repeated. Maximum 12 hrs.

4531-32-33-34 Advanced Chinese (4, 4, 4, 4) Prereq: Intermediate level competence and consent of instructor. Must be taken in sequence.

Black Studies

3140-50-60 Directed Readings in Black Studies (1, 1, 1) Designed for students who are interested in doing intensive reading in some area of Black Studies which is defined by the student and the instructor. Prereq: Introduction to Black Studies.

4200 Senior Seminar on Pan-Africanism (4) Explores concepts and philosophers of Pan-Africanism and implications of this ideology for various societal institutions.

4300 Resource Materials in Black Studies (4) (Same as Political Science 4300.)

4620 Cultural Studies (4) Deals with Black experience and research process.

4500 Current Issues and Topics in Black Studies (3-4) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

4630 Black Women in American Society (4) Historical and contemporary sociopolitical factors in American society as they relate to the Black woman. Afro-American History recommended. Prereq: Consent of Instructor.

4880 Afro-American Psychology (4) (Same as Psychology 4880.)

Cultural Studies

5101 Foreign Study (1-12) See page 148.

5102 Off-campus Study (1-12) See page 148.

5103 Independent Study (1-2) See page 148.
Linguistics

4000 Topics in Linguistics (3) Content varies. May be repeated. Maximum 9 hrs.

4020-30 Historical Linguistics, Neogrammarian School, and Growth of Structuralism (3, 3) 4020-30 follows course of scientific approach to linguistics from Jacob Grimm and Franz Bopp through the nineteenth century. 4030—Traces the advance in linguistic interest brought about by Saussure’s Cours and the growing impact of anthropology and behavior on linguistic studies.

4471-81 English as a Second or Foreign Language (3, 3) (Same as English 4471-81.)

Economics

See College of Business Administration.

English

MAJOR DEGREES

English M.A., MACT, Ph.D.

Professors:

Associate Professors:

Assistant Professors:

Visiting Lecturers:
W. Dykeman, B.A. Northwestern; G. Griffis, Ph.D. Vanderbilt.

Detailed information about the Master’s and Doctoral programs may be obtained by writing to the Director of Graduate Studies in English, McClung Tower. For admission forms, write to the Graduate School.

THE MASTER’S PROGRAM

The departmental requirements for the M.A. degree in English include (1) a thesis and 36 quarter hours of courses in English or 45 quarter hours without a thesis, (2) evidence of proficiency in one foreign language, and (3) a final examination. The courses should include 12 hours at the 6000 level, 12 hours of additional courses at the 5000-6000 level, and 12 hours at an advanced level for graduate credit, including the 3000-6000 level.

Students seeking the Master of Arts without a thesis may substitute 9 hours of 5000-6000-level courses for the thesis, making a total of 45 hours.

For the degree of Master of Arts in College Teaching (MACT) the requirements include (1) 45 quarter hours of courses in English, (2) 6 hours in special courses designed for MACT students, (3) a thesis or 9 additional quarter hours of 5000- or 6000-level courses in English, (4) evidence of proficiency in one foreign language, (5) a final examination, and (6) a program of supervised teaching approved by the department.

The language requirement may be fulfilled in one of the following ways:

a. The completion, before beginning graduate study, of a second year of a foreign language in college with a grade of C or better.

b. The completion of French 3020 or German 3020, at The University of Tennessee, with a grade of B or better.

c. The partial fulfillment of the Ph.D. language examination as currently administered.

Registration in any course in the 5000 or 6000 series may be repeated for credit with the permission of the department. That is, courses having the same number, but with differing subject matter, may be taken with each separate subject description.

THE DOCTORAL PROGRAM

The departmental requirement for the Ph.D. degree in English is completion of a minimum of three academic years of resident graduate study. This includes a balanced program of 24-quarter courses (or their equivalent) in English: 12 courses at the 6000 level; 6 additional courses at the 5000-6000 level; and 6 courses for graduate credit at any level, including the 3000-4000 level.

Candidates may include M.A. thesis credits or 9 hours of English Proficiency Examination for credit with the permission of the department. That is, courses having the same number, but with differing subject matter, may be taken with each separate subject description.

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among surface form, water, vegetation, and surface materials. Man as evaluator and agent of change.

3610 Political Geography (4) Importance of geographic factors for understanding political relationships within and between nations; spatial implications of political decision-making process; geography of administrative units.

3660 Cultural Geography (4) Basic concepts of spatial and cultural distribution of individuals and groups; world patterns of cultural phenomena.

3700 Geography of Middle America (4) Covers Mexico, Central America, and the West Indies.

3800 Geography of South America (4)

3870 Geography of Asia (4) A survey of the physical, cultural, and economic characteristics of the countries of Asia, excluding the Soviet Union.

3910 Regional Geography of the United States and Canada (4) Major physical, economic, and social distributions such as they interrelate to give distinctive character to regions of the United States and Canada.

3920 Geography of the American South (4) Geographical appraisal of the southeastern United States, including physical environment and human resources. Origin and development of contemporary economic and cultural traits of the area.

3940 Geography of Appalachia (4) Interrelation of physical, economic, and social patterns to give distinctive character to the region and its parts, especially Southern Appalachia. Appalachia in perspective in the current American scene.

4075 Geography of Transportation (4) Geographical examination of transportation systems, emphasizing transport of people on highways and by public facilities. Relationship of these systems to the changing geography of cities and urban hinterlands.

4100 Quantitative Methods in Geography (4) Geographical applications of statistical techniques, point pattern analysis and analysis of areal units. Prereq: Elementary Quantitative Methods or consent of instructor.


4240 Historical Geography of the United States (4) Survey of changing human geography of the United States during four centuries of settlement and development. Emphasis upon changing population patterns, development of agricultural regions and patterns of urban development.

4510 Principles of Geomorphology (4) (Same as Geology 4510.)

4550 Geography of Soils (4) Soils as physical systems and their relationship to environments. Investigation of specific cases of the role of soil in the management of environmental systems.

4610 Industrial Geography (4) Factors affecting location of manufacturing activities, with emphasis on the United States. Prereq: 3410 or consent of instructor.

4630 Geography of Agriculture (4)

4710 Cartography (4) Map construction, reproduction, and practice in map drawing.

4720 Data Mapping (4) Methods for representing spatial distributions by maps and graphs. Mappable data may include phenomena as diverse as birth rates, voting patterns, and air pollution levels. Prereq: Consent of instructor.

4740 Remote Sensing: Types and Applications (4) Basic principles and applications of aerial photography and other remote sensing techniques. Emphasis upon value of various types of imagery for geographic interpretation and simple mapping. Prereq: Consent of instructor.

4750 Interactive Computer Graphics (3) (Same as Computer Science 4750.)

5000 Thesis

5100 Colloquium in Geography (1) Discussion of departmental research, current research literature, and general topics. Registration at each offering required of resident graduate students. May be repeated. Maximum 8 hrs. S/NC only.

5101 Foreign Study (1-12) See page 148.

5102 Off-campus Study (1-12) See page 148.

5150 Introduction to Geographical Research (3) The aims of geographical research; survey of printed source materials; practice in effective presentation of research findings.

5160 Research Design and Field Problems (4)-6 Development of research problems, preparation of appropriate study designs, and practical field application. Normally offered as a 4-week summer course for 6 hrs credit. Students may not take other courses or have duty assignments during this 4-week period.

5170 Geographic Concept and Method (3) Traditional and modern thought regarding the nature, scope, problems, and methods of geography.

5200 Special Problems in Geography (2-6) Reading and research on problems or topics of interest to individual students. Students must define topic and receive instructor's approval of study plan before registering for course. May be repeated with consent of instructor.

5250 Topics in Historical Geography (3) Examination of trends, concepts and methods in historical geography. Prereq: 4240 or consent of instructor. May be repeated with consent of instructor. Maximum 9 hrs.

5260 Advanced Cultural Geography (3) Geographical analysis of rural settlement in the Eastern United States, with emphasis upon New England, Tidewater East, and Upland South, and its application to Southern Appalachians. Includes field work and final paper. Prereq: 3660 or consent of instructor.

5310 Topics in Regional Geography of the United States (3) Intensive analysis of problems and trends in one or more regions of the United States, excepting the American South. May be repeated with consent of instructor. Maximum 9 hrs.

5320 Topics in the Geography of the American South (3) Geographical perspective on economic and cultural aspects of the southeastern United States. Topics vary. May be repeated with consent of instructor. Maximum 9 hrs.

5410 Advanced Topics in Economic Geography (3) Examination of trends, problems, and methods in modern Economic Geography. Prereq: 3410 or consent of instructor. May be repeated. Maximum 9 hrs.

5520 Advanced Urban Geography (3) Analysis of research on urban systems, internal morphology, urban problems and urban spatial behavior. Prereq: 3410 or consent of instructor.

5550 Topics in Geography of Land-Surface System (3) Examination of trends, problems, and methods in geography of land-surface system. May be repeated with permission of instructor. Prereq: 3530 or consent of instructor.

5560 Topics in Climatology (3) Examination of trends, problems, and methods in modern climatology. May be repeated with permission of instructor. Prereq: 3520 or consent of instructor.

5710 Seminar in Geography (3)

5720 Topics in Quantitative Geography (3) Multivariate analysis applied to problems in geography; research problems utilizing appropriate packaged computer programs; usefulness to geographic research of techniques developed by other disciplines. Prereq: 4100 or consent of instructor.

5740 Advanced Topics in Remote Sensing (3) Applied research using remote sensing and aerial photographic imagery for the interpretation and mapping of geographic data. Prereq: 4740 or consent of instructor.

5915 Regional Geomorphology (4) (Same as Geology 5915.)

6000 Doctoral Research and Dissertation

6110-20 Seminar in Economic Geography (3, 3)

6220-30 Seminar in Urban Geography (3, 3)

6240-50 Seminar in Historical Geography (3, 3)

6260-70 Seminar in Cultural Geography (3, 3)

6310-20 Seminar in Rural Geography (3, 3)

6410-20 Seminar in Regional Geography of the United States (3, 3)

6610-20 Seminar in Regional Geography of Latin America (3, 3)

6710-20 Seminar in Physical Geography (3, 3)
THE DOCTORAL PROGRAM
Specific course program and thesis topic determined by candidate's faculty committee.

1. Program to be determined by faculty committee. Requirements include a minimum of 45 hours in the 6000 series, of which at least 15 hours must be in the 6000 series. Up to one-third of the required hours may be courses in or on the general field of the dissertation. A Master's degree is recommended. Registration in any course in the 6000 series may be repeated for credit with the permission of the department.

2. Preliminary examination will be both written and oral.

3. Each Ph.D. student must satisfy a research tool requirement which will be determined by his/her faculty committee and which will consist of one of the following:
   A. Demonstration by examination of a reading knowledge in one modern foreign language in which there is a significant body of geological literature.
   B. Completion of course 3030 in an appropriate foreign language with a B or better.
   C. Courses (minimum of 6 hours) at 3000 level or higher taken for undergraduate credit and completed with a B average in appropriate mathematics, statistics, or computer science courses. The courses must be taken during a student's graduate program and must be approved by the student's entire committee.

"3160 Introduction to Earth Materials (4) Introduction to the study of minerals and rocks. Laboratory includes both hand specimen and analytical methods of identification. Prereq: General Geology I. 2 hrs and 2 labs.

3180 Mineralogy (4) Introduction to crystallography and the study of minerals. Laboratory includes hand specimen, chemical and x-ray methods of identification. Prereq: General Geology I. 3 hrs and 1 lab.

3210-20 Invertebrate Paleontology (4, 4) Systematic review of important invertebrate fossil groups. 3210-Protozoa to Brachiopods, including sponges, coelenterates and bryozoa. 3220-Phoronida to Hemichordata, including annelids, mollusca, arthropods and echinoderms. May be taken separately or in any combination of 1-20 credits. Prereq: 3180. 2 hrs and 2 labs.

3330 Geology of East Tennessee (4) Lectures and field excursions. Prereq: 12 hrs of geology and consent of instructor.

3360 Stratigraphy-Sedimentation (4) An Introduction study of stratigraphic principles and practices and of sedimentary processes and the interpretation of depositional environments. Prereq: General Geology II and 3180. 3 hrs and 1 lab or field period.

3370 Structural Geology (4) Introductory discussion of the origins of changes that have occurred and the occurrence and behavior of water. 2 hrs and 1 lab. (Same as Water Resources Development 3410.)

3510 Introductory Environmental Geology (4) Geologic problems including environment and resources, and geoecologic principles associated with their control and misuse. Prereq: General Geology II or consent of instructor. 2 hrs and 2 labs or field periods.

3610 Quaternary Geology for Engineers (3) Erosional and depositional processes, landforms, ground water. 2 hrs and 1 lab or field period. Prereq: Introductory Geology for Engineers or equivalent.

3710 Origin and Evolution of the Continents and Ocean Basins (4) An introductory study of the earth's crust with emphasis on modern concepts of continental drift and plate tectonics. Prereq: General Geology II.

4110 Principles of Economic Geology (4) Formation of mineral deposits. Prereq: 3180, 3370, or equivalent.

4115 Elementary Applied Geophysics (4) Basic principles of electrical, seismic, gravity and magnetic surveying. Prereq: General Geology II and Principles of Physics or Fundamentals of Physics: Waves and Optics. 3 hrs and 1 lab.

4130 Sedimentology (4) Introduction to physical processes of sedimentation: transport of sediments and formation of sedimentary structures, river flows, waves, tides, and ocean circulation. Prereq: 3310. 3 hrs and 1 lab.

4230 Paleocology (4) Principles of environmental analysis of fossil assemblages and associated lithologies. Prereq: 3260 or consent of instructor. 3 hrs and 1 lab.

4240 Paleobotany (4) Survey of fossil record of plants with particular emphasis on comparative morphology and evolutionary trends in major plant groups and chronologic succession and geographic distribution of past floras on earth. Prereq: General Geology II or History of Life or consent of instructor. 3 hrs and 1 lab. (Same at Botany 4240.)

4310 Geologic Mapping (4) Interpretation and methods. Prereq: 12 hrs of geology, 3 hrs and 1 lab or field period.

4370 Tectonic Styles (4) Elements, habitats, and geotechnique of basic styles of tectonic deformation are presented on maps, sections, aerial photographs and fabric diagrams. 3 lectures and 1 seminar or lab. Prereq: 4115 or consent of instructor.

4440 Field Geology (6) Five-week field course, first term of summer quarter. Emphasizes entire time of students. A report is required, to be submitted no later than end of fall quarter. Prereq: Two courses in geology and consent of instructor.

4510 Principles of Geomorphology (4) A study of the gradational processes acting at the earth's surface and the landforms produced. Prereq: General Geology I or consent of instructor. 3 hrs and 1 lab. (Same as Geography 4510.)

4550 Optical Mineralogy (4) Identification of nonopaque substances by interference methods, using petrographic microscope.

4610 Principles of Geochemistry (4) Application of chemical principles to geologic problems. Emphasis on crystal chemistry and relation between basic atomic structure and the distribution and behavior of elements in the earth's crust. Prereq: General Chemistry or equivalent. Recommended: 3310.

4850 Mineral Phase Equilibria (3) Principles of phase equilibrium and application of phase equilibria to studies in rock-forming mineral systems as aid to understanding conditions of formation and modification of rocks. Prereq: 4610 or consent of instructor.

4810 Special Problems in Geology (1-4) May be repeated. Maximum 4 hrs.

5000 Thesis

5050 Geochronology of Ore Mineral Deposits (3) Study of ore deposits based on experimental, empirical or theoretical considerations. Prereq: 4650 and 4110 or consent of instructor.

5069 Experimental Geochemistry Laboratory (1-3) Independent lab study of a problem in geochemistry using lab techniques in 5060. Prereq: 5060 or consent of instructor.

5120 Geophysics--Gravity and Magnetic Methods (4) Potential methods discussed in depth, introduction to geodesy and paleomagnetism. Prereq: 4115, Differential and Integral Calculus or consent of instructor. Advanced engineering mathematics desirable. 3 hrs and 1 lab.

5130 Geophysics--Seismic Exploration Methods (4) Seismic refraction and reflection methods were discussed. Production to earthquake seismology and the earth's interior. Prereq: 4115 or consent of instructor. 3 hrs and 1 lab.

5210-20-30 Special Problems in Geology (1-4, 1-4, 1-4)

5290 Quaternary Problems (4) An interdisciplinary approach to the interpretation of physical and biological phenomena directly or indirectly influenced by Pleistocene glaciation. Prereq: Elements of Geology (quarters) or consent of instructor. (Same as Botany 5290 and Zoology 5290.)

5310 Advanced Stratigraphy and Sedimentation (4) Integrated field-oriented study of sedi-
terary rocks involving analysis of depositional environments, paleoecoregions, and paleoecological interactions.

5340 Seminar in Local Stratigraphy (1) Stratigraphy of the Knoxville area.

5350 Selected Topics in Geology (1) Presentation of graduate research, topics from current literature, and subjects of general interest. Registration required each quarter except summer for resident full-time graduate students. 2/NC only.

5370 Mesofabric Analysis (4) Introduction to techniques of examining thin sections in the interpretation of tectonic mesoscopic fabric data. 3 lectures and 1 lab or field meeting. Prereq: 3370.

5460 Photogeologic Interpretation (4) Advanced photogeometric techniques used to obtain geologic measurements from aerial photographs. Practice in photo interpretation of imagery covering selected geologic features. Prereq: 5450 or equivalent or consent of instructor.

5470 Plate Tectonics and Orogeny (4) Geometric principles of plate tectonics used to devise models of geosynclines, fold belts, metamorphic and plutonic belts, with recent added emphasis on interpreting tectonic mesoscopic fabric data. 3 lectures and 1 lab or 1 seminar or field meeting. Prereq: 3370.

5520 Igneous Petrology (4) Description, classification, and origin of igneous rocks. Laboratory emphasizes thin section study. Prereq: 3371, 4550, or 4560. 3 lectures and 1 lab.

5530 Metamorphic Petrology (4) A study of the physical and chemical characteristics of the metamorphic environment; its gradational nature with diagenesis on one hand and igneous activity on the other. Laboratory will consist of study of both hand specimens and thin sections and a field trip in the Blue Ridge province. Prereq: 3190 and 4550. 3 lectures and 1 lab.

5540 Terrigenous Clastic Sedimentary Petrology (4) Field and microscopic analysis of terrigenous clastic rock types emphasizing the role of transport and depositional processes in affecting sediment texture and composition. Prereq: 3390 or equivalent, 5516. 3 hrs and 1 lab.

5550 Carbonate Sedimentology (4) Emphasis on environments of deposition of modern and ancient carbonates. Prereq: 4130 or consent of instructor. Recommended: 4550. 3 lectures and 1 lab.

5620 Electron Microprobe and X-Ray Spectrographic Analysis: Theory and Application (4) Theory and application of electron microprobe and x-ray spectrographic analysis to chemical analysis with emphasis on the earth sciences. Prereq: 3190 or consent of instructor. 2 hrs and 2 labs.

5630 X-Ray Diffraction: Theory and Application (4) Production and use of x-rays in identifying crystalline substance; methods include powder camera, diffractometer, Gandolfi camera, and single crystal methods. Prereq: 3190 or consent of instructor. 2 hrs and 2 labs.

5640 Clay Mineralogy (4) Origin of the clay minerals; their structures and properties; application of mineralogical techniques in clay mineral studies. Prereq: Mineralogy and 5560 or equivalent. 2 lectures and 2 labs. To be offered on alternate-year basis.

5650 Thermodynamics for Geologists (3) Principles of chemical thermodynamics as related to geologic processes. Prereq: General Chemistry and Analytic Geometry and Calculus of a Single Variable or equivalents.

5670 Geochemical Prospecting (3) Theory and practice of geochemical prospecting for metallic ore deposits, i.e., the use of chemical analyses of rock, soil, plants, water, and stream sediment for locating ore. Prereq: 4110 and General Chemistry or equivalents.

5710 Advanced Paleonontology (4) Fossil Invertebrates.


5810 Geology of Fuels (4) Origin, occurrences, and uses of natural fuels.

5820-30 Mineral Deposits (4, 4) Distribution, origin and evolution of mineral deposits. May be taken separately in any order. Prereq: 4110 or consent of instructor. 3 hrs and 1 lab/field seminar period.

5840 Ore Microscopy (4) Study of ore mineral assemblages by reflected light microscopy. Other techniques such as x-ray diffraction and electron microprobe may be used as and when necessary. Prereq: 4110, 4550, and consent of instructor. 2-4 hrs.

5850 Regional Studies in Economic Geology (3) Literature study and seminars on specific mining districts and deposits, followed by a trip between quarters to study the same in the field. Prereq: 4110 and consent of instructor. 2 hrs plus field trip. May be repeated. Maximum 9 hrs.

5915 Regional Geomorphology (4) Study of selected geomorphologically-related processes, which have common elements such as history or development, related processes which have produced genetically similar assemblages of landforms. May be repeated with consent of department. (Same as Geography 5915.)

6000 Doctoral Research and Dissertation

6110 Seminar in Stratigraphic Geology (3)

6210 Seminar in Paleontology (3)

6310 Seminar in Structural Geology (3)

6410 Seminar in Mineralogy (3)

6510 Seminar in Petrology (3)

6610 Seminar in Economic Geology (3)

6710 Seminar in Geochemistry (3) Prereq: 4510 or consent of instructor.

6810 Seminar in Geomorphology (3) Prereq: 4510 or consent of instructor.

Germanic and Slavic Languages

MAJORS

GERMAN

Ph.D. Indiana; G. Gutsche, Ph.D. Wisconsin; C. J. Meiler, Ph.D. Chicago.

THE DEPARTMENT OF GERMANIC AND SLAVIC LANGUAGES OFFERS THREE ADVANCED DEGREES. THEY ARE THE MASTER OF ARTS (M.A.) IN GERMAN, THE MASTER OF ARTS IN COLLEGE TEACHING (MACT) IN GERMAN, AND THE DOCTOR OF PHILOSOPHY (Ph.D.) IN GERMAN LANGUAGE AND LITERATURE.

THE MASTER'S PROGRAM

In addition to the general Graduate School requirements as stated on page 19, the department requires 36 quarter hours in approved courses, including at least 18 hours in courses numbered above 5000. In addition to course work, the student is required to write a thesis, for which he/she may get a maximum of 9 hours credit. The minimum quarter hour credit for the M.A. is 45 quarter hours.

MASTER OF ARTS IN COLLEGE TEACHING PROGRAM

The MACT program is essentially an expanded M.A. program. The minimum requirement is 60 hours of graduate study, including 9 hours of thesis and a 3 quarter-hour seminar in college teaching. The aim of this program is to prepare highly qualified college teachers. Students receiving the MACT degree would be well prepared to go on to the Ph.D.

THE DOCTORAL PROGRAM

The student must fulfill the general requirements for the Ph.D. degree set by the Graduate School. The candidate for the Doctoral degree must complete a minimum of 81 quarter hours of course work beyond the Bachelor's degree in addition to 36 hours of doctoral research and dissertation. At least 45 quarter hours of the minimum must be taken in 5000 or 6000 courses. Of these 45 hours, a minimum of 18 hours must be chosen from the program seminar (5200) and the literary or philological seminars (6210-20-30-40-50-60 and 6310-20-30). At least 9 hours must be taken in a cognate field. Students are encouraged to take additional work in allied fields. A minor in an allied field must consist of at least 18 hours of 5000 or 6000 courses. Students must also have command of German, both oral and written, and a knowledge of two other foreign languages, French and another language, such as Italian, Latin or Russian, appropriate to his field of research. A preliminary comprehensive examination, both written and oral, on German language and literature and the minor field or fields, must be passed before the student may be admitted to candidacy. The student will be examined on an extensive reading list which covers the whole range of German literature, and will be expected to show familiarity with major works of world literature. The candidate will be required to defend the dissertation in an oral examination, which will cover also the general area of the dissertation. Central emphasis is put on the doctoral dissertation as a final test of the candidate's qualifications. The field of study is divided into (1) German literature and (2) German (or Germanic) philology or linguistics. A stu-
History

MAJOR

DEGREES

History

MAJOR

GREEK

See Classics
Professors: 
L. P. Graf (Head); Ph.D. Harvard; G. Broeker, Ph.D. Minnesota; E. V. Chmielewski, Ph.D. Harvard; R. E. Duncan, Ph.D. California (Berkeley); H. H. Henn, Ph.D. Princeton; A. G. Haas, Ph.D. Chicago; Y. P. Hao, Ph.D. Harvard; W. W. Haskins, Ph.D. California, Berkeley; R. W. Hafeman (Emeritus), Ph.D. Chicago; C. O. Jackson, Ph.D. Emory; R. A. Landen, Ph.D. Princeton; M. M. Klein; Ph.D. Columbia; R. C. Marius, Ph.D. Yale.

Associate Professors: 

Assistant Professors:
S. D. Becker, Ph.D. Case-Western Reserve; S. J. Kleinberg, Ph.D. Pittsburgh; R. B. Rice, Ph.D. Harvard.

THE MASTER'S PROGRAM

Master of Arts—Plan I: Course requirements include History 5240, and either 5250 or 5260; one M.A. reading course; at least 6 additional hours 5300 or above. Total hours, including thesis—45. Plan II: History 5240, and either 5250 or 5260; two M.A. reading courses; 12 additional hours 5300 or above, at least 2 of which must be 6000 or above. Total hours—45. Plan I and Plan II require evidence of proficiency in one foreign language before the M.A. degree is granted.

Master of Arts in College Teaching—Core requirements include History 5240-50-51, 5271-72-73, and Continuing and Higher Education 5110. Students must spend one year as a graduate assistant and one year as a teaching assistant. Total hours, including thesis—50. Students seeking the MACT degree may substitute 9 quarter hours of courses numbered 6300 or above for the Master's thesis.

THE DOCTORAL PROGRAM

1. Admission: (a) Acceptable scores on the Graduate Record Examination (General Aptitude and History Achievement). (b) Students successfully completing the M.A. degree at The University of Tennessee must be recommended by the Department of History. (c) Students from other Institutions should have an M.A. degree and must be recommended and approved by the Graduate Awards and Review Committee after their first year of work at The University of Tennessee.

2. Residence and Course Work: Beyond the Bachelor's degree a minimum of 75 credit hours in course work is required, of which not less than 45 must be in courses that are numbered over 5000. Not less than 6 quarters of the required 9 quarters of residence work shall be under the supervision of the staff of The University of Tennessee.

3. Language Requirements: Candidates shall be required to possess a reading knowledge of one language and such additional language or languages as may be determined by the student's graduate committee. Under normal circumstances students specializing in European history will need two languages. The committee may also specify any other research tools, such as statistics, which it regards as essential for the student's preparation.

The foreign language requirements may be satisfied in one of two ways:
(a) By examination. When the student is ready to take a language examination he/she should consult with an advisor. The appropriate forms and the time of the examination may be obtained from the Graduate School.
(b) By course work. Upon consultation with the advisor, a student may elect to complete an appropriate 3010-30-30 sequence in a language department (or an Intermediate language sequence in which no 3010-30-30 sequence is available). Satisfactory completion requires that a student must have at least a B in the final quarter.

4. Preliminary Examinations and Committee: Incoming students will be advised by the department head.

The preliminary examinations must be taken after all course work is completed, language requirements fulfilled, and at least nine months before the degree is expected. These examinations should normally be taken before beginning the ninth quarter of work toward the doctorate. The candidate must present four fields, distributed as follows: one major field (history); two minor fields (history); and one minor field which may be either in history or outside the department.

In any case, the student is required to have 9 hours of graduate work outside the History Department. Three of the four areas listed below must be represented by a major or a minor field, or both.

I. Ancient and Medieval
   (1) Ancient Near East (a) Greece (b) Rome
   (4) Early Middle Ages, 375-1122 (5) Late Middle Ages, 1065-1150

II. Early Modern
   (1) Renaissance and Reformation (a) Europe, 1575-1815
   (3) American History to 1815
   (4) Latin America, 1492-1825

III. Modern
   (1) Europe, 1815-1914 (2) European World Since 1914
   (3) American States, 1815-present
   (4) Latin America, 1789-present
   (5) East Asia, 1641-present
   (6) Middle East, 1798-present

IV. National, Sectional and Topical
   (1) England, 1485-1763 (2) Great Britain, 1760-present
   (3) France, 1500-1515 (4) France, 1789-present
   (5) Germany, 1555-1806 (6) Germany, 1806-present

375 Social and Cultural History of the United States
376-70 The American World (3, 3) 3760—Greek, 3770—Rome
378-90 History of the Middle East (3, 3) 3780—Rise and spread of Islamic Civilization to the 16th Century, 3790—The impact of the West on the Middle East from the Sixteenth century to World War I
3795 Contemporary Middle East (4) Background of current problems in the area, from World War I to present.
Military, diplomatic, and domestic experience.  

movements.

dods. Attention given to parallel changes in

4280 Women in European History (4) Com-

From the Enlightenment to the Age of Realism,

century. 4130-Nineteenth century to present.

discovery and exploration to nineteenth cen-

tury to Italian Renaissance.

4710-20-30 Medieval History, 506-1000 (3, 3, 3) 4710—Early medieval period to revival of

Europe, Russia, and America ; emphasis on

affairs from about 1900 to 1960 in Western

modern inter-

present with some emphasis on the Polish

of Polish history from its beginnings to the

1870.

4910-20-30 History of the South (3, 3, 3) 4910

History of the American Negro since 1619.

1789; 5215, American History to 1815 ; 5216,

Early Modern Europe ; 5214, Europe Since

1789; 5217, Latin America; 5218, Far East; 5219, Colonialism and

Imperialism; 5221, England; 5222, Russia; 5223, Germany; 5224, France; 5225, Middle East. S/NC only. Open only to Master's candidates in history.

5240 Introduction to Historical Research (3) Principles and techniques of research in the study of history. Required of all candidates for advanced degrees who do not present evidence of similar training elsewhere.

5250 European Historiography (3) Introduces the student to the historical literature of the leading European nations.

5260 American Historiography (3) Like 5250 in the American field.

5271-72-73 The Teaching of College History (6, 0, 3) An introduction to the problems of teaching at the college level. The place of history in the curriculum, types and levels of courses, and techniques of teaching. Prereq: Consent of instructor. Required of candidates for the MACT. Credit will be withheld until the student has passed 5723, with grades of "B+" or "NC" submitted at the end of each of the first two quarters.

5280 Philosophy and Methodology (3) Philosophies of history and their relationship to the milieux from which they emerge; modern trends in historical methodology.

5290 Quantitative Analysis of Historical Data (3) Prereq: Sociology 5320 and 5330, or consent of instructor.

5300 Topics in History (3)

5310 Topics in Women's History (3)

5320 Topics in Historical Editing (5) Principles and practice of editing documents.

5360 Topics in American Foreign Relations (3)

5410 Topics in Early Modern European His-

5440 Revolution and Restoration in Central

Europe, 1780-1850 (3) Reform, resistance, and the advocation of Liberalism and Nationalism.

5444 Topics in French History (3)

5445 Topics in Nineteenth-century European History (3)

5450 Topics in Twentieth-century European History (3)

5480 Topics in Russian History (3)

5810 Topics in Tudor-Stuart England (3)

5520 Topics in Modern English History (3)

5550 Reaction and Reform in England, 1789-1848 (3)

5560 Anglo-Irish Relations (3)

5640 Topics in American Social and Cul-

tural History (3)

5645 Topics in American Urban History (3)

5650 Topics in the American Westward Move-

ment (3)

5660 Topics in Negro History (3)

5670 Topics in American Colonial History (3)

5675 Topics in the Early National Period of

American History (3)

5680 Topics in Nineteenth-century American History (3)
She is reading, the student will be assigned to evidence at least two quarters. Only one course is required for candidates for the Ph.D. degree who are not currently engaged in research in an appropriate field. Students may take courses numbered above 5000 with the approval of their supervisory committee. Of the additional hours, 9 must be earned along with 36 additional hours of work in acceptable courses numbered above 4000. Of the additional hours, 9 must be in an area outside the department and 18 must be in courses in mathematics numbered above 5000.

After two quarters of graduate study, a student whose supervisory committee gives its approval may choose the non-thesis option, for which 45 hours of work in courses numbered above 5000 are required. Of these, 27 hours (at least 24 of which are in mathematics) must be in courses numbered above 4000. Of the additional hours, 9 may be in an area outside the department and the 18 must be in courses in mathematics numbered above 5000.

The following requirements must be met:
1. Completing 45 hours of coursework, of which at least 9 must be at the 5000 level. The course work must include:
   a. 36 hours of mathematics courses numbered 3050 or above,
   b. 9 hours of additional work from mathematics courses numbered 3050 or above or from courses in other departments selected in consultation with the advisor.
2. Passing a comprehensive examination upon completion of all course work.

THE MASTER'S PROGRAMS
The Master of Arts degree and the Master of Science degree are designed to prepare students for industrial employment and for teaching at the high school and junior college level.

The department offers two options for these degrees. The first option requires a thesis for which 9 credits may be earned along with 36 additional hours of work in acceptable courses numbered above 4000. Of the additional hours, 9 may be in an area outside the department and 18 must be in courses in mathematics numbered above 5000.

After two quarters of graduate study, a student whose supervisory committee gives its approval may choose the non-thesis option, for which 45 hours of work in courses numbered above 4000 are required. Of these, 27 hours (at least 24 of which are in mathematics) must be in courses numbered above 5000. Of the additional hours, 9 may be in an area outside the department and the 18 must be in courses in mathematics numbered above 5000.

The following requirements must be met:
1. Completing 45 hours of coursework, of which at least 9 must be at the 5000 level. The course work must include:
   a. 36 hours of mathematics courses numbered 3050 or above,
   b. 9 hours of additional work from mathematics courses numbered 3050 or above or from courses in other departments selected in consultation with the advisor.
2. Passing a comprehensive examination upon completion of all course work.

THE DOCTORAL PROGRAM
For the Ph.D. in Mathematics the student must meet the following departmental requirements:
1. Pass written examinations covering four of the following subjects to the extent indicated by the accompanying course numbers and such other topics as the graduate faculty may prescribe:
   a. Algebra 5510-20-30
   b. Functions of a Complex Variable 5110-20-30
   c. Functions of a Real Variable 5210-20-30
   d. Topology 5910-20-30
The student must pass at least two examinations from Group a.; anyone passing two examinations from Group b. will be required to take an approved one-year graduate course (numbered 5000 or above), in which mathematics is extensively used, outside of the Mathematics Department, and not cross-listed as a course.

2. Pass an intensive examination in the student’s area of specialization.

3. Demonstrate a reading knowledge of two of the following languages: French, German, Russian or an approved alternative. At least one language requirement must be met before taking a written exam in the student’s third area and the second language requirement must be met before the exam in the student’s area of specialization.

4. Complete an approved one-year 6000-level course in mathematics outside the student’s area of specialization.

5. Complete a dissertation consisting of original and significant research.

6. Pass a final oral examination.

Study in a cognate field is not required by the Mathematics Department.

Registration in any course in the 6000 series may be repeated for credit with the permission of the department.

*3050 Elementary Probability and Statistical Analysis (3) Combinatorial problems; sample spaces, sets, and events; statistical independence; axiomatic probability theory; random variables and their distributions; simple random processes. Prereq: Introductory Calculus, General Mathematics or equivalent.

*3060 Elementary Statistical Analysis (3) Elementary probability distributions used in statistical inference: binomial, normal and their properties; sampling theory; confidence intervals and statistical tests of hypotheses; least squares and linear regression. Prereq: 3050 or consent of instructor.

3090 Polynomials and Rings (3) Elementary introduction to modern abstract algebra. Axiomatic approach is used to study divisibility and factorization in rings of integers and of polynomials with coefficients from various fields. Prereq: Multivariable Calculus and Matrix Algebra or consent of instructor.

*3100 Logic and Sets (3) Elements of mathematical logic; truth sets and open sentences; diagrams for truth sets; elementary algebra of sets with operations of union and intersection. Prereq: 1 yr of college mathematics. Primarily for students in the College of Education.

*3110 The Real Number System (3) Laws of arithmetic; rational and irrational numbers; fields. Prereq: 1 yr of college mathematics. Primarily for students in the College of Education.

3150 Introduction to Numerical Algorithms and Programming (3) (Same as Computer Science 3150).

3155 Introduction to Numerical Algorithms (3) (Same as Computer Science 3155).

3220 History of Mathematics (3) Survey of development of various branches of mathematics, from ancient to modern times. Prereq: Single Variable Calculus or Calculus or equivalent.

3310 Advanced Euclidean Geometry (3) Triangles and circles, conics, modern concepts. Prereq: 1 yr of college math.

3320 Non-Euclidean Geometry (3) Foundations of geometry, Elliptic and hyperbolic plane geometry. Prereq: 1 yr of college mathematics.

3330 Transformational Geometry (3) Fundamental transformations and invariance of conics. Classification of isometries and similarities; symmetries of a polygon; inversions. Prereq: 1 yr of college mathematics.

3350 Intermediate Analysis (3) Primarily for students in secondary mathematics education. Course covers elementary calculus from advanced viewpoint with emphasis on proofs of basic theorems. Topics covered include limits of sequences and functions, continuous functions, derivatives, definite integral, and fundamental theorem of integral calculus. Prereq: Calculus of Algebraic Functions, Linear Algebra and Calculus or Single Variable Calculus.

3715 Discrete Structures (3) (Same as Computer Science 3715).


3780-90 Introduction to Combinatorial Theory (3) Introduction to combinatorial methods, and selection within discrete systems. Enumeration by recurrence relations and generating functions, graph theory, finite geometries and finite fields, partitions, block designs. Prereq: Multivariable Calculus and Matrix Algebra or consent of instructor.

3810 How to Prove It (3) Course is designed to improve understanding of nature and methods of mathematical proof by means of practicing and performing mathematical proofs. Variables and constant content will include certain standard topics such as elementary set theory, relations, functions, and properties of mathematical induction. Coreq: Multivariable Calculus and Matrix Algebra or Calculus.

3920-30 Topology of Euclidean Spaces (4, 4) Topics will include topology of line and plane, separation properties, compactness, connectedness, completeness, continuous functions, homeomorphisms, continuity, and topological invariants. Must be taken in sequence. Prereq: Multivariable Calculus and Matrix Algebra and 3910, or Honors: Multivariable Calculus and Linear Algebra.

3930-31 Studies in Mathematics (1-4) Credit determined at registration. Prereq: Consent of instructor. May be repeated with consent of department.

4035-45 Introduction to Numerical Linear Algebra (3, 3) (Same as Computer Science 4035-45).

4050 Matrix Algebra and Applications (3) Matrices, elementary operations, systems of linear equations, determinants, eigenvalues and eigenvectors. Prereq: Multivariable Calculus and Matrix Algebra or Calculus or consent of instructor.

4060-70 Matrix Algebra and Applications (3, 3) Eigenvalues and eigenvectors, singular values and singular vectors, unitary and similarity transformations, quadratic forms, vector and matrix norms, Jordan canonical form, and related topics. Prereq: Multivariable Calculus and Matrix Algebra or 4050.

4120 Linear Algebra (3) Abstract vector spaces, linear transformations, determinants, systems of linear equations and determinants, inner products, and diagonalization of symmetric matrices. Prereq: Multivariable Calculus and Matrix Algebra or Calculus.

4150-60 Abstract Algebra (3, 3) Equivalence relations and partitions, properties of integers, elementary theory of groups of rings, polynomial rings, integral domains, divisibility, unique factorization domains, fields. Must be taken in sequence. Prereq: Multivariable Calculus and Matrix Algebra or 4050.


4230 Intermediate Numerical Methods (3) Numerical methods in differential and algebraic equations, linear computations and other topics concerning the application of computers. Must be taken in sequence. Prereq: 3150 or 3155.

4250 Elementary Complex Variables (3) Complex numbers, Cauchy-Riemann equations, elementary functions, power series and related topics. Prereq: Multivariable Calculus and Matrix Algebra or Calculus or consent of department.

4400 Infinite Series and Functions of Several Variables (3) General theory, power series and Taylor’s formula, uniform convergence. Partial differentiation and maxima and minima for functions of several variables. LaGrange multipliers. Prereq: Multivariable Calculus and Matrix Algebra.

4550 Partial Differential Equations (3) Fourier series; Fourier integrals; orthogonal functions; the vibrating string; solution by series; heat flow, Bessel functions. Prereq: Multivariable Calculus or Matrix Algebra. Recommended: 4610 or 4710.


4640 Calculus of Finite Differences (3) Real difference equations in numerical mathematics. Employs techniques in engineering and physics. Prereq or coreq: 4610.

4650-70-80 Introduction to Mathematical Statistics (3, 3, 3) Introduction to probability; discrete and continuous distributions; correlation, regression, and statistical independence; foundations of sampling theory; significance tests.
**5010 Vector Analysis (3) Fundamental operations, basis vectors, dot and cross products, divergence, curl of vector fields, line and surface integrals, divergence theorem of Gauss, and Stokes's theorem. Prereq: Multivariable Calculus and Matrix Algebra.

**4750-50-70 Introductory Probability Theory (3, 3, 3) Fundamentals of probability, the weak and strong laws of large numbers, the central limit theorem. Prereq: Consent of instructor.

**5015 Probability and Statistical Inference for Teachers (3-4) Probability distributions including the binomial, Poisson, hypergeometric, and normal distributions. Expectation, conditional expectation, and the characteristic function of random variables, infinite sequences of random variables, the weak and strong laws of large numbers, and the central limit theorem. Prereq: Consent of instructor.

**5050-50-70 Mathematical Logic (3, 3, 3, 3) Truth functions; the syntax and semantics of propositional logic; Gentzen's sequence-calculus and systems of natural deduction; algebraic logic; the syntax and semantics of first order theories; elementary model and recursion theory; consistency, completeness, decidability.

**5110-20-30 Theory of Functions of a Complex Variable (3, 3, 3) Complex numbers; infinite series, analytic functions; conformal mapping; analytic continuation; special functions; Riemann surfaces. Prereq: 4510-20 for 5110; 4530 or 5120 for 5120. Must be taken in sequence.


**5190 Foundations of Analysis (3) Propositional functions and classes; Boolean algebra; Cardinal and ordinal arithmetic. Prereq: 4510-20.

**5240-50-60 Linear Algebra (3, 3, 3) Metric spaces, finite and infinite dimensional Banach and Hilbert spaces, linear operators, vector and matrix norms, spectral theory. Examples to be chosen from relevant applied areas. Prereq: 4510-20-30.


**5540 The Numerical Treatment of Algebraic and Transcendental Equations (3, 3) The mathematical principles underlying such methods as those of Gauss, Newton, Bernoulli, Graeffe, and others for obtaining numerical solutions; theorems of Budan and Fourier, Sturm, Rouché and Hurwitz, and others for localizing roots.

**5590 Theory of Rings (3) Direct and subdirect products of rings, prime and maximal ideals, modules and rings of endomorphisms; radicals; Wedderburn-Artin structure theory. Prereq: 5520.

**5610-20-30 Methodical Methods in Physics (3, 3, 3) (Same as Physics 5610-20-30.)

**5640 Numerical Methods in Physics (3) (Same as Physics 5640.)

**5655-65-75 Numerical Mathematics (3, 3, 3) The numerical solution of large systems of linear algebraic equations, systems of non-linear equations and the algebraic eigenvalue-
eigenvector problem. Prereq: 4245 or 4235.

5710-20-30 Tensor Analysis (3, 3, 3) The absolute differential calculus in three-dimensional Euclidean space; differential geometry of curves and surfaces; applications to physics; extension to n-dimensional space. Prereq: Instructor in mathematics or physics. Must be taken in sequence.


6810-20-30 Topological Algebra (3, 3, 3) Topics chosen from topological semigroups, topological groups, Lie groups; transmutations; topological lattices; relations in topological spaces; topological rings, fields, algebras. Prereq or coreq: 5100-20-30.

6910-20-30 Modern Topology (3, 3, 3) This course provides technical background to read and contribute to current literature in topology. Topics vary from year to year.

6940-50-60 Introduction to Algebraic Topology (3, 3, 3) Introduction to homology, cohomology, and homotopy theories. Typical topics discussed will be homology and cohomology groups, the Eilenberg-Steenrod axioms, cup and cap products, duality theorems, homotopy equivalence, higher homotopy groups, fiber spaces, spectral sequences. Prereq: 4160 and 5920.

6991 Seminar Algebra (1-3)
6992 Seminar Topology (1-3)
6993 Seminar Algebra (1-3)
6994 Seminar Foundations (1-3)
6995 Seminar Applied Mathematics (1-3)

Registration for seminars may be repeated with consent of department.

Microbiology

MAJOR

Microbiology

M.S., Ph.D.

Professors:


- Associate Professors:
  - J. M. Becker, Ph.D. Cincinnati;
  - T. C. Monte, Ph.D. Maryland; W. S. Riggby, Ph.D. Yale; B. T. Rouse, Ph.D. Guelph (Canada).

- Assistant Professors:
  - D. A. Bani, Ph.D. Cornell; D. A. Brian, Ph.D.; D.V.M. Michigan State; R. V. Miller, Ph.D. Illinois; G. S. Sayler, Ph.D. Idaho.

Lecturers:


Students planning to major in Microbiology are expected to present, as undergraduate prerequisites, a minimum of one year of biology, one year of mathematics including calculus, two years of chemistry and one year of physics.

The student's dissertation committee determines whether a foreign language is required for the Doctoral degree.

3810 Food Bacteriology (4) Methods for examination, cultivation and identification of bacteria associated with food fermentation and food spoilage. Prereq: General Microbiology and Elements of Organic Chemistry or Chemistry 2311.

3820 Yeast and Molds (4) Morphology, taxonomy, and physiology of yeasts, actinomyces, and fungi of industrial importance. Prereq: General Microbiology and Elements of Organic Chemistry or Chemistry 2311 or consent of instructor.

4110 Physiology of Bacteria (2) Modern concepts of bacterial physiology and metabolism including cell structures and function. Prereq: Introduction to Microbiology I: Physiology, Genetics and Ecology and 12 hrs of organic chemistry.

4119 Bacterial Physiology Laboratory (2) Prereq: Introduction to Microbiology Laboratory I. Coreq: 4110.

4130 Taxonomy of Bacteria (3) Bacterial classification. Prereq: Introduction to Microbiology I: Physiology, Genetics, and Ecology and laboratory.

4140 Molecular Genetics of Prokaryotes (2) Transmission and expression of genetic information at the molecular level. Emphasis is on bacterial and viral systems, but unique features of eukaryotic genetics are presented. Prereq: Introduction to Microbiology I: Physiology, Genetics and Ecology or consent of instructor.


4270 Advanced Immunology (2) Chemistry of antigens and haptens, theories of antibody formation, cell cooperation in immune mechanisms, transplantation, abnormalities of the immune system, and autoimmune diseases. Prereq: Introduction to Microbiology II: Immunology or consent of instructor. (Same as Zoology 4270.)

4279 Advanced Immunology Laboratory (3) Laboratory exercises designed to accompany 4270. Prereq or coreq: 4270.

4320 Pathogenic Bacteriology (2) Disease producing microorganisms including bacteria, rickettsiae, and viruses. Prereq: Introduction to Microbiology III: Pathogenic Microbiology.

4329 Pathogenic Bacteriology Laboratory (3) Techniques for isolation, cultivation, and identification of pathogenic bacteria. Prereq: Introduction to Microbiology III: Pathogenic Microbiology and 3920.

4339 Medical Virology (3) Diseases caused by viruses, special emphasis on the pathologist's role in diagnosis and treatment. Prereq: Introduction to Microbiology III: Pathogenic Microbiology and 3920.

4370 Medical Virology Laboratory (2) Prereq: Introduction to Microbiology Laboratory I. Coreq: 4339.

4430 Molecular Virology (2) Molecular aspects of the replication, assembly and expression of viruses; with emphasis on bacteriophage. Prereq: Introduction to Microbiology I: Physiology, Genetics, and Ecology.

4430 Medical Virology (3) General Virology with emphasis on medical aspects. Prereq: Introduction to Microbiology III: Pathogenic Microbiology.

4439 Medical Virology Laboratory (2) Laboratory procedures for isolation, handling, and culturing of animal viruses. Prereq: Introduction to Microbiology Laboratory III. Coreq: 4430.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such
5111-13:13-14:15:16 Mini-course in Microbiology (1, 1, 1, 1, 1) Selected, advanced topics in microbiology, concentrated in time and subject matter. Consult departmental listing for current topics. Prereq: admission to the program. May be repeated. Maximum 9 hrs. S/NC only.

5130 Topics in Taxonomy (3) Isolation, cultivation, and taxonomic relationships of chemo-organotrophic bacteria, with emphasis on the less frequently encountered orders. Prereq: 4130. 3 hrs. labs.

5310 Selected Topics in Microbiological Research (3) Literature surveys and laboratory methods for the development and interpretation of microbiological research. May be repeated.

5360 Topics in Immunology and Immunohemolytic (4) Molecular and genetic aspects of immunoglobulin synthesis. Theoretical and practical exercise in immunohemology. Prereq: 3071, 3072, Biochemistry 4110-20 or equivalent.

5400 Seminar in Microbial Physiology (1) Readings and discussions based on the current literature. May be repeated. S/NC only.

5410 Seminar in Immunology (1) Readings and discussions based on the current literature. May be repeated. S/NC only.

5441-42-43-44-45-46 Clinical Microbiology (6, 6, 6, 6, 6, 6) Six quarters, 6 quarter hrs each consisting of lectures and clinical laboratory experience. Enrollment by permission of department head.

5450 Seminar in Filamentous Fungi (1) Readings and discussions based on the current literature. May be repeated. Maximum 9 hrs. S/NC only.

5510-20-30 Research Problems (3, 3, 3)

5720 Microbial Physiology (3) Lectures and seminars dealing with current advances in bacterial physiology including growth and cell structure. Prereq: 4111; Biochemistry 4110-20.

5730 Pathogenesis of Infectious Disease (3) Host response to infection. Derangement of homeostasis mediated by microbial invasion, exotoxins, endotoxins and other factors related to virulence. Alteration of genetic and hormonal controls resulting from progressive infection. Prereq: 3071.

5750 The Oncogenic Viruses (3) Lectures and special laboratory exercises dealing with known tumor-inducing viruses. Prereq: 4521 or consent of instructor. 2 hrs and 1 lab.

5760 The Bacterial Viruses (3) Lectures and discussions dealing with bacterial viruses with emphasis on the biological and chemical consequences of bacteriophage infection. Text will be supplemented by readings from the literature. Prereq: 4521; Biochemistry 4110-20.

5819 Molecular Genetics Laboratory (3) Principles of modern methods of research in molecular genetics. Fundamental genetic concepts (mutation, complementation, recombination) at the molecular level. Emphasis on studies of the lactose operon of Escherichia coli. Prereq: 4811 and Biochemistry 4110-20 or consent of instructor.

5820 Microbiology of Foods (3) Lectures and seminars dealing with current advances and selected topics in food microbiology with emphasis on analytical methods, safety and preservation. Prereq: 3810; Biochemistry 4110-20. Recommended: Food Technology 4920.

5829 Experimental Microbial Ecology (3) Surveys of techniques for the assessment of microbial forms, functions, activities, and interactions in a variety of habitats. Prereq: 5009; Coreq: 4950 or consent of instructor. 1 hr and 2 labs.

5830 Seminar in Microbial Pathogenesis (1) Readings and discussions based on the current literature. May be repeated. S/NC only.

5850 Seminar in History of Microbiology (1) Studies concerned with microbiologists and their achievements from Pasteur to the present. S/NC only.

5910-20-30 General Seminar (1, 1, 1) Reviews of current literature. May be repeated with consent of department. S/NC only.

5940 Seminar in Microbial Genetics (1) Readings and discussions of the current literature. May be repeated with consent of department. S/NC only.

5970 Seminar in Virology (1) Readings and discussions of current literature. May be repeated with consent of department. S/NC only.

6000 Doctoral Research and Dissertation

6410 Concepts of Immunity (3) Discussions, readings, and laboratory in the most recent advances of resistance to infectious disease. 3-3 hr. labs.

6720 Advanced Topics in Microbial Physiology (3) Prereq: 5630 or 5720. May be repeated with consent of department.

6730 Advanced Topics in Microbial Pathogenesis (3) Prereq: 5720. May be repeated with consent of department.

6740 Advanced Topics in Virology (3) Prereq: 4521. May be repeated with consent of department.

6760 Advanced Topics in Microbial Genetics (3) Prereq: 5940. May be repeated with consent of department.

6810-20-30 Problem Seminar (1, 1, 1) Research problems and methods. Critical analysis of experimental data and validity of conclusions. May be repeated with consent of department. S/NC only.

Music

MAJOR

DEGREES

Music

M.A., M.M.


The Department of Music offers the degrees of Master of Music with concentrations in performance, composition, theory, choral conducting, Suzuki string techniques, and piano literature and the Master of Arts with a major in Music with concentrations in theory and musicology.

Applicants for these degree programs must have completed an undergraduate degree with a major in music, and have met all of the requirements for the Master's degree as established by the University, or its equivalent, in music requirements to those required in degrees conferred by The University of Tennessee, Knoxville, appropriate to the prospective area of concentration on the Master's level.

Applicants who plan to pursue the degree in performance (applied music) are required to audition before the appropriate area committee. Applicants for admission to the program in composition must submit scores and tape recordings of representative works. All applicants are required to take the Diagnostic Examinations in music theory and music history and literature.

General requirements for the Master's degree begin on page 19 of this catalog.

THE MASTER OF MUSIC PROGRAM

Voice: 45 hours distributed as follows: (a) 12 hours in applied music, (b) 9 hours in music history/literature or music theory, (c) 6 hours in vocal pedagogy, and (d) 3 hours in recital or lecture-recital, (e) 3 hours in ensemble, and (f) 12 hours in elective (excluding applied music and ensemble).

Piano: 45 hours distributed as follows: (a) 12 hours in applied music, (b) 9 hours in piano literature and/or pedagogy, (c) 3 hours in music research, (d) 6 hours in music theory, (e) 3 hours in ensemble or accompanying, (f) 6 hours in music history/literature, (g) 3 hours in recital, and (h) 3 hours in music electives.

Organ: 45 hours distributed as follows: (a) 12 hours in applied music, (b) 6 hours in organ literature or pedagogy, (c) 3 hours in music research, (d) 9 hours in music theory, (e) 3 hours in ensemble or accompanying, (f) 6 hours in music history/literature, and (g) 3 hours in recital.

Piano Literature: 45 hours distributed as follows: (a) 12 hours in applied music, (b) 12 hours in piano literature and/or pedagogy, (c) 3 hours in music research, (d) 6 hours in music theory, (e) 3 hours in ensemble or accompanying, (f) 6 hours in music history/literature, and (g) 3 hours in music electives.

String: 45 hours distributed as follows: (a) 12 hours in applied music, (b) 6 hours in area literature and/or pedagogy, (c) 3 hours in research techniques, (d) 6 hours in ensemble, (e) 3 hours in theory, (f) 3 hours in recital, and (g) 12 hours in music electives.

Winds and Percussion Instruments: 45 hours distributed as follows: (a) 12 hours in applied music, (b) 6 hours in area literature, (c) 3 hours in music research, (d) 3 hours in advanced conducting, (e) 3 hours in music theory, (f) 3-6 hours in ensemble, (g) 3 hours in recital, and (h) 9-12 hours in music electives.

Composition: 45 hours distributed as follows: (a) 9 hours in applied composition, (b) 3 hours in music research, (c) 15
hours in music theory, (d) 6 hours in music history/literature, (e) 9 hours in thesis, and (f) 3 hours in electives.

Music Theory: 45 hours distributed as follows: (a) 18 hours in music theory, (b) 3 hours in music analysis, (c) 6 hours in music history/literature, (d) 9 hours in thesis, and (e) 9 hours in electives.

Choral Conducting: 45 hours distributed as follows: (a) 6 hours in conducting, (b) 6 hours in choral literature/techniques, (c) 3 hours in music research, (d) 9 hours in theory, (e) 6 hours in ensemble, (f) 3 hours in choral performance or document, and (g) 12 hours in electives.

Suzuki String Techniques: 45 hours distributed as follows: (a) 72 hours in applied music, (b) 6 hours in Suzuki literature/techniques, (c) 3 hours in music research, (d) 3 hours in music theory, (e) 3 hours in recital, (f) 6 hours in ensemble, and (g) 12 hours in electives.

Musicology: 45 hours distributed as follows: (a) 21 hours in music history/literature, (b) 3 hours in music research, (c) 6 hours in theory, (d) 9 hours in thesis, and (e) 6 hours in electives.

A reading knowledge of French or German must be demonstrated by candidates for the Master of Arts degree.

Specific course requirements will be prescribed by the department for all degree programs and elective courses must have the approval of the student's advisor.

3041 Keyboard Harmony (3) Melody harmonization, figured bass realization, and improvisation. Prereq: Harmony I, sight singing and ear training, and keyboard proficiency at the 2000 level.

3051 Organ Improvisation (2) Prereq: 3041 and organ proficiency at the 2000 level.

3114-24 Choral Arranging (3, 3) Analysis of scores and writing of arrangements for choirs. 3114—male and female chorus; 3124—mixed chorus. Prereq: Instrumentation or consent of instructor.

3122 Orchestration (3) Advanced techniques in instrumental writing with emphasis on scoring for the concert orchestra. Prereq: Instrumentation or consent of instructor.

3230 The Concerto (3) Survey of literature from seventeenth century to present.

3240 The Symphony (3) Survey of symphonic literature from predecessors of classical symmetry to present.

3260 Chamber Music (3) Survey of chamber music from 1750 to present.

3271-81 History of Opera (3, 3, 3) Dramatic, vocal, and orchestral elements in opera of Italian, French, and German schools. 3271—1600-1800; 3281—1800 to present.

3340 Oratorio (3) Choral works other than those appropriate for use in church.

4001 Organ Design (3) Historical, tonal and mechanical principles of organ design.

4041 Styles in Opera Acting (3) Study and practice of styles in opera acting based on historical and national characteristics. Prereq: Fundamentals of Opera Acting or consent of instructor.

4045 Projects in Opera Theatre (1-3) May be repeated. Prereq: Consent of instructor.

4050 Advanced Instrumental Conducting (3) Development of knowledge and skills in instrumental conducting; study of various periods and composers and relationship of different styles to the conductor's art; musical analysis and practice in conducting. Prereq: Instrumental Conducting or equivalent.

4060 Advanced Choral Conducting (3) Development of knowledge and skills in choral conducting; study of various periods and composers and relationship of different styles to the conductor's art; musical analysis and practice in conducting. Prereq: Choral Conducting or equivalent.


4112 Twentieth-century Compositional Techniques (3) Styles and compositional devices from Debussy to present. Analysis of scores; idiom writing. Prereq: Harmony II or equivalent.

4113 Pedagogy of Music Theory (3) Techniques, methods and materials involved in college-level theory programs. Prereq: Consent of instructor.

4114 Stage Band Arranging (3) Analysis of scores and arranging for the stage band. Prereq: Instrumentation and consent of instructor.

4115 Variation (3) Study and application of variation procedures. Prereq: Analysis II or equivalent.

4116 Set Structure in Musical Composition (3) Theory of sets and its application to analysis of music. Prereq: Consent of instructor.

4124 Band Transcription (3) Study and application of techniques employed in scoring for the marching and concert bands. Prereq: Instrumentation or equivalent.

4134 Band Transcription (3) Technique and application of transcribing keyboard and orchestra music for concert band; editing and rescoring. Prereq: Instrumentation or equivalent.

4210 Music in the Romantic Period (3) Survey of music from Beethoven through post-Romantic instrumental and vocal styles.

4230 Contemporary Music: 1945 to Present (3) Survey of new and avant-garde music in Europe and America since World War II.

4241 American Music (3) American music from colonial times to present. Emphasis on twentieth century. Includes both folk and cultivated traditions.

4260 Introduction to Ethnomusicology (3) Basic attitudes and techniques of ethnomusicology. Survey of music cultures of the Pacific, Near East, Asia and Africa.

5115 Theory of Computers and Music Research (3) Theory of computer applications in music, emphasizing techniques of analysis and indexing. Prereq: Consent of instructor.

5116 Musical Styles (3) The elements of design and their role in the definition of musical styles. Exercises in aural and visual identification. Prereq: Consent of instructor.


5121 Analytical Techniques (3) A survey of analytical techniques with emphasis on contemporary approaches. Tonal and neotonal music. Prereq: Consent of instructor.

5125 Practicum in Computers and Music Research (3) Programming languages, design, and implementation of projects in musical analysis, composition and indexing. Prereq: 5115 or consent of instructor.

5150 Seminar in Music Theory (3) Topics vary. Prereq: Consent of Instructor.

5200 Independent Study in Music History and Literature (1-3) Prereq: Consent of department head.

5210 Introduction to Music Research (3)

5220 Proseminar (3) Research techniques in music emphasizing bibliography, writing of research papers and presentation of oral reports. Prereq: Consent of instructor.

5270 Seminar in Musicology (3) Topics vary. Prereq: Consent of Instructor.

5315 Band Literature (3) A study of band literature and the origins of the band emphasizing its important, expanded cultivation during the past century in the United States and Europe.

5350 Music in the Middle Ages (3) Emphasis on early Christian chant, medieval secular song, early theory, and the development of polyphony and musical notation.

5352 Music in the Renaissance (3) Survey of music from 1400 to 1600. Mass, motet, chanson, madrigal, and other vocal and instrumental forms and genre.

5353 Music in the Baroque Period (3) Music from 1600 to 1750; rise of opera and oratorio, church and secular cantata, instrumental forms, performance practice.

5355 Music in the Classic Period (3) Preclassical music (Rococo) and music of Haydn, Mozart and early Beethoven. Includes background of other cultural and artistic activities.

5400 Musical Aesthetics (3) An examination of the nature of music and the musical experience, sense perception and the emotions, value in music, and the role of the artist in society. The aesthetic viewpoint of individuals and historical eras will be explored through selected writings.

5500 Flute (1-4)
5505 Oboe (1-4)
5510 Bassoon (1-4)
5515 Clarinet (1-4)
5520 Saxophone (1-4)
5525 Horn (1-4)
5530 Trumpet (1-4)
5535 Trombone (1-4)
5540 Baritone (1-4)
5545 Tuba (1-4)
5550 Percussion (1-4)
5560 Violin (1-4)
5565 Viola (1-4)
5570 Cello (1-4)
5575 String Bass (1-4)
5580 Piano (1-4)
5585 Harpsichord (1-4)
5590 Organ (1-4)
5595 Guitar (1-4)

5997 Composition with Electronic Media (1-3) May be repeated. Maximum 9 hrs. Prereq: 3199 and consent of instructor.

5999 Composition (1-3) Prereq: Consent of instructor.

**5600 Small Ensemble (1)
**5602 Brass Choir (1)
**5604 Jazz Ensemble (1)
**5606 Trombone Choir (1)
**5607 Tuba Ensemble (1)
**5610 Percussion Ensemble (1)
**5612 Baroque Ensemble (1)
**5620 UT Singers (1)
**5630 Chamber Singers (1)
**5632 Collegium (1)
**5634 Saxophone Choir (1)
**5640 Opera Theatre (1)
**5642 Opera Workshop (1)
**5650 Concert Band (1)
**5652 Campus Band (1)
**5654 Varsity Band (1)
**5656 Laboratory Band (1)
**5657 Marching Band (1)
**5670 Symphony Orchestra (1)
**5680 Concert Choir (1)
**5682 University Chorus (1)
**5694 Campus Chorus (1)
**5696 Men's Glee Club (1)
**5697 Women's Chorale (1)
**5699 Accompanying (1)

* May be repeated.
** May be repeated. Maximum 6 hrs.

Philosophy

MAJOR

DEGREES

Philosophy

M.A., Ph.D.

Professors:
J. W. Davis (Head), Ph.D. Emory;
R. B. Edwards, Ph.D. Emory; R. D. Hermann,
Ph.D. Mainz (Germany); M. H. Moore (Emeritus),
Ph.D. Chicago; D. Van de Vate, Jr., Ph.D. Yale.

Associate Professors:
R. E. Aquila, Ph.D. Northwestern; L. B. Cebik,
Ph.D. Nebraska; G. C. Graber, Ph.D. Michigan.

Assistant Professors:
J. O. Bennett, Ph.D. Tulane; G. G. Brankort,
Ph.D. Michigan; S. H. Cohen, Ph.D. Northwestern;
K. A. Emmett, Ph.D. Ohio State;
H. P. Hamlin, Ph.D. Georgia; R. Jones, Ph.D.
Chicago; B. C. Latta, Ph.D. Yale; S. Reaven,
Ph.D. California (Berkeley).

THE MASTER'S PROGRAM

See general requirements on page 19. Courses below 4000 may not be taken for graduate credit by philosophy majors except with special permission.

THE DOCTORAL PROGRAM

Specific requirements for doctoral stu-
dents in Philosophy include a minimum of three academic years of graduate study involving at least 72 quarter hours credit in course work (normally 24 quarter courses or their equivalent, exclusive of credit for the thesis and dissertation) of which not less than 45 shall be in courses numbered over 5000, and of which at least 9 shall be in a subject other than philosophy. The specific number and distribution of courses will be determined by the student's faculty committee.

Two foreign languages, normally French and German, are required. As an alternative to the two-language requirement, candidates for the Ph.D. may elect to demonstrate a substantially more advanced proficiency in reading knowledge of one language. Requirements for this option may be obtained in the department office.

Registration in any course in the 5000 or 6000 series (except 5050 and 5910-20-30) may be repeated for credit with the consent of the department. That is, courses having the same number, but with different subject matter, may be taken with each separate subject description.

MEDICAL ETHICS

The department has an M.A. and Ph.D. program of graduate study with a concentration in medical ethics. Details concerning the program can be obtained from the department.

RELIGIOUS STUDIES

The department has an M.A. program of graduate study with a concentration in philosophy of religion and other religious studies. Details concerning the program can be obtained either from the Departments of Philosophy or Religious Studies.

3111 Ancient Western Philosophy (4)
3121 Medieval Philosophy (4)
3131 Seventeenth- and Eighteenth-century Philosophy (4)
3141 Nineteenth- and Early Twentieth-century Philosophy (4)
3151 Contemporary Philosophy (4) Survey of recent movements in philosophy.
3270 Russian Philosophical and Theological Thought (4) (Same as Religious Studies 3270.)
3311-12 American Philosophy (4, 4) 3311—Colonial to late nineteenth century. 3312—Late nineteenth century to present.
3315 American Ideals (4) Ideological variants in the American scene.
3320 Philosophy of Law (4) Nature, sources, function of law.
3330 Philosophy of History (4) Speculative and critical aspects of the philosophy of history.
4310 Philosophical Ideas in Literature (4)
Philosophic assumptions and implications in major literary works.

4320 Philosophy of Literature (4) Study of the nature, function, and ethical implications of literary art.

4330 Concepts of Woman (4) Examination of some of the theoretical foundations of feminism and antifeminism.

4340 Social Ethics (4) Ethical theory as related to politics, economics, law, religion and the family.

3510 Existentialism (4)

3550 Marxism as Philosophy (4)

3650 Philosophy and Religion in India (4) (Same as Religious Studies 3650.)

3660 Buddhist Philosophy and Religion (4) (Same as Religious Studies 3660.)

3690 Philosophy of Religion (4) Analysis of basic issues of religion. (Same as Religious Studies 3690.)

3720 Science, Technology, and the Modern World: A Philosophical Approach (4)

3740-50 Conceptual History of Science (4, 4) 3740-50—The Scientific Revolution; historical evolution of thought in astronomy, mechanics and philosophy of nature up to Newton, 3750—The Development and Decline of Newtonian Science; historical evolution of thought on the nature of matter and light, and on that of life. Prereq: 8 hrs of physical science or consent of instructor.

3770 Introduction to Philosophy of Science (4) Standard topics in philosophy of science; scientific method, nature of laws and theories, problems of induction, explanation, measurement. No background in logic presupposed.

3810 Introductory Symbolic Logic (4) Techniques for formal analysis of deductive reasoning. (Propositional logic and quantification theory).

3910 Contemporary Aesthetics (4) Philosophical discussion of contemporary art.

4000 Special Topics (4) A student- or instructor-initiated course to be offered at the convenience of the department. Subject matter to be determined by mutual consent of students and instructor with approval of department. Prerequisites to be determined by department.

4111-21 Modern Religious Philosophies (4, 4) (Same as Religious Studies 4111-21.)

4310 Intermediate Ethics (4) Topics in meta-ethics or ethics. Prereq: Elementary Ethics.

4370-71 Theoretical Issues in Medical Ethics or ethics. (Same as Religious Studies 4370-71.)

4410 Plato (4) Prereq: 8 hrs of philosophy or consent of instructor.

4420 Aristotle (4) Prereq: 8 hrs of philosophy or consent of instructor.

4450 Continental Rationalism (4) Prereq: 8 hrs of philosophy or consent of instructor.

4460 British Empiricism (4) Prereq: 8 hrs of philosophy or consent of instructor.

4470 Kant (4) Prereq: 8 hrs of philosophy or consent of instructor.

4480 Advanced Topics in Existentialism and Phenomenology (4) Prereq: 8 hrs of philosophy or consent of instructor.

4490 Process Philosophy (4) Prereq: 8 hrs of philosophy or consent of instructor.


4511 Advanced Topics in Logic (4) Prereq: Consent of instructor. May be repeated.

4610 Philosophical Analysis (4) Prereq: 8 hrs of philosophy or consent of instructor.

4620 Philosophy of Mind (4) Problems of mind and body in relation to consciousness and personal identity. Prereq: 8 hrs of philosophy or consent of instructor.

4630 Philosophy of Language (4) Prereq: 8 hrs of philosophy or consent of instructor.

4710 Philosophy of Natural Science (4) Consideration of standard topics pertinent to natural science including reduction of theories and teleological explanation. Familiarity with symbolic logic is recommended. Prereq: 3770 or 2 yrs of natural science.

4720 Philosophy of Social Science (4) Examination of methods and modes of explanation in social sciences. Prereq: 3770 or 2 yrs of social science.

4810 Metaphysics (4) Prereq: 8 hrs of philosophy or consent of instructor.

5000 Thesis

5080 Symbolic Logic (4)

5089 Philosophy of Logic (4) Nature of logic; epistemological, metaphysical and axiological assumptions and implications in various theories of logic. Prereq: 4510 or its equivalent.

5110-20-30-40-50-60 Studies in the History of European Philosophy (4, 4, 4, 4) Intensive critical work on a major philosopher or a school. 5110—Greek, 5120—Hebrew, and/or Medievul, 5130—Modern, before Kant, 5140—Kant, 5150—Nineteenth Century, 5160—Twentieth Century.

5250 Studies in the History of American Philosophy (4) Intensive, critical work on a major philosopher or a school.

5310-20-30 Studies in Value and Normative Theories (4, 4, 4) 5310—Axiology, 5320—Ethics and metaethics, 5330—Aesthetics.

5370 Topics in Medical Ethics (4) Prereq: 4370-71 or permission of the Medical Ethics Committee.

5410 Philosophy of History (4) Theories of history and historical processes.

5430 Philosophy and Literature (4) Mutual influence of philosophy and literature, the possibility of philosophy of literature, the philosophy of criticism.

5450 The Problem of the Self (4) Current studies in sociology, social psychology, and philosophy are used to amend and elucidate traditional philosophical treatments of the problem of the self.

5460 Philosophy of Mind (4) An examination of the relation of the mental to the physical and of the role of words in discourse for mental activities such as thinking and feeling.


5550-60 Philosophy of Science (4, 4) The nature of the subject matter and method of the sciences. 5550—Natural sciences. 5560—Social sciences.

5610 Recent Developments in Philosophy of Religion (4)

5710 Studies in Metaphysics (4) Metaphysics of a philosopher or systematic philosophical tradition.

5810 Social and Political Philosophy (4)

5910-20-30 Research (4, 4, 4) Independent study under the direction of a member of the department.

5950 Clinical Practicum in Medical Ethics (4-12) Prereq: Permission of the Medical Ethics Committee. Open only to students concentrating in medical ethics. S/NC only.

6000 Doctoral Research and Dissertation

6110-20-30 Seminars in the History of European Philosophy (4, 4, 4)

6150-60 Seminars in the History of American Philosophy (4, 4)

6250 Seminar in the Philosophy of Religion (4)

6310 Seminar in Aesthetics (4)

6370 Advanced Topics in Medical Ethics (4) Prereq: 5370 or permission of the Medical Ethics Committee.

6510 Seminar in Epistemology (4)

6550 Seminar in Philosophy of Science (4)

6950 Advanced Residence in Medical Ethics (4-12) Prereq: Permission of the Medical Ethics Committee. Open only to students concentrating in medical ethics. S/NC only.

Physics and Astronomy

MAJOR

DEGREES

Physics

M.S., M.A.C.T., Ph.D.

Professors:

W. M. Bugg (Head), Ph.D. Tennessee

Associate Professors:


W. A. Dunham, Ph.D. Florida; G. C. Eldridge, Ph.D. California (Berkeley); S. Georgiou, Ph.D. Manchester (England); E. L. Hart, Ph.D. Cornell; G. H. Huray, Ph.D. Tennessee; H. C. Jacobson, Ph.D. Yale; J. W. Lewis, Ph.D. Missouri; R. L. Lister, Ph.D. Michigan; W. A. McGee, Ph.D. Tennessee; L. R. Painter, Ph.D. Tennessee; D. J. Pegg, Ph.D. New Hampshire; L. L. Riedinger, Ph.D. Vanderbilt; S. Y. Shieh, Ph.D. Maryland; C. C. Shih, Ph.D. Cornell; J. R. Thompson, Ph.D. Duke.

Assistant Professors:

M. F. Fair (Visiting), M.S., Michigan; R. Kohl, Chancellor's Research Scholar.

Benwood Foundation Distinguished Professor.

Presently on leave of absence.

Alumni Distinguished Professor.

1. Space Institute, Tullahoma.
A student who enrolls in the Graduate School with the intention of attaining an advanced degree shall, in general, have completed an undergraduate major in physics or its equivalent. Physics 3210-20-30, 3710-20-30 or 4110-20-30, 4210-20, 4230 or 4240 constitute the minimum courses prerequisite to graduate study.

A student who intends to present Physics as a graduate minor shall, in general, have completed an undergraduate minor in physics or its equivalent. Physics 3210-20. 4210-20 constitute the minimum course work prerequisite to graduate study.

Graduate programs leading to the Master of Science and Doctor of Philosophy are offered in a number of specialized fields including chemical physics, elementary particle physics, atomic and low temperature physics, health physics, molecular spectroscopy, nuclear physics, plasma physics, solid state physics, theoretical physics, and ultrasonics.

Departmental graduate programs providing special opportunities for academic and research work in areas pertinent to atmospheric and space flight are available at the Space Institute, Tullahoma.

All first-year graduate students are required to take a comprehensive examination in undergraduate physics during the fall quarter registration period.

THE MASTER'S PROGRAM

The Physics Department has two Master's degree programs—thesis and non-thesis.

The thesis program is primarily designed for students intending to go into industrial or governmental laboratories as physicists. The course requirements include 36 quarter hours in such courses as Physics 4510-20-30, 4610-20-30, 5110-20-30, 5210-20-30, 5310-20-30, 5610-20-30, and appropriate courses in related fields. Each candidate must present an acceptable thesis, equivalent to 9 hours of credit, and pass an oral examination on course material and thesis.

The non-thesis program is primarily designed for students intending to teach in colleges or universities on the elementary or intermediate level, or for students specifically intending to work toward a Ph.D. Students seeking an M.S. in Physics by this method must apply to the department's graduate committee for permission to enroll under this program.

The requirements for the M.S. under this method are the satisfactory completion of 45 hours of course work composed of at least a 30-credit hour major field, numbered above 5000 (e.g., 5110-20-30, 5210-20-30, 5310-20-30); 9 hours in a minor field (e.g., mathematics); and 9 hours from other courses in physics numbered above 4000 (preferably of advanced laboratory nature). In addition, the candidate must pass a comprehensive examination administered by the committee.

The Physics Department is also participating in the program which leads to the Master of Arts in College Teaching degree. In addition to the requirements for either of the Master's programs described above, the MACT degree in Physics requires 15 more hours of credit, making a total of 60 quarter hours. Nine of these hours are specified as follows: 3 hours in a seminar course dealing with general problems of college teaching; 3 hours in a seminar course dealing with special problems in the teaching of physics; and 3 hours in a course dealing with the history and philosophy of physics. The other 6 hours of course work may be elected from any of the physics courses numbered above 5000. During the two-year program leading to the MACT degree, the candidate will be continuously engaged in supervised teaching activities.

THE DOCTORAL PROGRAM

All students are expected to take Physics 5210-20-30, 5310-20-30, 5410-20-30, 5510-20-30, 5610-20-30, 6110-20-30 and 6310. Physics 6210-20-30 are normally required of students specializing in Atomic and Molecular Physics. Physics 6500-10 of students in plasma physics, Physics 6610-20-30 of students in health physics, Physics 6710-20-30 of students in solid state physics, and Physics 6810-20 of students specializing in molecular spectroscopy. (The Master's degree is not required.)

A reading knowledge of one foreign language in which there exists a significant body of literature is required.

German or French 3030 with a grade of A or B may be substituted for the corresponding language examination.

The thesis topic will be chosen with reference to one of the fields in which research facilities can be made available either at the University laboratory or at the Oak Ridge National Laboratory, Oak Ridge, Tennessee.

A program leading to the Ph.D. in chemical physics is conducted jointly with the Chemistry Department, which offers a similar degree. Physics departmental requirements for the degree in chemical physics include the successful completion of: Physics 4510, 4610-20-30, 5210-20-30, 5310-20-30, 5410-20-30, 5510-20-30, 5610-20-30, 6110-20-30, and either 6310 or 5720; Chemistry 4160-70, 5430, and any two quarters from 5340-50, 5460, 5860, 6730 or 6810-20.

Astronomy


3230 Heat and Thermodynamics (3) Concepts of temperature and heat; the laws of thermodynamics; applications of laws to simple physical and chemical problems. Prereq: College physics and calculus; 3210-20 or consent of instructor.

3910-20-50 Concepts of Modern Physics (3, 3, 3) Modern ideas of atoms, nuclei, particles, and radiation. No prerequisites for majors of Physics. General Physics must be taken in sequence.

5310-20-30 Physical Measurements (3, 3, 3) Laboratory measurement of some physical quantities. Theory supplied where necessary. Prereq: College physics and calculus; 3610 for 3520 and 3530. 3 labs.

3610-20 Electronics (3, 3) Electronic components and circuits of interest to physicists. Prereq: College physics and calculus. 3610 for 3530. 3 labs.

5350 Nuclear Electronics Laboratory (3) Elementary circuits of interest in nuclear instrumentation are designed and built, and their characteristics are tested as a function of various parameters. Prereq: 3610-20.

3940-50-60 Health Physics Practicum (3, 3, 3) Instrumentation; legal aspects and practice of applied health physics; problem solving; record keeping and report writing. For students in the health physics cooperative program.


4110-20-30 Introduction to Quantum Mechanics (3, 3, 3) Introduction to fundamental principles of quantum mechanics and methods of calculation. Applications to atomic, molecular, and nuclear physics. Prereq: Fundamentals of Physics or equivalent; advanced calculus and differential equations.

4140 Elementary Nuclear Physics (3) General properties of nuclei, two-nucleon systems, nuclear forces, nuclear reactions, nuclear disintegrations and beta-decay, nuclear spin and magnetism. Prereq: 3730 or 4120.

4160 Physical Acoustics (4) Considerations fundamental to detailed investigation of any branch of acoustics; propagation of acoustic waves in the infrasonic, the audible, the ultrasonic, and the hypersonic ranges of frequencies. 3 hrs and 1 lab. Prereq: 3210-20, 3230.

4210-20-50 Electricity and Magnetism (3, 3, 3) Intermediate level electrostatics; steady and alternating currents; laws of magnetism; Maxwell's equations; radiation of electromagnetic waves; reflection and transmission; electromagnetic fields of moving charges. Must be taken in sequence. Prereq: Fundamentals of Physics, general physics, or mathematics numbers in physics, and calculus and analytical geometry.

4230-40 Modern Optics (4, 4) Geometrical optics: Reflection and transmission of light at a diagram. Interference: physical, these of interfaces, lenses, and mirrors; thin lenses, lens systems, ray tracing; polarization; imagery; laser light. 4240—Physical optics; Mathematics of wave motion, superposition of waves; interference; Fraunhofer and Fresnel diffraction; Fourier optics, holography. Prereq: 4210 or consent of instructor. 3 hrs and 3 labs.

5310-20-30 Advanced Dynamics (3, 3, 3) Equations of motion; Lagrange's equations; Hamilton's principle; theory of characteristics; variational principles; canonical transformations; normal coordinates, elasticity, fluid mechanics. Prereq or coreq: 5610-20-30.


5210-20-30 Molecular Structure (3, 3, 3) General properties of the nucleus; two-body scattering problems; saturation and symmetry properties of nuclear forces; theory of light nuclei; nuclear model; rare Earth spectroscopy; special nuclear models; theory of nuclear reactions; theory of beta-decay. Prereq: 6110-20-30.

6110-20-30 Quantum Mechanics (3, 3, 3) Fundamentals of quantum mechanics and principal approximation methods. Application to atomic, molecular and nuclear physics. Dirac's equation; relativistic electrons; spurious solutions; spectra of hydrogen and helium. Prereq: 4130 or 5210; 5310-20-30 or 5410-20-30. Whichever of the latter series is not used is a prerequisite to be considered corequisite.

6210-20-30 Solid State Physics (3, 3, 3) General properties of the nucleus; two-body scattering problems; saturation and symmetry properties of nuclear forces; theory of light nuclei; nuclear model; rare Earth spectroscopy; special nuclear models; theory of nuclear reactions; theory of beta-decay. Prereq: 6110-20-30.

6310 Electromagnetic Theory of Light (3) Classical electrodynamics including theories of line breadth, dispersion and absorption; scattering of light and X-rays; dielectric and magnetic properties of gases and solids. Optical properties of electromagnetic waves in isotropic media including reflection, refraction and polarization; also theory of diffraction. Prereq: 5410-20-30.

6320 Special Relativity (3) Lorentz transformation; Einstein postulates; relativistic ten- sion, relativistic kinematics and dynamics. Prereq: 5410 or equivalent. (Same as Chemistry 5440.)

6460 Radiation Chemistry (3) (Same as Chemistry 5460.)


6540 Numerical Methods in Physics (3) Numerical methods available for solution of physical problems, pointed toward use of automatic computers; error analysis; linear algebra, matrices, vector spaces; Fourier series and integrals; spherical harmonics; Bessel functions; linear second-order partial differential equations and their associated boundary value problems. Variational calculus; Green's functions; integral transform methods. Special attention is devoted throughout course to problems arising in physics. Prereq: Advanced calculus and differential equations. (Same as Math 5610-20-30.)

6510-20-30 Introduction to Theoretical Physics (3, 3, 3) Classical theoretical physics, with limited use of mathematics. Prereq: 3210-20; 4210-30; advanced calculus, differential equations, and vector analysis. May be repeated with consent of department. S.N.C.

6510-20-30 Advanced Modern Physics (3, 3, 3) Advanced theoretical physics, with emphasis on theoretical and experimental aspects of atomic and molecular physics; quantum mechanics of nuclei and molecules; relativistic quantum mechanics; foundations of quantum mechanics; mathematical problems of quantum mechanics; principles of quantum mechanics; and principal approximation methods. Application to atomic, molecular and nuclear physics. Dirac's equation; relativistic electrons; spurious solutions; spectra of hydrogen and helium. Prereq: 4130 or 5210; 5310-20-30 or 5410-20-30. Whichever of the latter series is not used is a prerequisite to be considered corequisite.

6520 Interaction of Electrons with Solids (3) Collisions with free electrons; stopping power; electron slowing down spectral; electron screening; energy of solid; electron diffusion; plasmon effects in irradiated solids; light emission from irradiated solids; techniques in electron microscopy; applications to dosimetry. Prereq or coreq: 4120-20.

6530 Interaction of Radiation with Matter (3) Topics in atomic collision theory. Photon-atom
interactions; electron-atom and electron-molecule collisions, dielectric theory, stopping power, collective excitations in electronic systems, Cherenkov radiation, electron transport in gases and solids. Prerequisite or corequisite: 6110-20-30.

6710-20-30 Advanced Solid State Physics (3, 3, 3) Lattice dynamics; phonons; Brillouin zone; band structure; energy band structure of solids; cohesive energy; work function. Crystal oscillator strengths; effective mass approximation. Die-, para-, and ferromagnetism; neutron diffraction. The Fermi surface. Superconductivity. Phonon and electron scattering from phonons, electrons, and defects. Excitation excitation processes; surface states. F-centers; dislocations; and other defects. Prerequisite: 4630, 5210-20, 5220 or corequisites 4630 or 5240 or 5250; 6110 for 6710, 6120 for 6720.

6810 Vibrational Problems in Molecular Spectra (3) Normal coordinates and potential functions; group theoretical methods and selection rules in gases and condensed phases. Lasersam spectroscopy and nonlinear optical phenomena. Prerequisite: 5340-50 and 5420 or 6110-20, 6120-30. (Same as Chemistry 6810)

6820 Molecular Vibration-Rotation Theory (3) Molecules as vibrating and rotating systems possessing specific symmetry properties; quantum mechanics of symmetric and asymmetric molecular vibrators including vibration-rotation interaction theory; intensities and energies of molecular transitions; methods of analysis used in high resolution molecular spectroscopy. (Same as Chemistry 6820)

Political Science

MAJOR

Political Science

M.A., Ph.D.

Public Administration

M.P.A.

Professors:


Associate Professors:

R. E. Cunningham, Ph.D., Indiana; J. Dodd, Ph.D., Tulane; A. Elliott, Ph.D., Columbus; G. J. A. Bolam, Ph.D., Hopkins; H. H. Hopkins, Ph.D., Syracuse; S. Osofsky; Ph.D., Johns Hopkins; T. A. Smith, Ph.D., Ohio State.

Assistant Professors:

M. Boughton, M.A., Tulane; W. Koehler, Ph.D.; M. N. Cornell; W. Lyons, Ph.D., Oklahoma; C. Mauney, Ph.D., Tennessee; G. J. Rathjen, Ph.D., Michigan State; R. E. Robson, Ph.D., Maryland.

Registration in any courses in the 5000-6000 series may be repeated for credit with consent of the department.

THE BUREAU OF PUBLIC ADMINISTRATION

The University maintains in the College of Liberal Arts a Bureau of Public Administration for the purpose of promoting sound governmental administration through research, publication, and consultation. The staff is as follows: Professor Ungs (director); Professor Lyons (acting associate director), Robson (assistant director); Research Associates Brown, Durant, Kennedy, Thomas.

THE MASTER'S PROGRAM

See general requirements on page 19.

MASTER'S IN PUBLIC ADMINISTRATION

Specific requirements for graduation include:

1. The completion of 45 quarter hours of approved graduate courses including 9 hours of thesis work. In lieu of thesis, candidates may complete a total of 48 quarter hours of course work.

2. At least 50 percent of the credit hours including thesis must be in approved courses numbered 5000 and above.

3. Demonstration of command of the material covered in course work in an oral comprehensive examination. A non-thesis student must have a written examination which may be followed by an oral examination.

Inquiries concerning all programs should be directed to the Department of Political Science, Knoxville, Tennessee 37916.

THE DOCTORAL PROGRAM

Specific requirements for the degree of Doctor of Philosophy in Political Science include:

1. A minimum of 117 quarter hours, following the Bachelor's degree, is required. At least 93 hours shall be in political science. At least 72 hours in political science shall be graduate level hours (level earned in 5000 or 6000-level courses). At least 45 of these graduate level hours shall be at the 6000 level. This figure includes 36 hours of credit for the dissertation.

2. Each Ph.D. candidate must pass an examination in one foreign language. Students specializing in some areas may be required to demonstrate knowledge of a second language or appropriate research tools or both.

3. Admission to candidacy shall be based on written and oral preliminary examinations which must be passed not later than three quarters before the date on which the degree is granted.

4. The candidate may complete a final oral examination on the doctoral dissertation.

5. Successful completion of the degree also depends on course performance and other evidence of professional interest and conduct.


3555 Minority Group Politics in the United States (4) Content varies from quarter to quarter. May be repeated with consent of department. Maximum 8 hrs.

3555 Introduction to Public Administrative Organization and Management (4) Organization and decision-making theory, line and staff services, politics of organization, leadership, personnel and fiscal management, administrative responsibility, United States Government and Politics desirable as preceding course. (Same as Water Resource Development 3565)

3556 Public Administration and the Policy-Making Process (4) Public bureaucracies and the policy-making process, their political environment, administrative problems associated with policy making, United States Government and Politics desirable as preceding course.

3605 Political Change in Developing Areas (4) Characteristics and problems of political changes with primary focus on developing areas.

3615-16 Dynamics of Black African Politics (4, 4)

3621-22 Politics of Asian States (4, 4)

3625-26 Latin American Government and Politics (4, 4)

3631-32 Government and Politics of the Soviet Union (4, 4)

3635-36 Political Culture in Western Democracies (4, 4) Political culture, patterns and institutions of Western democratic systems.

3641 Government and Politics of Middle East and North Africa (4)

3710 State Politics (4) Focus on formal and informal setting of state governance: governors, courts, legislatures, and state administrators. Attention will be paid to state government's role in formulating, enacting, and implementing state policy.

3720 State Government and Policy Making (4) Nature and functions of the institutions of state government: governors, courts, legislatures, and state administrators. Attention will be paid to state government's role in formulating, enacting, and implementing state policy.

3750 The Urban Polity (4) Analysis of political institutions and processes in metropolitan areas.

3760 Urban Policy Process (4) Analysis of urban problems and policies in metropolitan areas.

3795 Contemporary Problems of Soviet Foreign Policy (4)

3801 Studies in Ancient Political Thought (4) Classical Greek and Roman political thought.

3802 Studies in Medieval Political Thought (4) From Augustine to Luther: Emphasis on problems and theories of religion and politics.

3803 Studies in Early Modern Political Thought (4) Machiavelli through the Enlightenment.

3804 Studies in Nineteenth- and Twentieth-century Political Thought (4) Political theories of industrial and technological societies; nineteenth and twentieth century.

3880 American Political Thought (4) Examination of role of selected political ideas, doctrines, and themes in America, emphasizing their development and relationships to diverse political interests.

4410 Law and the Administrative Process (4) Powers of, procedures of, controls over administrators.

4535-36 Political Attitudes, Opinions and Communication (4, 4)

4540-50 Presidency, Congress and Public Policy (4, 4) The Presidency and Congress within framework of policy-making process.

4545-46 The Judicial Process (4, 4) The study of courts as components of political systems, and public policy formulation through judicial
5410-20 Seminar in Public Law (3, 3, 3) Special problems in constitutional and administrative law.
5440-50 Theory and Analysis of U.S. Foreign Policy Processes (4, 4) Theoretical approaches to decision making in the foreign policy area and an analysis of the policy-making process.
5510-20 Seminar in International Organization (3, 3) 5510—Introduction to regional international organizations; political integration at the international level. 5520—Functional international organizations.
5540 Seminar in Comparative Public Administration (3) Approaches to and methods used in comparative analysis.
5550 Seminar in Administration in Developing Countries (3)
5600 Public Administration (3) Survey of public administration theory and functions, approaches to public management, contemporary problems in public administration.
5605 Research and Methodology in Public Administration (3) Introduction to basic assumptions and techniques of research in public administration; research design, data measurement, analysis, and reporting of data.
5610-20 Seminar in Organization Theory (3, 3) An appraisal of major theories of organization and their applicability to the public sector.
5611-21 Seminar in State-Local Administration (3, 3, 3)
5639 Seminar in Technology and Public Policy (3) Technological change and the policy process, government interactions with the scientific community, political characteristics of the scientific enterprise.
5635-45 Operations Research for Public Administrators (3, 3) Operations research methodology; applications and limitations of quantitative methods in policy analysis, network analysis, PERT, dynamic programming and other methods.
5640-50-60 Seminar in Metropolitan Areas (3, 3, 3)
5641 Seminar in Contemporary Public Policies (3) Examination of problems in one or more public policy areas from political and administrative perspectives. Topics to be selected by the instructor.
5670-80 Seminar in Policy Analysis (3, 3) Role of administrators in policy analysis and decision making with special attention to historical and current issues.
5710 Seminar in the Politics of Administration (3) An examination of public administration in the context of the American political system with emphasis upon policy making and the political roles of public administrators and agencies.
5740 Seminar in Organizational Analysis (3) Organization theory applications in public management; field analysis of public organizations.
5750-55 Seminar in Public Management (3, 3) Examination of selected problems.
5760 Seminar in TVA Public Personnel Management Practices (3) Exploration of public personnel management through an in-depth examination of one of the nation's largest personnel systems—TVA, staff and employee organization representatives serve as discussion leaders.
5765-75 Law and the Administrative Process (3, 3) Constitutional position; decisional processes, regulation and management; limitations on governmental action; questions of structure, role, and administrative choice.
5770 Practicum in Public Administration (3)
5780 Seminar in Fiscal Management (3) The fiscal role of government in a mixed economy, sources of public revenue and credit, financial planning and control.
5785-95 Seminar in Staff Functions (3, 3) Functions of administrative staff serving in the political and policy-making processes, legislative, executive, and community groups in the public sector. Selected topics include budgeting, personnel, evaluation, and other staff functions.
5810 The American Political Process (4) Principal patterns of political activity linking citizens and political institutions.
5820 The American Political Process (4) Selected problems in American politics.
5850 Seminar in Comparative State Politics (3) Intensive readings in comparative state politics focusing on the environment of state politics, Institutions and policy making.
5910-20-30 Seminar in Public Administration (3) Approaches to and methods used in public administration.
5950 Seminar in the Politics of Administration (3) An examination of public administration in the context of the American political system with emphasis upon policy making and the political roles of public administrators and agencies.
5970 Seminar in Organizational Analysis (3) Organization theory applications in public management; field analysis of public organizations.

Psychology

MAJOR

DEGREES

Psychology

M.A., P.H.D.

Professors:


Associate Professors:

H. S. Bacon,* Ph.D. Tennessee; C. B. Travis, Ph.D. California (Davis).

M.S.S.W. Tennessee; E. D. Sundstrom, Ph.D. Yale; J. C. Malone, Ph.D. Duke; W. G. Catholic; H. R. Friedman,* Ph.D. Tennessee; H. S. Bacon,* Ph.D. Tennessee; C. P. Cohen, Ph.D. Syracuse.

Professors:


Assistant Professors:


The Psychology Department emphasizes doctoral degree programs with specializations in clinical, school/community, industrial-organizational and general psychology. Some students complete a Master's degree as part of their doctoral program.

For detailed information on graduate programs and admissions requirements, write: Graduate Secretary, Department of Psychology, University of T. Duke; W. G. Morgan, Ph.D. Tennessee; W. M. Simmons, M.S.S.W. Tennessee; E. D. Sundstrom, Ph.D. Utah; C. B. Travis, Ph.D. California (Davis).

The Psychological Clinic supports graduate training in clinical psychology. Psychological diagnosis and psychotherapy are offered on an outpatient basis, with medical consultants, to the general public as well as to University students, on referral by a physician.

4107 Experience in Individualized Instruction (1-6) Supervised participation as a tutor in individualized instruction. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

4120 Topics in Social Psychology (4) Intensive study of selected research topics. Prereq: 3120 or Sociology 3130 (Same as Sociology 4120).


4249 Laboratory in Sensory Processes and Perception (2) Prereq or coreq: 4230. 2 periods.

4460 Organizational-Industrial Psychology (3)

4510 Personality Theories (4) Prereq: Abnormal Psychology or equivalent.

4520 Personality and Social Systems (4) Prereq: Abnormal Psychology.

4610 Group Processes (3) Study and experience of theory and techniques of group processing and facilitation. Those participating in 4610 are expected to continue into 4620 and 4630. Prereq: Consent of instructor.

4620-30 Seminar in Group Processes (3, 3) Didactic and laboratory experience for those qualified for further training as group facilitators. Prereq: Consent of instructor.

4640 Psychological Tests and Measures (4) Theory and construction of individual and group measures; survey of various methods of assessment of intelligence, personality, special abilities, and educational achievement. Prereq: Psychological Statistics.

4650 Symbolic Processes (4) The logic of signs and symbols; directed and associative thinking: memory, problem solving, and concept formation; the nature, use and development of language. Prereq: Learning and Thinking or consent of instructor.

4660 The Psychology of Language (4) Theories and descriptions of phonology, syntax, and semantics as applied to psychology and related disciplines:Recommended: 4650 or Linguistics 4000.

4710 Physiological Psychology (4) Nervous system and psychological correlates of behavior. Prereq: 1 yr of biology or zoology and Biological Foundations of Behavior.

4719 Physiological Psychology Laboratory (4) Coreq: 4710.

4720 Comparative Animal Behavior (4) Methods and principles. (Same as Zoology 4720).

4729 Comparative Animal Behavior Laboratory (4) Laboratory and field studies. Coreq: 4720. (Same as Zoology 4729).

4750 Evolution and Ontogeny of Social Behavior (4) Genetic, evolutionary, ecological, and developmental processes as they apply to social organization and dynamics of vertebrates. Prereq: Consent of instructor.

4830 History and Systems of Psychology (4) Prereq: 9 hrs of upper division psychology.

4850 Learning Theories (4) Historical and theoretical development of learning models. Prereq: Learning and Thinking.

4860 Programmed Learning (3) (Same as Curriculum and Instruction 4860).}

4870 Contemporary Research in Behavior of Women (4) Study of interaction of cultural and biological factors in determining the behavior of women, with emphasis on physiological mechanisms involved.

4880 Afro-American Psychology (4) Review and analysis of psychological literature on African-Americans. Prereq: Consent of instructor. (Same as Cultural Studies 4880).

4900 Aspects of Urban Environment (4) Interdisciplinary course on urban problems. Prereq: Consent of instructor. (Same as Architecture 4900, Real Estate 4900.) S/NC only.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

5017 Colloquium in Experimental Psychology (1) Coreq: 5019, S/NC only.


5070 Seminar in College Teaching (2) Concepts, methods, and materials in the introduction of psychology at the college level. Emphasis upon research. Required of all Ph.D. candidates. S/NC only.

5079 Practicum in College Teaching (2) Supervised participation in College Teaching. S/NC only.

5120 Topics in Applied Psychology (3)

5160 Development Psychology (3) Prereq: Child Psychology or Child-Youth-Education Psychology. (Same as Educational Psychology 5160).

5180 Developmental Assessment (3) Survey of techniques for assessing development in infants and children. Does not include practicum. Prereq: 5100 or equivalent and consent of instructor.

5111-12-13 Seminar in Current Issues in School Psychology (1, 1, 1) Historical, legal-ethical, and technological issues impinging on school psychological practice.

5140-50-60 Psychoeducational Assessment (3, 3, 3) Naturalistic, psychometric, and sociometric assessment methods in school learning environments. Must be taken in sequence. Coreq: 5479-89-99. Prereq: Admission to School Psychology program or consent of instructor. (Same as Educational Psychology 5140-50-60).


5170-90-99 Seminar in Organizational Psychology (3, 3, 3) Introduction to the basic concepts and ideas required for graduate study in organizational psychology. Must be taken in sequence during the student’s first year. Prereq: Consent of instructor. (Same as Industrial Management 5170-90-99).

5150 Topics in Developmental Psychology (3) Prereq: 5100 or equivalent and consent of instructor. May be repeated. Maximum 6 hrs.

5210 Readings in Psychology (1) S/NC only.

5220 Readings in Psychology (2) S/NC only.

5230 Readings in Psychology (3) S/NC only.

5240 Readings in Psychology (4) S/NC only.

5250 Readings in Psychology (5) S/NC only.

5260 Special Problems in Psychology (1) S/NC only.

5270 Special Problems in Psychology (2) S/NC only.

5280 Special Problems in Psychology (3) S/NC only.

5290 Special Problems in Psychology (4) S/NC only.

5300 Special Problems in Psychology (5) S/NC only.

5319 Field Work in School Psychology: Level 1 (2) Supervised on-the-job training in school psychology. Limited to students fully admitted to the doctoral program in school psychology who are assigned to program approved field...
settings. May be repeated. Maximum 6 hrs. Prereq: 5140-50-60 or equivalent. S/NC only. (Same as Educational Psychology 5319.)

5340 Group Dynamics (3) (Same as Educational Psychology 5340.)

*5350-60-70 Seminar in Psychology (3, 3, 3)

5400 Psychophysics and Scaling Methods (3) Prereq: One course in statistics.

5420-30-40 Advanced Psychological Statistics (3, 3, 3) Must be taken in sequence.

5445 Advanced Correlational Methods (3) Bivariate, multivariate, and multiple correlation and regression; stepwise regression and cross-validation; simple and partial discriminant analysis; rank correlation methods. Prereq: 5435.

5450 Human Problems in Administration (3) (Same as Industrial Management 5230.)

5460 Personnel Research Seminar (3) (Same as Industrial Management 5240.)

5500 Fundamentals of Psychometrics (4) Basic concepts and techniques in psychometrics. All the graduate students who plan to take one or more courses in psychometrics are required to take the course. Prereq or Coreq: 4640.

5510 Instrumentation for Psychological Research (3)

5520 Theory of Mental Measurement (3) Reliability, validity, scaling and equating, norms, combining tests into batteries. Prereq: Descriptive Statistics, Interpretation of Statistical Reports 4540 and 5500.

5530 Issues in Applied Psychological Measurement (3) Applications of measurement in community and organizational research. Prereq: Statistics 5050-60-70 or equivalent and consent of instructor.

5550 Advanced Social Psychology (3) Interaction between individual and group theories of group behavior. Prereq: Social Psychology. May be used for credit in sociology.

5560-70 Seminar in Social Psychology (3, 3) Prereq or Coreq: 5550. May be repeated. Maximum 9 hrs.

5580 Theories of Personality (3)

5581-82-83 Clinical Psychology I: Human Development and Personality (2, 2, 2) First quarter of the doctoral program in clinical psychology. Students take the 3 2-hr courses concurrently, each covering the content area from one of the three major contemporary points of view.

5589 Psychological Techniques Laboratory (2) Basic techniques of psychological appraisal. Restricted to doctoral students in clinical psychology.

5590 Psychodynamics (3) A research-and-theory-oriented course focusing upon the origins of behavior.

5591-92-93 Clinical Psychology I: Patterns of Adaptation (2, 2, 2) Second quarter core of the doctoral program in clinical psychology. Students take the 3 2-hr courses concurrently, each covering the content area from one of the three major contemporary points of view.

5601-02-03 Clinical Psychology I: Behavioral Deviance and Psychopathology (2, 2, 2) Third quarter core of the doctoral program in clinical psychology. Clinical students take the 3 2-hr courses concurrently, each covering the content area from one of the three major contemporary points of view.

5610-20 Psychology of Learning (3, 3) Prereq: 3210 or Educational Psychology 3700.

5650 Ethics and Professional Practices (1) A review and discussion of problems arising in the practice of clinical psychology. Offered in alternate years. Prereq: M.A. in psychology or equivalent.

5670 Forensic Psychology (2) The psychologist's role in relation to the law, including questions concerning licensure requirements, legal restrictions, and testimony as an expert witness. Offered every other year. Prereq: M.A. in psychology or equivalent.

5680 Neural Basis of Behavior (3) Neuroanatomy; the basis and symptomatology of neurological syndromes encountered in clinical psychology. Prereq: M.A. in psychology or equivalent.

5690 Psychopharmacology (3) A review and evaluation of pharmacology as it relates to psychology. Prereq: Consent of instructor. Offered in alternate years.

5713 Learning Modules for Techniques in Professional Psychology (1-4) A set of learning packages, each of which develops a skill in assessment, technology, child psychology, or neuropsychology. Prereq: Consent of instructor. May be repeated. S/NC only.

5750 Ethological Psychology (3) Evolutionary and physiological basis of comparative psychology and implications for human behavior. Prereq: Introductory Biology and graduate standing.

5760 General Vertebrate Neuroanatomy (3) Lecture and laboratory dealing with structure and function of the central and peripheral nervous system. Prereq: 4710, 4719 or consent of instructor. (Same as Zoology 5760.)

5769 Advanced Techniques in Physiological Psychology (3) Animal and human laboratory procedures. Prereq: formal research and laboratory experience in physiological psychology. Prereq: 4710, 4719 and consent of instructor. May be repeated with consent of instructor.

5780 Seminar in Psycholinguistic Concepts in Speech Pathology (3) (Same as Speech Pathology 5790.)

5810 Techniques of Psychological Examination (3) Development and administration of basic psychological tests. Intended primarily for students in fields related to psychology using assessment procedures. Prereq or Coreq: 4640 or equivalent and consent of instructor.

*5819 Practicum in Techniques of Psychological Examination (2) Coreq: 5810.

5840 Student Appraisal (3) (Same as Educational Psychology 5840.)


5858-69-79 Practicum in Psychological Appraisals (3, 3, 3) Ordinarily to be taken concurrently with 5850-60-70.

5890 Counseling Theories and Techniques (3) (Same as Educational Psychology 5890.)

5950-60-70 Consultation in Human Development Settings (3, 3, 3) Study of issues, models, and evaluation of the process of consultation in settings where human developmental needs and crises are managed by persons who seek aid from psychologists. Must be taken in sequence. (Offered in Educational Psychology 5950-60-70.)

5959-69-79 Practicum in School Psychology II (2, 2, 2) Second year School Psychology Pro-
6450-60 Advanced Psychometrics (3, 3) Construction and standardization of psychological tests, questionnaires, and rating scales; theory of errors or measurements; item analysis, scaling, equating, and norms development. Prereq: 4650, 5440, and 5500. May be repeated. Maximum 9 hrs.

6491-2-3-4 Field Placement in Clinical Psychology Levels 1, 2, 3, 4, (1-0, 1-0, 1-0, 1-0) Supervised clinical experience. Required of and limited to students fully admitted to the Ph.D. program in Clinical Psychology. May be repeated. Maximum 8 hrs per course. B/NC only.

6500 Seminar in Psychometrics (3) Seminar for advanced graduate students in psychometrics or quantitative psychology, to deal with advanced theories, methodologies, and their applications. Prereq: 4640, 5550 or equivalent, and consent of instructor. May be repeated. Maximum 9 hrs.

6550 Seminar in Advanced Social Psychology (3) Prereq: Consent of instructor.

6571 Seminar in Mental Health Administration (3) Theory and problems in the organization and management of mental health administration.

6650-60-70 Systems Approaches in Psychological Services (3, 3, 3) Systems and organization development approaches in schools and other human services settings. Prereq: Consent of instructor. (Same as Educational Psychology 6650-60-70.)

6659-69-79 Practicum in School Psychology (2, 2, 2) Third year School Psychology Program practicum core sequence. B/NC only. (Same as Educational Psychology 6659-69-79.)

6710 Seminar in Physiological Psychology (3)

6720 Seminar in Comparative and Ethological Psychology (3)

6730 Methods of Ethological and Naturalistic Research (3) Current research and field techniques. Prereq: 4725, 5760, 6720, or consent of instructor.


6800 Advanced Psycholinguistics (3) Language from psychological and associated points of view; methodological and theoretical problems. Prereq: Consent of instructor.


6870 Adult Psychotherapy (3) Prereq: 5580-90-600. Prereq or coreq: 6550-60.

6900 Field Work in Industrial and Organizational Psychology (1-15) (Same as Industrial Management 6900.)

Note: Psychology 5210-5300, 5550-60-70, 5819, 6310-400, 6419-29-35, 6710-20-30, 6750, 6840, 6870, and/or 6800 may be repeated for credit with the approval of the department.

Religious Studies

Professors:
F. S. Lusby (Head), B.D. Colgate Rochester;

Associate Professors:
B. L. Daniels, Ph.D. Duke; W. L. Humphreys, Ph.D. Union; D. E. Linge, Ph.D. Vanderbilt; C. H. Reynolds, Ph.D. Harvard.

Assistant Professors:
J. Kim, Ph.D. Chicago; R. Lee, Ph.D. Harvard.

Instructor:

An M.A. in Philosophy with a concentration in religious studies is available for graduate work in these related fields. (Details of this program are available in the office of either department.) Graduate courses in religious studies further provide opportunity for students in a variety of disciplines to pursue work in religious studies as a graduate concentration.

3051-71 History of Western Religious Thought and Institutions (4, 4) 3061-71

3210 Early Greek Mythology (3) (Same as Classics 3210)

3220 Greek Mythology in the Classical Period (3) (Same as Classics 3226)

3230 Roman Mythology (3) (Same as Classics 3236)

3270 Russian Philosophical and Theological Thought (4) A survey of the development of philosophical and theological thought in Russia from the Middle Ages to the Revolution. Special emphasis on the expression of this thought in Russian literature and literary criticism. Not open to graduate students only. (Same as Philosophy 3270 and Russian 3270)

3411-12-13 Renaissance and Reformation (3, 3, 3) (Same as History 3411-12-13)

3440 Religion of Primitive Peoples (3) (Same as Anthropology 3440)

3550 Philosophy and Religion in India (4) (Same as Philosophy 3550)

3600 Buddhist Philosophy and Religion (4) (Same as Philosophy 3600)

3690 Philosophy of Religion (4) (Same as Philosophy 3690)

4111-21 Modern ReligiousPhilosophies (4, 4) Examination of the religious implications of major thinkers and movements. 4111—Nicolas of Cusa to Hume; 4121—Kant and the nineteenth century. Prereq: 9 hrs of philosophy other than logic. (Same as Philosophy 4111-21)

4210 Topics in Ancient Israelite and Ancient Near Eastern Religions (4) Prereq: Ancient Israel's Historical and Religious Traditions, The Rise of Judaism, or consent of instructor. May be repeated. Maximum 8 hrs.

4310 Jesus and Paul Compared (4) Jesus' teaching and activity in the context of first-century Palestinian Judaism; analysis of what the Apostle Paul made of the tradition of and about Jesus. Recommended prereq: Introduction to Religions of the World or introduction to Ancient Near Eastern Religions and Images of Jesus.

4370-71 Theoretical Issues in Medical Ethics (4, 4) (Same as Philosophy 4370-71)

4410 American Religious Thought (4) (Same as Sociology 4410) Selected figures, movements and problems in American religious thought from colonial period to present.

4450 Topics in American Religion (4) Prereq: one of the following: Religions in America, 4410; or consent of instructor. May be repeated. Maximum 8 hrs.

4540 Social and Religious Change (4) (Same as Sociology 4540)

4610 Topics in Western Religious Thought and Institutions (4) Selected figures, issues and institutions. Seniors and graduate students only, except by permission of department. Prereq: History of Western Religious Thought and Institutions. May be repeated. Maximum 12 hrs.

4640 Topics in Early Christianity and Hellenistic Religions (4) Selected figures, issues and institutions. Seniors and graduate students only, except by permission of department. Prereq: Introduction to Near Eastern Religions or permission of instructor. May be repeated. Maximum 12 hrs.

4670 Topics in Eastern Religions (4) Selected figures, issues and institutions. Seniors and graduate students only, except by permission of department. Prereq: 3550-60. May be repeated. Maximum 12 hrs.

4810-30 Readings and Research in Religious Studies (3-3, 3-3, 3-3) See page 148.

4840 Readings in Selected Languages Related to Religious Studies (3-3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

4940 Sociology of Religion (4) (Same as Sociology 4940)


4960 Tradition, Change and Modernity in Asia (4) Comparative study of processes of religious and social change, in historical context in Asian societies. Comparative focus of course will vary each year (e.g., China, Japan, India and South Asia.) May be repeated. Maximum 8 hrs. (Same as Sociology 4960.)

5101 Foreign Study (1-12) See page 148.

5102 Off-campus Study (1-12) See page 148.

5103 Independent Study (1-12) See page 148.

5310-20 Topics in Religion and Society (4, 4)

5510-20 Topics in the History of Religion (4, 4)

5710-20 Topics in Religious Thought (4, 4)

Romance Languages

MAJORS

DEGREES

French
M.A.

Romance Languages
M.A.T,

Spanish
M.A., Ph.D.

Professors:
H. C. Rutledge (Head), Ph.D. Ohio State;
W. R. Averett (Emeritus), A.M. Texas;
P. E. Barrett, Ph.D. California; G. W. Cobb, Ph.D. Tulane; P. J. Cooper, Ph.D. Columbia;
W. R. Helman, Jr., Ph.D. North Carolina;
T. B. Irving, Ph.D. Princeton; H. E. Lewald, Ph.D. Minnesota; F. D. Maurino, Ph.D. Columbia;
A. M. Vazquez-Bigl, Ph.D. Minnesota;

Associate Professors:
W. F. Byess (Emeritus), Ph.D. Wisconsin;
R. M. DeRycke, Ph.D. Illinois;
J. C. Elliott, A.M. Illinois;
W. H. Helmin, Ph.D. Florida State;
P. M. Petroska, Ph.D. Kentucky;

Assistant Professors:
E. J. Campion, Ph.D. Yale; M. Handleman, Ph.D. Florida; K. B. Levy, Ph.D. Kentucky;
C. Pinsky, Ph.D. California (Berkeley).

The Department of Romance Languages offers three advanced degrees: the Master of Arts in College Teaching (M.A.T. in the Romance Languages only; the Master of Arts (M.A.) in French and Spanish; and the Doctor of Philosophy (Ph.D.) in Spanish.}
THE MASTER OF ARTS IN COLLEGE TEACHING PROGRAM

This program requires a minimum of 60 hours of graduate work. Students must participate in the graduate seminar in college teaching during their first year of residence (3 hours credit). They must also complete 6 credits in supervised instructional experience. French or Spanish must be selected as the major subject, and at least 36 hours of graduate work including 9 hours of thesis and 9 hours of linguistics and philosophy, and 3 hours of problems in language teaching, must be completed. In addition, civilization courses are strongly recommended. Spanish or French must be selected as the minor subject, in which at least 18 hours of graduate work must be completed.

THE MASTER OF ARTS PROGRAM

The student may select either Plan A or B.

Plan A
1. Completion of a minimum of 36 quarter hours of which 24 must be taken in courses numbered above 5000, including 5011 (French or Spanish, as appropriate).
3. A written examination covering the course work and selected items from a master reading list.
4. A final oral examination covering the thesis.

Plan B
1. Completion of 45 quarter credits of which 33 must be in courses beyond 5000, including 5011 (French or Spanish, as appropriate).
2. Three term papers that have been accepted as satisfactory by the Advisory Committee.
3. A written examination covering the course work and selected items from a master reading list.

THE DOCTORAL PROGRAM

Residence and Course Work:
Completion of at least three consecutive quarters of full-time residence, a minimum of 81 credit hours in course work beyond the Bachelor's degree or its equivalent, and a dissertation (36 credit hours).

No less than 54 quarter hours should be taken in courses pertaining to the student's major field; of these a minimum of 18 hours are to be taken in courses above 6000, a maximum of 12 hours may be taken in courses of the 4000 level and the rest in courses above 5000. All students must complete the series in methods of research (5151-61-71) for a total of 3 credits. The minor shall consist of at least 18 hours of which at least 12 hours must be numbered above 5000 and the rest above 4000, and should represent a meaningful complement to the student's area of concentration. In addition 9 hours of courses above 4000 in a related discipline are required. In special cases the latter requirement may be waived in favor of additional course work in the major field.

Language Requirements:
Students are expected to demonstrate written and oral fluency in Spanish as well as knowledge of two other foreign languages. One of these must be French; the second one should be chosen from such languages as German, Italian, Portuguese, Arabic or Spanish in accordance with the student's field of concentration. Proficiency in Latin shall be required of all students specializing in an area related to philology or the medieval period.

Examinations:
A preliminary comprehensive examination, both written and oral, covering the major and minor fields must be passed before a student can become an official candidate for the degree. This preliminary examination is to be held at the time deemed most appropriate by the student's major advisor and committee. The candidate is expected to defend the dissertation in a final oral examination.

For additional information on the program, consult pages 22-23.

Arabic
3510-20 Intermediate Modern Standard (4, 4)
3610 Islamic Literature in English Translation (4) Survey from origins to modern period of major Islamic literatures, especially Arabic, Persian, and Turkish. Readings include The Arabian Nights, The Rubaiyat of Omar Khayyam, and Gibran's The Prophet.
5070-80-90 Hispano-Arabic Literature and Culture (3, 3, 3) (Same as Spanish 5070-80-90.)
5101 Foreign Study (1-12) See page 148.
5102 Off-campus Study (1-12) See page 148.
5103 Independent Study (1-12) See page 148.

French
3610-20-30 Elements of French for Upper Division and Graduate Students (3, 3, 3) Elements of language, elementary and advanced readings. Open to graduate students preparing for language examinations, and upper division students desiring reading knowledge of the language. Undergraduate credit only. No credit for those having had Elementary French. No auditors.
4010 Masterpieces of French Literature in English Translation (3) No foreign language credit.
4020 Masterpieces of French Drama in English Translation (3) No foreign language credit.
4110-20-30 French Literature of the Seventeenth Century (3, 3, 3) Prereq: Intermediate French (third quarter) or equivalent.
4150 Theatrical French (1-3) Performance in one or more French plays. May be repeated with consent of department. Prereq: one year of Intermediate French or equivalent and consent of instructor.
4160-70-80 Advanced Conversation (2, 2, 2) Intensive training in paired and spontaneous conversations. Subjects range from travel and current events to literature and aspects of national culture. Prereq: Completion of 9 hours of courses on 3000 level.
4210-20-30 Phonetics and Advanced Grammar (3, 3, 3) Prereq: Intermediate French (third quarter) or equivalent.
4250 Introduction to Descriptive Linguistics (3) Phonetics and phonology, and syntax, of languages, linguistic groups, dialects and dialect geography. The application of descriptive linguistics—field linguistics, dialect study; its practical use in learning languages and in language teaching. An introduction to transformational grammar. Prereq: 9 hrs of upper division English, or 9 hrs of upper division courses in a modern or ancient language (exclusive of German and French 3019-20-30, courses in literature in translation, and general courses in Latin and Greek requiring no knowledge of these languages), or consent of the department. (Same as German and Spanish 4250.)

4260 Introduction to Historical and Comparative Linguistics (3) (Same as German 4260.)

4270 Introduction to Romance Linguistics (3) A study of the development of Classical Latin through Vulgar into the major Romance languages. (Same as Spanish 4270.)

4310-20-30 French Literature of the Eighteenth Century (3, 3, 3) Prereq: Intermediate French (third quarter) or equivalent.
4410-20-30 French Civilization (3, 3, 3) Prereq: Intermediate French (third quarter) or equivalent.
4510-20-30 French Literature of the Nineteenth Century (3, 3, 3) Prereq: Intermediate French (third quarter) or equivalent.
4640-50-60 French Literature of the Sixteenth Century (3, 3, 3) Prereq: Intermediate French (third quarter) or equivalent.
4710-20-30 French Literature of the Twentieth Century (3, 3, 3) Prereq: Intermediate French (third quarter) or equivalent.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student desiring a graduate degree. No foreign language credit except those whose previous training or experience warrants their being excused by the Advisory Committee.

5011 Techniques in Literary Analysis (3) Required for either Plan A or Plan B of the M.A. program. An intensive course in explication de texte.
5101 Foreign Study (1-12) See page 148.
5102 Off-campus Study (1-12) See page 148.
5103 Independent Study (1-12) See page 148.

College of Liberal Arts 141
5340 Problems in Hispanic Culture (3) Intensive study of prevailing social, political, artistic, literary and ideological conditions and patterns of any area or period within Spanish or Latin American culture. May be repeated with permission of department. Maximum 6 hrs.
5510-20-30 The Spanish Theatre after the Golden Age (3, 3, 3) 5510—From the eighteenth century through Romanticism. 5520—From Realism through the Generation of 1936. 5530—Contemporary theatre.
5610 Spanish American Prose to 1900 (3) Novel, chronicle, essay.
5611-21 Spanish American Lyric Poetry (3, 3)
5620-30 The Modern Novel in Spanish America (3, 3)
5631 Spanish American Essay (3)
5632 The Spanish American Short Story (3) The short story as a major literary genre in Spanish America. Reading and criticism of the works of authors such as Darío, Quir Quir, Borges, Arezuela, and Ruflo.
5633 Twentieth-century Latin American Theatre and Film (3) Readings from the works of playwrights such as Carlos Solórzano, Rodolfo Usigli, Conrado Nafé Rojo, Roberto Cossa, René Marques and Sebastián Salazar Bondy. Presentation of films as adaptations of classics such as Dofia Bárbara, Los de abajo and Do Segundo Sombra as well as exponents of the experimental cinema of today.
5640 Latin American Women Writers (3) An introduction to the works of Latin American women writers, focusing on the feminine point of view, the modern image of woman, male-female relationships and society as a context for woman’s destiny. Readings from poetry and fiction, including such authors as Alfonquina, Delmira Agustini, Gabriela Mistral, Silvina Builrich, Silvina Ocampo, and Rosario Castellanos.
5650-60 Advanced Syntax and Stylistics (3, 3) Readings and written imitations of modern literary style in the form of compositions, sketches and original stories.
5670 Problems in Romance Linguistics (3) (Same as French 5670.)
5610-20-30 Spanish Lyric Poetry (3, 3, 3)
5910 Literary Criticism: The Foundations of Romance Criticism (3) (Same as French 5910.)
6000 Doctoral Research and Dissertation
6210-20-30 Seminar in Spanish Literature (3, 3, 3) Topics vary in the field of Peninsular Literature. May be repeated with consent of department.
6310-20-30 Seminar in Latin American Literature (3, 3, 3) Topics vary. May be repeated with consent of department.

Russian

See German

Sociology

MAJOR

Sociology

M.A., M.A.T., Ph.D.

Professors:

D. McAlister, Head, Ph.D. North Carolina; J. A. Black, Ph.D. Iowa; D. J. Champion, Ph.D. Purdue; W. E. Cole (Emeritus), Ph.D. Cornell; L. E. Dotson, Ph.D. Vanderbilt; L. Ebersole, Ph.D. Pennsylvania; S. Wallace, Ph.D. Minnesota.

Associate Professors:

D. M. Botz, Ph.D. Michigan State; D. Cieland, Ph.D. Michigan State; D. Hastings, Ph.D. Massachusetts; T. C. Hood, Ph.D. Duke; R. Perrin, Ph.D. British Columbia; N. Shover, Ph.D. Illinois.

Assistant Professors:

S. Kurth, Ph.D. Illinois; S. Nortland, Ph.D. Iowa; T. Weirath, Ph.D. Wisconsin.

For a full statement of departmental requirements, students are referred to the Departmental Graduate Manual.

All registration for 3000- and 4000-level courses requires the consent of the Instructor.

The MASTER’S PROGRAM

The department offers both a thesis and non-thesis option for a Master’s degree. For information concerning the Master’s degree with thesis, see the General Requirements on page 19. Those interested in the non-thesis option should obtain details from the department.

The DOCTORAL PROGRAM

General requirements for the degree of Doctor of Philosophy are described on page 22. Additional specific requirements for the degree of Doctor of Philosophy in Sociology include:

1. A minimum of 108 credit hours following the Bachelor’s degree, exclusive of credits for the Master’s thesis, is required. Of this number, 36 hours shall be allocated to doctoral research and dissertation. A maximum of 12 hours credit outside the major may be taken in related fields, with the approval of the student’s committee. Exclusive of doctoral research and dissertation at least one-half of all credits shall be in courses numbered 5000 or 6000.

2. A written preliminary examination covering sociological theory, research methodology, and other areas in sociology must be passed prior to admission to candidacy. This examination must be passed not later than one academic year before the date on which the degree is granted.

3. No later than one month before granting of the degree, the candidate will be required to pass an oral examination on the doctoral dissertation. At the oral examination the candidate will be expected to show a thorough knowledge of sociological theory and methodology related to the research.

4030 Society and Law (4) A general treatment of the social origins and consequences of law and the legal process. Particular emphasis is placed on problems of law and social change, and on the structure and functioning of legal sanctions. Some attention is paid to law and law-like phenomena in formal organizations and primitive societies.

4110 Population Problems (4) Demographic factors and social structure; trends in fertility, mortality, population growth, migration, distribution, and composition; population policy.

4120 Topics in Social Psychology (4) (Same as Psychology 4120.)

4130 Sociology of Punishment and Corrections (4) Traces development of correctional movement, develops a critical sociological perspective on contemporary correctional programs, and provides overview of evaluative research in corrections.

4310 Criminology (4)

4330 Urban Ecology (4) Examination of public, private, collective, and individual space. Classical school of ecology, its neoclassical revisions, social area analysis, and cognitive and symbolic ecology emphasized.

4410 Educational Sociology (3) (Same as Curriculum and Instruction 4410.)

4520 Community Organization (4) Structure; function; linkages; change and development; important community studies are reviewed and discussed. Emphasis on sociological analysis, not on the implementation of change.

4540 Social and Religious Change (4) (Same as Religious Studies 4540.)

4560 Formal Organization (4) Analysis of the bureaucratic process, division of labor, delegation of authority, channeled communication under a system of rationality.

4820 American Minority Groups (4) Minority groups and social structure in American society; analysis of intergroup relations with attention given to non-past and present relationships of selected groups to broader society.

4930 Social Movements (4) Development, organization, and function of social movements; attention is given to the ideology, leadership and organization of political, religious and other types of social movements.

4940 Sociology of Religion (4) Interrelationship of society, culture, and religion. (Same as Religious Studies 4940.)

4960 Tradition, Change and Modernity in Asia (4) (Same as Religious Studies 4960.)

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated S/NC only.

5040 Methodological Issues in Social Research (3)

5050 Seminar in Political Sociology (3) The political system from the societal, organizational, and group perspectives.

5060-70 Special Social Investigation (3, 3) Directed readings and/or research projects.

5200 Seminar in Collective Behavior and Social Movements (3)

5210, 5420-30 Social Theory (3, 3)

5220 Social Control (3)

5230 Seminar in Sociology of Medicine (3)

5240 Theory and Research in Human Migration (3)

5250 Selected Topics in Migration Research (3)

5310 Seminar in Methods of Sociological Research (3) A consideration of major methodological issues in sociology; scaling techniques; reliability, validity, sampling, and qualitative methodology.

5320-30 Social Statistics (3, 3) General survey of parametric and nonparametric procedures in analysis of sociological data; assumptions underlying procedures; advantages, disadvantages, and special applications. Must be taken in sequence.

5520 Crime, Law, and Social Control (3)
experimental research projects. (Same as Psychology 6050.)

6070 Field Research (3) Prereq: 4140-50.


6090-100 Survey Design and Analysis (3, 3) Application of general methodological principles to the particular operating context of a survey. Systematic exploration of survey problems through consideration in the design and analysis of a survey (two quarters).

6120 Selected Topics in Deviance and Law (3)

6130 Seminar in Mass Behavior and Related Topics (3)

6140 Advanced Reading in Sociological Theory (4)

6150 Advanced Reading in Sociological Methods (4)

6160 Advanced Special Social Investigation (4)

6200 Cross-cultural Aspects of Human Fertility (3) Historical, topical, regional, and methodological approaches to human fertility and demographic problems. Consideration of the relations obtained between socioeconomic and demographic change in various parts of the world; fertility rates and national power: controversies on control of vital rates of growth.

6180 Theory and Method of Human Ecology (3) The theoretical perspective and research techniques of human ecology applied to selected research sites.

6190 Advanced Special Social Investigation (4)

6510 Advanced Issues in Criminological Theory (3) Emphasis on problems related to theory construction and measurement.

6520 Sociology of Deviance (3) Advanced studies in deviant behavior. Theories and findings regarding cause and procedures and programs for social control. Prereq: 4310 and 5520.

6530 Sociology of Law (3) An analysis of the social and cultural factors influencing the emergence and maintenance of law as a social institution and affecting the relations between law and deviant behavior; an appraisal of the theoretical and methodological issues encountered in studying the law.

6540 Readings in Criminology and Deviance (3) Directed readings and selected topics on criminology and deviance.

6550 Advanced Studies in Community (3) Analysis of concepts of community, theories of community change, and techniques used in community research.

6610 Seminar in Formal Organization (3) Major formal organizational theories; bureaucracy; functions of theoretical models of organizations; major organizational variables; organizational authority patterns; communication in formal organizations. Prereq: 3910-20.

6710 Seminar in Class and Status (3) Classic and recent studies of class and status. Methods used in the research and current position of theory.

6810 Advanced Studies in Social Psychology (3) Social interaction and personality; the genesis and functioning of the self; the interplay of social structures and individual action; problems of social psychology related to these problems and recent research are discussed. May be repeated. Prereq: Social Psychology or 5640 or Psychology 5650.
Theatre
3121-22 Advanced Acting (4, 4) Historical styles of acting. 3121—Renaissance, 3122—seventeenth and eighteenth centuries.
3151-52 Major Productions (1-4, 1-4)
3153 Outdoor Repertory Production (4)
3221-22 Introduction to Scene Design (4, 4) Descriptive drawing as an approach to three-dimensional design; theatrical graphic standards; problems in stage design with reference to lighting; movement, scale and style. Prereq: Stagecraft or consent of instructor.
3262-63 History of American Theatre (4, 4) Development of theatre as social institution in American life. 3262—from its beginnings to 1900. 3263—from 1900 to present.
3321-22 Introduction to Lighting Design (4, 4) Mechanics of stage lighting; elementary theory; problems in basic lighting practice. Prereq: Stagecraft and consent of instructor. Must be taken in sequence.
3451-52 Play Directing (4, 4) Must be taken in sequence. Prereq: Acting.
5111-12 Introduction to Theatre Costume Design (4, 4) Costume as an expression of character on stage; the application of costume history to specific design projects. Prereq: Basic stage costume or consent of instructor.
4333-34 Special Problems in Acting (4, 4) Advanced exercises in voice and movement; preparation of major roles with particular emphasis on interpretation through scenic means; setting and construction; pattern drafting; draping. Prereq: 3511-12 or 3512. Consent of instructor.
4511-52 Major Productions (1-4, 1-4, 1-4) Continuation of 3151-52. Available for credit only to theatre majors Prereq: Consent of instructor.
4513 Outdoor Repertory Productions (4) Continuation of 3153. Available only to members of summer company by consent of instructor.
4241-42 Advanced Scene Design (4, 4) Play interpretation through scenic means; setting as environment for dramatic action. Prereq: 3221-22 and consent of instructor.
4341-42 Advanced Lighting Design (4, 4) Relation of light to setting in creating stage environment. Prereq: 3321-22 and consent of instructor. Must be taken in sequence.

Speech and Theatre
4432-33 Project in Lighting Design (3) May be repeated. Maximum 9 hrs.
4492-93 Project in Scene Design (3) May be repeated. Maximum 9 hrs.

Other requirements for admission: Applicants for graduate study are expected to have a background no less extensive than that required of undergraduate majors in this department. This includes a knowledge of the basic principles of cell biology, genetics, and ecology. Other requirements for admission are: (1) general zoology or general biology, 12 quarter or 8 semester hours; (2) upper division zoology, 18 quarter or 12 semester hours; (3) mathematics, 9 quarter or 6 semester hours including differential and integral calculus; (4) physics, 12 quarter or 8 semester hours; (5) chemistry, two years including 12 quarter or 8 semester hours of general inorganic; (6) Graduate Record Examination scores (Verbal, Quantitative and
Advanced Biology); and (7) a grade point average of 3.0 out of a possible 4.0.

Otherwise superior students, deficient in one or more of the above requirements, may be admitted at the discretion of the Graduate Affairs Committee.

A course in biostatistics is required of all candidates for an advanced degree in Zoology.

All aspirants for advanced degrees in Zoology must exhibit competency in four (M.S.) or five (Ph.D.) of six areas of zoology as determined by a comprehensive examination. Students must take this examination during the fall quarter of the first year and may repeat the examination the following fall quarter if unsatisfactory scores are received. Competency must be exhibited within this two-year period for a student to continue in the program.

Preparation for thesis or dissertation: During the first year a written examination and a special research problem in each of two faculty members' laboratories will determine the student's preparation for thesis or dissertation study.

THE DOCTORAL PROGRAM

Special requirements in Zoology are as follows: (1) course requirements shall be determined by the candidate's faculty committee; (2) the preliminary examination will be an oral and written examination in zoology and in allied fields in which the candidate has had training; (3) the candidate for the Ph.D. degree must possess a reading knowledge of at least one foreign language in which there exists a sizeable amount of literature relevant to the major field of study. The student has the option of demonstrating a reading knowledge of this foreign language by (a) passing the official reading examination given by the language department or (b) earning at least a B in 3030 language courses. This requirement for the first language must be fulfilled before the student can take the preliminary examination.

The student's faculty committee may require of the student a level of training or proficiency in a second foreign language but may not require that the student take the official language examination in the second language.

3040 Natural History of the Vertebrates (5) Behavior, life history, phylogeny, and classification. 3 hrs and 2 labs or field periods.

3050 Comparative Vertebrate Embryology (5) Developmental morphology of selected vertebrates. 2 hrs and 3 labs.

3050 Comparative Vertebrate Anatomy (4) Anatomy of organ systems. Dogfish shark and cat used in laboratory. 2 hrs and 2 labs.

3071 Immunology (3) (Same as Microbiology 3071.)


3110 General Entomology (5) Introduction to insects: basic structure, development, behavior; classification of insect orders and representatives; interpretation and use of keys. Prereq: General Ecology or consent of instructor. 3 hrs and 2 labs.

3150 Invertebrate Zoology (5) Biology of invertebrates (except insects) with emphasis on ecology and behavior. Prereq: General Ecology. 3 hrs and 2 labs.

3220 Physiology of Reproduction (3) (Same as Animal Science 3220.)

3320 Histology (4) Study of animal tissues. Prereq: Cell Biology. 2 hrs and 2 labs.

3410 Bioethics (3) Relationship between biological discoveries and human values. Open discussion of selected dilemmas arising from new knowledge about medicine, behavior, resources, and technology.

4007, 4100-4107 Minicourse in Zoology (2 hrs each) Selected advanced topics in zoology, concentrated in time and subject matter. Consult departmental listing for actual topics to be offered. Prereq: As posted. May be repeated.

4050 Developmental Biology (4) Experimental morphogenesis, fertilization, cellular interactions, hormonal effects and related topics with examples drawn primarily from invertebrates and vertebrates. Prereq: 3050, Cell Biology and General Ecology. 2 hrs and 2 labs.

4120 Undergraduate Research Participation (2) Experience in active research projects under supervision of staff members. Prereq: Consent of instructor.

4140 Practicum in Zoology (1-3) Participation in research projects outside the usual curriculum. Prereq: General Ecology. 2 hrs and 2 lab or field periods.

4190 Mammalogy (4) Classification, evolution, distribution, reproduction, populations, and behavior. 2 hrs and 2 lab or field periods.

4200 Ichthyology (5) Classification, collection and identification, distribution, life histories, and economic importance of fishes. Prereq: General Ecology or consent of instructor. 2 hrs and 2 lab or field periods.

4210 Cell Physiology (5) Development of modern concepts in cell physiology from point of view of information and control which examines kinetics and integration of cellular activities. Prereq: Cell Biology or any physiology, and Organic Chemistry. Recommended: Biochemistry. 3 hrs and 1 lab.

4240 Animal Ecology (4) Environmental factors determining the distribution and numbers of animals; interspecific relations; problems and methods. Prereq: General Ecology. 2 hrs and 2 labs.

4250 Comparative Animal Physiology I (3) Environmental physiology. Survey of physiological mechanisms and their relation to ability of animals to survive in diverse physical environments. Prereq: Cell Biology, General Ecology and 2 yrs chemistry.

4259 Comparative Animal Physiology Laboratory I (1) Coreq: 4250.

4260 Comparative Animal Physiology II (3) Sensory, effecter and integrative physiology. Prereq: Principles of Animal Physiology.

4269 Comparative Animal Physiology Laboratory II (1) Coreq: Principles of Animal Physiology.

4270 Advanced Immunology (2) (Same as Microbiology 4270.)

4280 Comparative Endocrinology (5) Comparative analysis of the physiology and morphology of endocrine glands in invertebrates and vertebrates. Their role and interaction in maintenance of the organism and species. Prereq: Principles of Animal Physiology or Hormones and Endocrine Function. 3 hrs and 1-3 hr lab.

4290 Herpetology (4) Classification, distribution, life histories, collection and identification of amphibians and reptiles. Special emphasis on local species. 2 hrs and 2 labs or field periods.

4300 Ornithology (4) Morphology, physiology, behavior, reproduction, populations, evolution, field identification. 2 hrs and 2 labs or field periods.

4310 Nuclear Cytology (4) Chromosome structure and behavior in mitosis and meiosis. 1 hr and 3 labs. Prereq: General Genetics.

4320 Microtechnique (4) Prereq: 3320 recommended. 2 hrs and 2 labs.

4330 General Cytology (4) Study of cellular organelles at the light and electron microscope levels and the functioning of these organelles. Prereq: Cell Biology.

4369 General Genetics Laboratory (2) Experiments designed to illustrate basic principles of inheritance. Prereq: General Genetics. 2 labs.


4410 General Parasitology (4) Morphology, taxonomy and ecology of parasitic worms and protozoa, with emphasis on host-parasite relationships. 3 hrs and 1 lab.

4430 Medical Entomology (4) Distinctive morphological features, distribution, life histories, and control of arthropods that parasitize man or serve as vectors of human pathogens. Recommended prereq: Agricultural Biology 3210 or General Ecology. (Not open to students with credit for 4340.)

4450 Protozoology (4) Morphology, taxonomy, and physiology of protozoa in relation to fundamental biological concepts. 2 hrs and 2 labs. Recommended prereq: Cell Biology.

4610-20 Comparative Animal Pathology (2, 2) Abnormal morphological changes and their causes. 4610—Cell and tissue changes. 4620—Organ, organ system, and organism changes. Recommended: 3060, 3060, 3520.

4619-29 Comparative Animal Pathology Laboratory (2, 2) 4619—Organ system, organ changes. 4629—Organ, organ system, and organism changes. Coreq: 4610-20.

4660-70 Limnology (4, 4) 4660—Effects of origin, age, and location of lakes on their physical and chemical nature. 4670—Lake communities, productivity and pollution. Prereq: General Chemistry, General Ecology. Recommended: General Botany and Introductory Physics. 2 hrs and 2 labs (4660); 3 hrs and 1 lab (4670). Must be taken in sequence, except with consent of instructor. Not open to students with credit for former 3640 or 4660.

4700 Arachnology (4) Biology of spiders, mites, scorpions, and relatives. Prereq: 3110, or 3150. 2 hrs and 2 labs.

4720 Comparative Animal Behavior (4) Methods and principles. (Same as Psychology 4720.)

4729 Comparative Animal Behavior Laboratory (4) Laboratory and field studies. Coreq: 4720. (Same as Psychology 4729.)

4810-20-30 Insect Morphology and Taxonomy (4, 4, 4) 4810—Internal morphology of both genital and appendage forms. 4820—Taxonomy of major orders. 4850—Taxonomy of minor orders and immature forms. Prereq: 3110 or consent of instructor for 4820-30. 2 hrs and 2 labs.
5480 Physiology of Exercise (4) Functions of body muscular work; physiological aspects of fatigue, training, and physical fitness. Prereq: Human Physiology or 3080. 3 hrs and 1 lab. Consent open to students with credit for 3940.

5000 Thesis

5080 Graduate Research Participation (3) Advanced research techniques are studied under the supervision of a staff research director whose interests are consistent with the interests of the student. Open to all graduate students in good standing. Prereq: Consent of department and research director. Course may be repeated with consent of the department. S/NC only.

5110-20-30 Special Problems (2, 2, 2)

5150 Zoological Bibliography (1) Study and practice in methods of locating and using zoological literature, bibliographies, and abstracts, and of preparing bibliographies and scientific papers.

5180 Fresh Water Invertebrate Zoology (4) Ecology and taxonomy of fresh water invertebrates exclusive of insects. Laboratory and field study. Prereq: 3150.

5210 Plant Parasitic Nematodes (4) (Same as Agricultural Biology 5210.)


5270 Advanced Neuromuscular Physiology (5) Cellular and molecular aspects of phenomena associated with conduction of excitation and muscular contraction. Prereq: 4250. 3 hrs and 2 labs.

5280 Insect Physiology (4) Functions and interrelations of the systems relating to metabolism, growth, coordination, movement, and reproduction. Prereq: 4510, 1 yr General Chemistry or consent of instructor. 2 hrs and 2 labs.

5290 Quaternary Problems (4) (Same as Geology 5290.)

5310-20 Seminar in the Teaching of College Zoology (2, 2) Current concepts and principles in the teaching of zoology; modern techniques and instrumentation; supervised application of teaching principles and methods. Must be taken in sequence. Prereq: Consent of instructor. S/NC only.

5350 Biometry (3) Statistical methods used in analysis of quantitative biological data. Prereq: 1 quarter statistics or consent of instructor.

5410 Advanced Parasitology (4) Life cycles, techniques of collection, preservation, and identification of parasitic worms and protozoa. Prereq: Consent of instructor.

5430 Advanced Medical Entomology (3) Prereq: 4530.

5550 Advanced Ornithology (4) Classification, distribution, and anatomy of birds. Prereq: 4300.

5570 Animal Populations (3) Characteristics and methods of study of animal populations.

5610-20 Foundations of Radiation Biology (4) Principles of physics, and biological mechanisms involved in the actions of different kinds of radiations on the living cell and its components. Recommended prereq: 1 yr biological science, General Physics; Biochemistry; Calculus. 3 hrs and 1 lab.

5630 Methods of Experimentation with Laboratory Mammals (3) Designed to give competence in handling laboratory mammals. Techniques of anesthesia, drug administration, radiography and surgery will be included. Prereq: 4030, or 4310, consent of instructor.


5670 Cellular Immunology (4) Laboratory course with emphasis on immunological phenomena at the cellular level. Includes preparation and use of immunofluorescent reagents, macrophase migration inhibition, skin allograft reactions, diffusion chamber cultures, and antibody formation at the cellular level. Recommended prereq: Immunology. 4 hrs and 2 labs.

5760 General Vertebrate Neuroanatomy (3) (Same as Zoology 4760.)

5780 Radiation Physiology (4) Effects of different kinds of radiations on the functions of cells, tissues, and organ systems of animals. Recommended prereq: 5610.

5790 Transport of Ions Across Epithelia (4) A laboratory course designed to teach the operational principles and methods needed to study the electrical and kinetic properties of epithelia and electrically excitable tissues. Emphasis will be on quantitative methods of measuring ion fluxes and flux ratios. Two upper-division physics courses, laboratory, and consent of instructor. Prereq: Consent of instructor. 4 hrs and 2 labs.

5840 Aquatic Insects (4) Taxonomy and biology of aquatic insects, with emphasis on immature forms. Offered spring quarter. 2 hrs and 2 labs.

5860 Geographic Distribution of Animals (4) Distributional patterns of vertebrate and invertebrate animals in major habitats. Prereq: Consent of instructor.

5870 Insect Systematics (4) Ecology of insect communities.

6000 Doctoral Research and Dissertation

6110 Seminar in Cellular Biology (2) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

6140 Seminar in Immunobiology (2) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

6210 Seminar in Physiology (2) Prereq: Two physiology courses or consent of instructor. May be repeated. Maximum 6 hrs.

6310 Seminar in Cytology (2) Prereq: 4310. May be repeated. Maximum 6 hrs.

6350 Seminar in Developmental Biology (2) Internal regulation in the differentiating cell. Prereq: 3050, 4050; Biochemistry 4110-20.

6410 Seminar in Parasitology (2) Prereq: 5410. May be repeated. Maximum 6 hrs.

6510 Seminar in Genetics (2) Prereq: General Genetics. May be repeated. Maximum 6 hrs.

6610 Seminar in Ornithology (2) Prereq: 4300. May be repeated. Maximum 6 hrs.

6650 Seminar in Aquatic Biology (2) Prereq: 3050, or Zoology 5082 or 5770 or 5780, or Zoology 5350 or Plant and Soil Science 3610, or Chemistry 3810, or Biochemistry 4110-20 or 5510-20-30. (At least one-half of the student's program must be at the 5000 level.) A thesis is required of all students.

Interdepartmental Program in Radiation Biology

MAJOR DEGREES

Radiation Biology

M.S., Ph.D.

Daniel Billen, Director

A graduate major in the field of Radiation Biology is offered through the Institute of Radiation Biology. This is a program crossing both departmental and institutional lines. Included on the Institute staff are certain scientists from the Departments of Biochemistry, Botany, Chemistry, Microbiology, Physics, Zoology and the Memorial Research Center and the Comparative Animal Research Laboratory of the University of Tennessee, the Biology and Environmental Sciences Division of the Oak Ridge National Laboratory, and the Medical Division of Oak Ridge Associated Universities.

Formal courses in this program are offered mainly on the Knoxville campus. Thesis research may be carried on either at the University or, by special permission, at one of the Oak Ridge laboratories. Problems selected for thesis research shall involve the interaction of radiations or long-lived fission products with biological systems, at the molecular, cellular, organ- ismal, or ecological level of complexity. Areas of radiation specialization include biochemistry, biophysics, cytology, ecology, physiology, radiobiology, recombinant DNA technology, genetics, hematology, immunology, microbiology, molecular biology, oncology, parasitology, pathology, physiology, and tissue culture.

ADMISSION REQUIREMENTS

The minimum academic requirements for admission to the Institute are: (1) A Bachelor's degree from an accredited college or university, (2) biological science, chemistry, physics: 30 quarter hours in one and 12 in each of the others, (3) college mathematics: potential candidates for the Master's degree, 9 quarter hours; potential candidates for the Doctorate degree, differential and integral calculus, for the Ph.D. program, Graduate Record Examination scores.

THE MASTER'S PROGRAM

Course requirements shall include: (1) Zoology 5610, (2) Zoology 5620 or 5770 or 5780, (3) Zoology 5350 or Plant and Soil Science 3610, (4) Chemistry 3810, (5) Biochemistry 4110-20 or 5510-20-30. (At least one-half of the student's program must be at the 5000 level.) A thesis is required of all students.

College of Liberal Arts 147
THE DOCTORAL PROGRAM

(1) Courses: In addition to those required for the Master's degree, Chemistry 3410-20-30 or 3710-20-30; Physics 3710-20-30; (Chemistry 3810 may be substituted for Physics 3730); Zoology 5620. Additional course requirements are determined by the student's faculty committee. The student's special field of interest and plans for a career determine these requirements. The more important courses from which selection may be made are advanced courses in biochemistry, botany, chemistry, electrical engineering, mathematics, microbiology, physics, and zoology. Courses are available in The University of Tennessee Graduate School of Biomedical Sciences at Oak Ridge. (2) The preliminary examination will consist of oral and written portions in radiation biology and in allied fields in which the candidate has received training. (3) Candidates will be required to pass, before the preliminary examination is taken, the official reading examination of the University in only one foreign language, or must earn a B average or at least a B in the last quarter of an appropriate language sequence, but the student's faculty committee may require other levels of training or proficiency in an additional foreign language. (4) The final examination will be an oral examination covering the candidate's dissertation and such other fields as the candidate's faculty committee may specify.

Regular attendance at the weekly Radiation Biology Seminar or an appropriate Departmental Seminar is expected of all students.

General Information

FOREIGN STUDY COURSES

Foreign study courses offered in some departments of the College provide an opportunity to undertake independent study outside the United States. Prior to departure the student must have a plan of study approved by the department head and a supervising faculty member of the department concerned. Credit will be given only upon fulfilling all requirements set by the department and may vary from 1-12 hours. The maximum credit which may be applied toward a degree in the College is established in each individual case by the department in which the student is working.

INDEPENDENT STUDY

Certain educational goals may best be met through independent study done by an individual under the direction of a faculty member. Students who wish to do such independent work should obtain the approval of the faculty members and the departments concerned prior to embarking upon their study. Credit per quarter will vary from 1-12 hours. The maximum credit which may be applied toward a degree in the College is established in each individual case by the department in which the student is working.

OFF-CAMPUS STUDY

Recognizing that learning is not restricted to formal classroom situations, the College provides for students to earn credit toward graduation for approved off-campus study. Such study may be undertaken only with prior approval of the faculty member and the department concerned. It may include certain kinds of work experiences, community involvement, working in political campaigns, etc. Credit per quarter will vary from 1-12 hours. The maximum credit which may be applied toward a degree in the College is established in each individual case by the department in which the student is working.
Sylvia E. Hart, Dean
Barbara M. Reid, Associate Dean for Student Affairs
Dorothy B. Stephens, Assistant Dean for Clinical and Business Affairs
Paul G. Zarbock, Director of Special Projects

MAJOR DEGREE
Nursing M.S.N.

The College of Nursing offers a five-quarter program of study leading to the Master of Science in Nursing degree. The general purpose of the program is to prepare at the graduate level nurses who are qualified to function as practitioners, clinicians, educators, and administrators in all segments of the health care delivery system.

Upon successful completion of the program, graduates will be able to:
1. Provide advanced high quality, comprehensive nursing care to individuals and groups in a variety of settings;
2. Collaborate with other health professionals in systematic implementation and evaluation of health care delivery to large groups in agency and community settings;
3. Utilize appropriate advanced teaching, administrative and clinical practice skills in the discharge of one's professional responsibilities;
4. Utilize appropriate research findings in the implementation and evaluation of nursing care;
5. Participate in clinical research activities by means of data collection, tabulation, and analysis, and by generating research topics for referral to nurse researchers.

GENERAL REQUIREMENTS FOR ADMISSION
1. Meet requirements for admission to the Graduate School.
2. Hold a Bachelor's degree in Nursing. If the Bachelor's degree is not in Nursing the applicant must demonstrate successful completion of the equivalent of an upper division major in Nursing.
3. If the number of qualified applicants exceeds the number that can be accommodated, preference will be given to applicants:
   a. whose undergraduate GPA is 3.0 or higher;
   b. who have had at least two years of full-time clinical practice experience following completion of a baccalaureate nursing program;
   c. who are Tennessee residents;
   d. who are currently employed in underserved health service areas and who can demonstrate their commitment to return to those areas following completion of the program; or
   e. who are currently employed as nurse educators in programs preparing registered nurses; or
   f. who are currently employed as directors of nursing service.
4. Ordinarily one year of full-time clinical practice experience should be completed prior to applying for admission to the program.

DEGREE REQUIREMENTS
1. Students must complete 60 quarter hours of graduate level course work with a cumulative GPA of 3.0 or better.
2. The 60 credit hours must include the following components:
   Core requirement 14 hrs
   Functional concentration option 11 hrs
   Electives 9 hrs
   Clinical concentration option 26 hrs
   60

3. A Master's thesis is not required, but those students who wish to complete a thesis as a part of their program may substitute the thesis for the 9 elective hours.
4. Those students who do not choose the thesis option must successfully complete a comprehensive final examination.
5. Students may choose either primary or secondary care as a clinical concentration option. Students selecting the primary care nursing clinical option must complete the following courses: 4770, 5220, 5240, 5260, 5550, 5650. Students selecting the secondary care nursing clinical option must complete the following courses: 5120, 5130, 5160, 5310, 5330, 5530.
6. The core requirement which must be completed by all students regardless of clinical option includes 5010, 5020, 5210, and a 4-hour graduate level statistics course which must be approved in advance by the student's faculty advisor.
7. Students may select a functional concentration option in teaching, management or advanced clinical practice. Students selecting the teaching option must complete 8 hours of graduate level courses in education and 5630. Students selecting the management option must complete 8 hours of graduate level courses in administration and 5730. Students selecting the advanced clinical practice option must complete 5560 and 5660 if their clinical option is primary care or 5320 and 5340 if their clinical option is secondary care. All courses taken in other colleges must be approved in advance by the student's faculty advisor.
4550 Oncology Nursing (3) In-depth exploration of the cancer problem; medical and nursing intervention. Relates cellular kinetics to theories of carcinogenesis and metastasis, and examines treatment modalities and nursing intervention employed in all phases of the disease management of health care for each analyzed. Prereq: Psychosocial and Long Term Nursing, R.N., status, or consent of instructor.

5210 Nursing Research Methods (4) Utilization of the research process to identify and solve common nursing problems; methods of data collection and analysis; effective use of the literature; approaches to presentation and publication of findings. Prereq: Graduate level course in behavioral or biomedical statistics.

5220 Principles of Health Maintenance (3) Health and its meaning to various community groups; health screening, counseling, and education as approaches to health maintenance; health promotion and its relationship to the quality of life; the economics of health maintenance. Prereq: 5010.

5240 Management of Common Health Problems (4) Indications for treatment and referral; use of protocols and treatment plans; pharmacological agents in common use; intervention in emergencies. Prereq: 5010, 5220. 2 hrs and 2 labs.

5250 Chronic Health Problems (4) Identification and in-depth exploration of health problems of a long term or life long nature which are common to people in various age groups over the life continuum; nursing and health care management of individuals and groups who must deal with one or more chronic health problems throughout most or all of their lives. Prereq: 5220. 2 hrs and 2 labs.

5260 Advanced Family Health Care (4) Nursing and health care management of families in the childhood and child-rearing stages of development; advanced developmental theory, changing family dynamics, management of women during pregnancy, labor and delivery, and post partum period, assessment of newborns. Prereq: 5220. 2 hrs and 2 labs.

5310 Secondary Care Nursing Field Work I (8) Advanced clinical practice in acute care hospital settings with opportunities to apply newly acquired nursing knowledge to more complex clinical nursing situations. Prereq: 5120-30 or 5140-50.

5320 Secondary Care Nursing Field Work II (8) A continuation of 5310 with emphasis on further acquisition and refinement of nursing skills needed to provide high quality nursing care to acutely ill patients. Prereq: 5310.

5350 Secondary Care Nursing Seminar I (2) A weekly on-campus seminar taken concurrently with 5310; seminar topics will focus on a discussion of nursing problems commonly encountered in acute care settings.

5360 Secondary Care Nursing Seminar II (2) A continuation of 5350 to be taken concurrently with 5320.

5410 Principles of Community Mental Health I (3) The epidemiology of mental health; sociocultural, religious, and economic variables affecting the mental health status of individuals, families, and communities, function and status of community mental health centers.

5420 Principles of Community Mental Health II (3) A continuation of 5410 on recognized and developing approaches to mental health promotion and maintenance.

5430 The Adult and Mental Health (3) Coping and adjustment problems commonly experienced from post adolescence through middle adulthood; nursing approaches to the alleviation of mental health problems of both institutionalized and noninstitutionalized adults will be explored and analyzed.

5550 Nurse Practitioner Fieldwork I (8) Placement in selected off-campus primary health care delivery site for purposes of applying newly acquired knowledge and developing clinical skills necessary to function as a nurse practitioner. Prereq: 5240-50-60.
The University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences, located within the Biology Division of Oak Ridge National Laboratory, offers programs leading to the Master of Science and Doctor of Philosophy degrees. The National Laboratory, one of three installations operated at Oak Ridge by Union Carbide Corporation for the Department of Energy, is a well-known center of basic research. The school utilizes the staff and facilities of this laboratory, and thus brings directly the talent and experience of that staff, as well as the most advanced research methods and technology.

The program of study, which incorporates a high faculty-to-student ratio, is based on intensive graduate courses supplemented by tutorial instruction, participation in a wide variety of seminars, and a heavy emphasis on communication skills, research training and independent study. The program encourages students to pursue graduate studies to the limits of their abilities.

The school is not departmentalized, and, apart from certain basic requirements, each student's curriculum is planned to meet individual needs, with the aim of giving: (1) strength in the basic sciences; (2) perception of the biomedical sciences as a whole; and (3) experience and training in a chosen specialty.

The research areas available for Master's and Ph.D. dissertation work are biochemistry, biophysics, carcinogenesis, cell biology, genetics, and physiology. Included are such subjects as microbiology, immunology, protein and enzyme chemistry, nucleic acid chemistry, cytology, radiation biology, virology, developmental biology, experimental pathology, microbial and mammalian genetics, mutagenesis, and problems of aging.

ADMISSION REQUIREMENTS

A Bachelor's degree or its equivalent is required. Students with M.S., D.V.M., or M.D. degrees are also encouraged to apply. Completed applications, Graduate Record Examination scores and letters of reference should be sent to the address below. The student will need previous training in biology, calculus, physics, organic and physical chemistry. However, a course in physical chemistry is offered by the school in order to meet this requirement. It is recommended that deficiencies in meeting entrance requirements should be eliminated prior to entrance.

Requests for application forms, information on admission, financial support, and housing should be sent to: Director, University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences, Biology Division, ORNL, Box Y, Oak Ridge, Tennessee 37830.

THE DOCTORAL PROGRAM

Requirements for the Ph.D. degree are:

1. Satisfactory (B grade or better) completion of the following core courses or their equivalent: Biochemistry (5110-20); Biophysics (5140); Genetics (5160); Molecular Genetics (5170); Cell Biology (5180-90); Mammalian Physiology (5200) and Statistics for Biologists (5740).

2. Three quarters of Biomedical Sciences Laboratory 5310-20-30-40).

3. Participation in Biomedical Sciences Seminar (5350-60-70) for one year.

4. Participation in at least one of the seminar courses (6110-70) during each quarter of residence after the first year is strongly recommended.

5. Satisfactory completion of formal advanced courses in the areas of the student's interests. The number and nature of the required advanced courses will vary depending upon the student's background and area of specialization.

6. Pass both written and oral examinations.

7. A dissertation reporting the results of original and significant scientific research. A minimum of 36 quarter hours of course 6000 is required.

8. A final oral examination on the dissertation.

9. A formal seminar presentation of the dissertation research.

SPECIAL MASTER OF SCIENCE DEGREE PROGRAM

The graduate faculty has designed a Master of Science program in Biomedical Sciences primarily to fill the need for such a degree within the Oak Ridge National Laboratories; however a limited number of students from other institutions may be accepted if qualified and as space is available.

Requirements for the M.S. degree are:

1. Graduate credit or a proficiency in the following core courses: Biochemistry (5110-20); Cell Biology I (5180); Cell Biology II (5190); plus any three of the following four courses: Biophysics (5140); Genetics (5160); Molecular Genetics (5170); and Mammalian Physiology (5200). Additional credits may be obtained (6 to 15 credit hours) with electives. The student will need previous training in biology, calculus, physics, organic and physical chemistry.
2. Forty-five hour credits of approved graduate courses including a minimum of 9 quarter hours for thesis (maximum 18 quarter hours of credit for course 5000).

3. For admission to candidacy: Completion of one or two prerequisite courses and one quarter of graduate course work with a B average. Admission to candidacy forms must be filed at least one full quarter prior to receipt of degree.

4. A Master's Committee of three approved faculty members upon admission to candidacy.

5. A thesis reporting results of original and significant scientific research.

6. Pass a final oral (or oral and written) examination as determined by the student's committee.

Full-Time Faculty

Professors:  
D. Billen, Ph.D. Tennessee; D. E. Olin, Ph.D. Rockefeller.

Associate Professors:  
F. H. Gaertner, Ph.D. Purdue; F. D. Hamilton, Ph.D. Pittsburgh.

Assistant Professors:  
N. W. Revins, Ph.D. Glasgow, Scotland.

Research Assistant Professor:  
C. T. Hadden, Ph.D. Washington.

Shared Faculty

Not all faculty listed are necessarily available in teaching and/or research roles in every academic year.

L. B. Russell, Ph.D. Chicago; W. L. Russell, Ph.D. Chicago; G. A. Sega, Ph.D. Louisiana State; J. K. Rockwell, Ph.D. Syracuse.


R. Wallace, Ph.D. Columbia.

L. C. Waters, Ph.D. Georgia; C. H. Wei, Ph.D. Wisconsin; R. J. Totter, Ph.D. Tennessee Medical Units; W. J. Yang, Ph.D. Tennessee.

* Staff of Oak Ridge Associated Universities

Courses

The courses below are not necessarily taught every year.

5000 Thesis

5070-80 Physical Chemistry for the Life Sciences (3) Thermodynamics, phase equilibria; chemical equilibria; electronegativity; surface chemistry, electrolyte solutions, kinetics, conductance, viscosity, diffusion.


5140 Biophysics (3) Energy levels and excited states of large molecules; optical instrumentation; adaptations to system perturbations; properties of macromolecules in solutions; molecular conformations; inter- and intramolecular forces; physical principles of microscopy. Prereq: 5070-80.

5160 Genetics (5) Mendelian genetics, mitosis and meiosis. Genetics of phage, bacterial and eukaryotic organisms. Mapping and linkage; meiotic recombination; recombinant DNA and proteins; genetic analysis and techniques; meiosis and mitosis; malarial gametocytes of eukaryotic cells. Pertinent instrumentation and techniques; meiosis and mitosis; cell cycle; chromosome structure; nuclear RNA metabolism; nucleocytoplasmic biogenesis; survey of specialized cells. Structure of genetic transcription and translation in bacteria. Coreq: 5110.

5160 Cell Biology I (3) Structure and composition of major gene families and cytoplasmic or nuclear proteins of eukaryotic cells. Pertinent instrumentation and techniques; meiosis and mitosis; cell cycle; chromosome structure; nuclear RNA metabolism; biogenesis of nucleolus and ribosomal biogenesis; survey of specialized cells. Structure of genetic transcription and translation in bacteria. Coreq: 5110.

5160 Cell Biology II (3) Comparative biochemical approach to cell structure and function. Membrane systems and metabolism; development and function of mitochondria, chloroplasts, peroxisomes and other organelles as related to metabolism and regulation of transport phenomena; cell cycle. Coreqs: 5110, 5160, 5120.

5200 Mammalian Physiology (4) Survey of the mammalian organ systems and their functions. Nervous, muscular, endocrine, digestive, respiratory, circulatory, reproductive, and excretory systems will be included; interrelationships of these systems and their comparative importance will be investigated. Coreqs: 5110, 5160, 5120.

5230 Biochemical Concepts in Medical Sciences (3) Biochemical mechanisms involved in physiological conditions and pathological processes of human body. Dynamic functions of organ systems: biochemical and pharmacological; hormone actions; neurobiological. Emphasis is placed on current biochemical advances in basic and clinical medicine. Prereq: 5200, 5110-20.

5310-20-30-40 Biomedical Sciences Laboratory (3, 3, 3, 3) Laboratory courses designed to acquaint students with both the approaches and techniques in various areas of modern biology. Students will spend a quarter in each of four or three laboratories conducting research in different areas of modern biological science. Required of all first-year students.

5530-60 Biomedical Sciences Seminar (1, 1) Critical analyses of current journal publications in a selected area of modern biology. Written evaluation of papers and weekly oral presentations by each student. Required of all first-year students.

5370 Biomedical Sciences Seminar (1) Basic principles of scientific writing. Research articles, grant and thesis proposals, abstracts, review articles, progress reports. Required of all first-year students.

5436-50-60 Graduate Research Participation (1, 1) Special seminars in modern biology; covering an area not related to dissertation research. Topics chosen with consent of instructor. May be repeated.

5519-20-30-40 Special Topics in Biomedical Sciences (3, 3, 3, 3) Given either as tutorials or as formal lectures. Potential topics for such courses include x-ray diffraction and crystallography; excited-state biophysics; physical chemistry of macromolecules; computer science; pathology; cytology and cyrogenetics; mammalian genetics; cancer research; plant physiology; radiation biology; aging research. Additional courses can be developed on any subject of mutual interest to individual students and staff members. May be repeated.

5700 Developmental Biology (3) Principles of early embryogenesis and tissue interactions that initiate cellular differentiation. Emphasis on mechanisms of differential gene action and regulation that are essential to cell differentiation. Prereq: 5120, 5170, 5200.

5740 Statistics for Biologists (3) Application and interpretation of statistical methods in biological sciences. Randomized block designs; nonparametric, biomial, and Poisson distributions, statistical presentation of data; estimation and confidence intervals. Emphasis on variability, correlation and association; linear regression. Prereq: Introductory Statistics or consent of instructor.

5750 Experimental Design in Biomedical Research (3) Methods and designs for the reduction of error, including paired comparisons, randomized blocks, and Latin squares; use of supplementary observations to reduce errors; randomization; investigating several variables simultaneously by factorial and fractional factorial experiments; determining the number of observations. Prereq: 5740.

5830 Physical Biochemistry (3) Methods and concepts relevant to the determination of size, shape, and function of biological macromolecules. Discussion of optical activity and light scattering by macromolecules in solution. Prereq: 5070-80, 5110-20, 5140.

5840 Bioorganic Reaction Mechanisms (3) Nature of the chemical bond, nucleophilic and electrophilic reactions, molecular rearrangements and catalysis; oxidation-reduction, photosynthesis, enzyme reactions, and modification of nucleic acids by chemical and biological methods. Prereq: 5190.
5860 Cryobiology (3) Physical and chemical responses of cells to low temperatures and ice formation. Relation of these responses to permeability, structure of semipermeable membranes, conformation of macromolecules, and the nature and state of water in cells; and how they bear on other fields of biology and medicine—including electron microscopy, photobiology, cell physiology, exobiology, and cryosurgery. Prereq: 5070-80 or equivalent, and 5190.

5920 Mammalian Genetics (3) Oorderly presentation of known genetic variants affecting each of the organ systems of experimental mammals, especially the laboratory mouse. Prereq: 5170.

5940 Classic Experiments in Genetics (3) Original papers presenting new and lasting concepts in genetics will be read and discussed. Prereq: 5170.

6000 Doctoral Research and Dissertation.

6110 Seminar in Plant Physiology (1) May be repeated. Maximum 12 hrs. S/NC only.

6120 Seminar in Cellular and Developmental Biology (1) May be repeated. Maximum 12 hrs. S/NC only.

6130 Seminar in Genetics (1) May be repeated. Maximum 12 hrs. S/NC only.

6140 Seminar in Mammalian Research (1) May be repeated. Maximum 12 hrs. S/NC only.

6150 Seminar in Immunology (1) May be repeated. Maximum 12 hrs. S/NC only.

6160 Seminar in Biophysics (1) May be repeated. Maximum 12 hrs. S/NC only.

6170 Seminar in Biochemistry (2) May be repeated. Maximum 24 hrs. S/NC only.

6180 Advanced Seminar in Biomedical Sciences (1-3) Presentation, evaluation and discussion of current research in the various areas of the biomedical sciences, including cell biology, genetics, biophysics, and biochemistry. Prereq: Consent of instructor. May be repeated. S/NC only.

6190 Seminar in Animal Virology (1) Discussion of experimental data and in-depth surveys of active research problems in virology through use of literature. May be repeated. Maximum 12 hours. S/NC only. Prereq: Microbiology 4621 or equivalent and consent of instructor.

6200 Nucleic Acid Chemistry (3) Chemistry of nucleotide-derived materials covering topics including alkylation, solvolysis, oxidation-reduction, polymerization, synthesis, denaturation and other structure perturbants. The reaction of nucleic acids in the above systems will be examined with emphasis on the relationship of structure and reactivity. Prereq: 5110-20. Coreq: 5080.

6210 Protein Chemistry and Enzyme Mechanisms (3) Theoretical and practical aspects of protein chemistry including chemical and physical characterization of proteins, chemical modification of proteins, and structure-function relationships. The latter will emphasize enzymes and will include approximation of substrates, covalent catalysis, general acid-base catalysis, and strain and distortion of substrates. Prereq: 5110-20.

6220 Enzyme Regulation and Kinetics (3) Kinetics of catalysis; inhibition by product, substrate and dead-end inhibitors; stimulation and inhibition of allosteric enzymes, types of feedback regulation; role of subunits in enzyme regulation; multifunctional enzymes. Prereq: 5110-20.

6240 Chemistry and Metabolism of Lipids (3) Nomenclature, chromatographic isolation, chemistry, physical properties, and enzymology of lipids. Hormonal action of prostaglandins and the role of lipids in membranes, enzymic expression, and nervous tissue. The main emphasis is on lipid biochemistry of mammals, although comparative aspects, particularly the lipid pathways in bacteria and yeast are also described. Prereq: 5110-20.


6260 Advances in Animal Virus Research (3) Mechanisms of infection, replication, and maturation; alternations of host cell structure and function; host immunological responses; oncogenesis; pathogenesis; genetics; interferon. Prereq: 5110-20, 5180-90.

6270 Viral Carcinogenesis (3) History of viral oncology and descriptive catalog of tumor viruses. The biology of normal and transformed cells. DNA tumor viruses; replication cycle; transformation; genetics; natural history. RNA tumor viruses: endogenous and exogenous states; genetics; induction; transformation; natural history.


6290 Cancer Biology and Biochemistry (3) Pathology and nomenclature of cancer. Tumor immunology and immunotherapy. Biochemistry of tumor cells; enzymology, metabolism; membranes; DNA repair; regulation; strategies in chemotherapy.

6300 Mutagenesis (3) Course will include basic mechanisms in chemical and radiation mutagenesis and dosimetry in a variety of systems including bacteria, fungi, Drosophila, and mice.

6510-20-30-40 Advanced Topics in Biomedical Sciences (3, 3, 3, 3) Emphasis on current and future research developments. Offered on the topics listed under the Special Topics Courses and can be taken either as tutorials or as literature survey courses requiring substantial student participation. May be repeated.
The Graduate School of Library and Information Science provides a library education program leading to the preparation of librarians for work in all types of libraries. The programs of study of this School include the graduate curriculum leading to the degree of Master of Science in Library Science.

**MAJOR in LIBRARY SCIENCE**

The objective of the program is to prepare responsible and competent individuals to assume a professional role in libraries and information centers in society and the processes by which knowledge is communicated through the medium of the graphic record. Students acquire a familiarity with the bibliography and the literature of various subject fields. They are expected to develop the ability to evaluate and use various types of print and non-print materials. Students are also introduced to current concepts of the management of library operations and services.

**PROGRAMS OF INSTRUCTION**

The program leading to the degree of Master of Science in Library Science involves a total of 51 quarter hours of graduate courses, 21 hours of which form a core curriculum required of all students. Either a thesis or a non-thesis program is available, with 9 hours allowed for thesis credit. At least 36 hours must be taken in the GSLIS, allowing up to 15 hours outside the school. Upon completion of the program, all students are subject to an examination. For students who elect the thesis option, the examination will be a defense of the thesis. Students who elect the non-thesis option will be given a written comprehensive examination. Programs are designed for persons interested in school libraries, public libraries, academic libraries, information science/technical information service, and library management.

**ADMISSION REQUIREMENTS**

The minimum grade point average for admission to the Graduate School is 2.5. Candidates who have at least a 3.0 average in the junior and senior years will receive first consideration. Applicants are required to take the aptitude test of the Graduate Record Examination. The test should be taken at least one quarter in advance of application for admission to the Graduate School.

Foreign applicants are required to take the Test of English as a Foreign Language.

**APPLICATION PROCEDURE**

Admission to the programs in the Graduate School of Library and Information Science should be made in advance of the quarter for which admission is requested. Applicants should submit the "Application for Admission" form (printed as the first page of the Graduate School Catalog) and should request the registrars of all colleges and universities attended to send two official transcripts to the Graduate School. In addition, each applicant should make arrangements to take the GRE and TOEFL exams, if applicable. A personal data sheet and three recommendations (obtained from the Graduate School of Library and Information Science) should be returned to the Director of the School.

**FINANCIAL ASSISTANCE OPPORTUNITIES**

Arrangements made with the University of Tennessee Libraries provide a work-study plan for selected students who wish to obtain experience in academic librarianship while pursuing the degree. Such students are expected to work at least 20 hours each week and to extend the period required for the degree to approximately two years.

Similar arrangements exist with some of the other libraries in the Knoxville area. A limited number of graduate assistantships are available through the School for the degree. Assistantships of this type carry a waiver of tuition and fees as well as a stipend, and require that recipients work 10 hours per week in the School.

Information on financial assistance is available from the Director of the Graduate School of Library and Information Science.

**Faculty**

Professors: E. E. Mauldin, M.S.L.S. Illinois; G. R. Purcell (Director), Ph.D. Case Western Reserve.


Assistant Professors: J. Knightly, Ph.D. Texas; J. M. Pemberton, Ph.D. Tennessee; G. M. Sinkenkeze, Ph.D. Pittsburgh; P. Wilson, Ph.D. Michigan.

**Courses**

4140 Libraries and Librarianship (3) Librarianship as an occupation; its organization, responsibilities, problems and prospects.

4150 School Library Administration (3) Objectives, functions, and place of the school library; relationship to local and state services; cooperative planning for quarters and materials; evaluation. (Same as Curriculum and Instruction 4150.)

4270 Organization of Library Collections I (6) Acquisitions, cataloging and maintenance of library collections.

4330 Introduction to Reference Materials (3) Basic information sources and services for all libraries.

4750 Utilization of Instructional Media (3) (Same as Curriculum and Instruction 4750.)
patterns in multiunit public library service systems. Emphasis on management and organization concepts applicable to libraries and librarians. Prereq: 5200.

5220 Sources and Services for the Natural Sciences (3) Use of English and non-English literature and bibliographical sources in mathematics, physics, astronomy, chemistry, geology, biology and medicine; emphasis on organization of collections for optimum use. Prereq: 5200.

5230 Sources and Services for the Humanities (3) Use of English and non-English literature and bibliographical sources in languages, fine arts, music, philosophy and religion; emphasis on organization of collections for optimum use. Prereq: 5200.

5240 Organization of Library Collections II (3) Construction and maintenance of the library catalog as a retrieval instrument, including indexing and subject analysis theory, comparative classification with emphasis on the Library of Congress system, and problems in reclassification. Prereq: 4270.


5260 Government Publications II (3) Acquisition, organization and utilization of the publications of foreign governments and international organizations such as the United Nations, UNESCO, and others.

5270 Legal Bibliography (3) Introduction to the literature of Anglo-American jurisprudence. Emphasis on use of reports, statutes, administrative regulations and decisions, treatises, periodicals, and indexes as bibliographic tools.

5300 Library Management (3) A basic overview of management and organization concepts applicable to libraries and librarians.

5310 Library Systems and Services (3) National, state, and regional systems of library service with attention to organization and planning, staff utilization, service standards and evaluation, and problems of jurisdictional relationships brought about by organizational patterns in multunit public library service systems.

5320 Library and Information Networks (3) National and regional information networks will be examined. Primary attention will be given to the design and analysis of existing systems within the academic or special library sphere.

5330 Academic Libraries (3) Discussion of persistent and current problems. Topics vary depending upon needs and interests of the group.

5350 School Libraries (3) Discussion of persistent and current problems. Topics vary depending upon needs and interests of the group.

5360 Technical Libraries and Information Centers (3) Purpose, functions and organizational characteristics of those libraries and information centers, private and public, which offer scientific and technical information services. Problems related to the acquisition, organization and servicing of technical information collections.

5370 The Library in the Community (3) Public library as a social agency; its role in the education and communication systems of the community.

5380 Seminar: Academic, Public, School or Special Libraries (3) Prereq: Consent of instructor.

5400 Library Facilities (3) Problems inherent in the planning and construction of library quarters. Examination of the interrelationship of staff, materials and user space requirements.


5510 Multimedia Resources of Libraries (3) Selection, acquisition, processing, storing, and servicing nonbook materials, with special attention to films, recordings, microforms, photocopying.

5520 History of Books and Printing (3) Development of the book in its various forms. History of the alphabet and writing; early writing materials; book in manuscript; history and technique of printing; book illustration and binding; standards of modern fine printing.

5530 Contemporary Publishing (3) Creation, production, marketing, and distribution of materials acquired by libraries, with special attention to various types of publishers.

5540 Special Collections—Archives and Rare Books (3) Problems involved in the acquisition, organization, housing, preservation and utilization of rare books and archival materials.

5600 Reading Guidance for Children and Young People (3) Organization to meet needs, interest, abilities of different age and socioeconomic groups. Prereq: 5640 or consent of instructor.

5610 Mass Communications and the Library (3) Mass media of communication in terms of their relation to modern library service, considered as forces that influence what people read, see, and hear.

5620 Traditional Literature and Oral Narration (3) Fundamental principles of the art of storytelling including techniques of adaptation and presentation for various age groups; instruction and practice in oral techniques.

5630 Critical History of Children's Literature I (3) Development of literature for children noting influence of changing social and cultural factors; attention to emerging genres through primary sources. Fifteenth century to 1920.

5640 Critical History of Children's Literature II (3) Development of literature for children noting influence of changing social and cultural factors; attention to emerging genres through primary sources. 1920 to present.

5691 Advanced Production of Audiovisual Software (3) (Same as Curriculum and Instruction 5691.)

5700 Automation of Library Processes (3) Analysis of the application of data processing methods to basic library operations such as bibliographic control, technical processes, circulation control, and management functions.

5710 Introduction to Information Science (3) Survey of the content and method of information science with emphasis on the application of research findings to general library practice.

5720 Information Systems Analysis and Design (3) Elements involved in the design and operation of information retrieval systems, including: acquisition, indexing, vocabularies, information representation, file organization, search procedures, and system evaluation.

5730 Information Retrieval Systems Laboratory (3) Comparative capabilities of various types of information retrieval systems; analyzing the performance of systems to arrive at generalizations with respect to the theory, design and operation of IR systems.

5999 Practicum (6 or 9 or 12) An opportunity to translate library theory into practice under the guidance of qualified librarians. Prereq: Completion of the 21- hr core curriculum plus approval of the director.
The Graduate School of Planning offers a two-year graduate course leading to a degree of Master of Science in Planning.

The purpose of study is the education of professional planners, competent to handle positions of increasing technical and administrative responsibility. Graduates are candidates for professional service in regional, city, county, and metropolitan area planning agencies, in local, state, and federal agencies concerned with physical, economic and administrative planning, in private businesses and organizations dealing with urban problems, and in private consulting practices.

The curriculum is organized on a basis of six quarters, or 72 credit hours, and provides the student with core courses in planning theory, methods, and techniques, and also takes advantage of offerings at The University of Tennessee in related fields such as government, economics, geography, civil engineering, and sociology.

The course of study ordinarily requires two years with an optional work internship during the summer between the two years. Planning courses as well as related courses will be offered during the summer period. The purpose of this is to serve the needs of those planners now in the field who wish to acquire their professional degree but who can spare only the minimum amount of time from their jobs because of financial or family considerations.

Entering students follow a program of courses which provides education in the basic elements of planning. These include studies in theory, history, analytical methods, and legislation, as well as related courses in government, geography, sociology, and economics. Students in the latter quarters of the first year, and in the second year, are permitted to pursue particular interests through the choice of electives approved by the Graduate School of Planning. Practice in research and analysis on a particular planning problem or topic is obtained through the preparation of a thesis or major study option.

Core planning courses are taught by the faculty of the Graduate School of Planning. Related courses are taught by other specialists drawn from the University faculty. In addition, the services of experienced professional planners in TVA and other public and private organizations are called upon to broaden the scope of the students' understanding. A variety of outside speakers and seminar leaders provide insight into particular problems of significance to planners.

ADMISSION PROCEDURES

All applicants should submit two letters of recommendation with their applications. Both letters should be from teachers familiar with the applicant's undergraduate or, where applicable, graduate academic record. In the event the applicant has had planning experience, a third letter is required from a supervisor or other person familiar with the planning work of the applicant. All applicants who wish to be considered for financial assistance from the University or the Graduate School of Planning should also submit recent Graduate Record Examination scores for the Aptitude (verbal and quantitative) portion of that test. Applicants are also requested to submit a statement of career goals in support of their application.

Applications will be acknowledged upon receipt. The applications will then be held by and reviewed in the Graduate School of Planning. The applicant should not anticipate an immediate response in regard to admissibility. Applications will be held until mid-April. Recommendations will then be made to the Graduate Office regarding the applicant's admission status. The Graduate School will then notify the applicants whether they have been admitted to the University and under what conditions the admission has been made.

All inquiries concerning admission should be addressed to: Director, Graduate School of Planning, The University of Tennessee, Knoxville, Tennessee 37916.

DEGREE REQUIREMENTS

Each student will be required to complete a minimum of 72 hours credit including at least 36 hours at the 5000 level or above.

Each student will be required to demonstrate competence in individual research. This may take either of two forms.

Plan I—Complete a thesis for 9 hours credit.

Plan II—Complete a major study with acceptable documentation. In order to be eligible for the major study the student must have earned a grade of B+ or higher in Research Methods II, have a 3.5 cumulative grade point at the time of approval of the major study proposal, and have completed at least 24 hours of graduate study. The student meeting these criteria may present a proposal for a
major study which will include at least 9 hours of elective course work in an area of concentration. The proposal shall justify the area of study, approach to the study, and the method of final documentation. Approval of the documentation, which must include written documentation, is a prerequisite for graduation.

Students in the Graduate School of Planning will be given a comprehensive written examination after approximately four quarters of course work. In addition to testing the knowledge of the student, the information thus obtained will be taken into account in advising students concerning the study program they should undertake during the balance of their academic program to remove any indicated deficiencies.

Each student will be encouraged, but not required, to complete a work internship equivalent to at least two and one-half months of full-time work in a planning agency at approximately the mid-point in course work.

Faculty


Associate Professors: J. A. Spencer, M.C.P. Ohio State; R. L. Wilson, M.R.P. North Carolina.


Courses

4100 Introduction to Planning (3) History of planning, familiarization with the operations of contemporary planning, the concept of systems, current trends and issues. Emphasis on the relationship between planning and the society in which it occurs.

4200 Planning Communications (1) Graphic, oral and written communication of information and recommendations.

5000 Thesis

5002 Non-Thesis Graduate Completion (3-15) When the non-thesis student is not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed, he may not be used toward degree requirements. May be repeated. S/NC only.

5100 Theory of Planning (4) Analysis of the means and objectives of the planning process. Emphasis on the role of the planner and the planning function in public decision making. Prereq: 4100.

5130 Planning Research Methods I (3) Research techniques in subject areas associated with city and regional planning. Research tools, data collection, analysis and projection as a basis for planning and decision making. Coreq: 4100 or consent of instructor. (Same as Water Resources Development 5130.)

5135 Planning Research Methods II (3) Application of rigorous investigation techniques in solving planning problems, including the use of statistical analysis and mathematical models. Urban and regional information systems as a resource and tool in problem identification and solution. Prereq: 5130.

5160 Planning and Utilities (3) (Same as Environmental Engineering 5160.)

5230 Urban and Site Design (2) Principles of design of small areas such as residential subdivisions, shopping centers, institutional complexes, central business districts. Brief examination of the problems of reviewing alternative designs against each other or written regulations. Extensive laboratory experience. Fees. Prereq: 5160.

5270 Planning and Transportation (2) (Same as Civil Engineering 5270.)

5290 Planning Methods (5) Tooling up studies; methods for preparation of land use and public facility elements of comprehensive development plans, including visual aspects. Prereq: 5130.

5300 Regional Planning (3) Making the planning process operative in an intergovernmental context. Theories of regional and analysis of metro planning, area planning, regional planning by states, single-purpose agency planning, and the TVA. Prereq: 5120.

5310 State Planning (3) Evolution of the planning function in state government, with emphasis on the institutional environment in which planning occurs. Context and scope of state planning, and the relationships with other branches and levels of government. Prereq: 5130.


5350 Urban Spatial Structure (3) Examination of past, present, and possible future patterns of urban spatial structure as determined by changing technology, interaction patterns, and socioeconomic environment, drawing on contemporary theories, models, empirical research. Prereq: Consent of instructor.

5360 New Towns (2) Historical development of planned new towns and implications for a national urbanization policy in the United States; the process by which new towns are being created, from the establishment of objectives to administration of the development process and the provision of public services; organizational alternatives for new town planning, development and management in the context of past experience and future objectives. Prereq: 4100, and consent of instructor.

5380 Housing (2) The nature and the demand for housing in the U.S. and abroad with emphasis on the U.S. experience. The private market processes and public influences. The problems of change in the housing supply, impact of new technology, and governmental programs designed to improve the supply and quality of housing are emphasized. Coreq: 4100 or consent of instructor.

5410-20-30 Special Topics in Planning (1-3, 2-3, 2-3) Lecture, group discussion, and individual research and study on specialization topics in planning not covered in depth in other courses. These courses may be repeated for credit. Prereq: Consent of instructor.


5450 Urban Renewal (2) The use of urban renewal as a device for rebuilding the central city. Programing in relation to the general plan and budget. Familiarization with techniques and procedures so as to be necessary to gain insight into major problem areas. Prereq: 4100.

5500 Synthesis (9) Problem-oriented experience designed to integrate knowledge from previous courses. Interrelationships will be stressed and the student will be required to use judgment in evaluation and creation of plans and policies addressed to real world situations. Extensive laboratory experience. Fees. Prereq: 5340.
The University of Tennessee School of Social Work is a fully accredited two-year graduate professional school, with a program (thesis or non-thesis option) leading to the degree of Master of Science in Social Work. The full two-year curriculum is offered in all three branch locations.

GRADUATE PROFESSIONAL EDUCATION

The goal of graduate professional social work education is the education and training of personnel for leadership roles in the social welfare community and in the social work profession. Leadership roles include those in social welfare management and administration, social planning, social policy development, and research. Social treatment leadership roles include treatment team leaders, consultants, supervisors, and expert practitioners.

In order to help reduce and eliminate such basic social problems as poverty, racism, crime, social injustice, and ill health, both educational and social welfare service organizations must focus on preventive as well as restorative objectives and functions. The School of Social Work's curriculum provides a core program and two areas of specialization: social work treatment, and social welfare administration and planning. The two-year or six-quarter program focuses on the social student with the basic components of professional competence through a progression of course work and supervised practice experience.

At the core of professional practice is the individual's capacity for self-awareness and self-discipline and a commitment to the values and goals of the profession. The student must be able to think independently and analytically in order to use the skills and knowledge for purposeful and effective intervention at all societal levels.

THE PROFESSIONAL CURRICULUM

The curriculum offered during the first two quarters of the first year, the Core Curriculum, is required for all students. The Core Curriculum is designed to provide students with knowledge and skills that are common to social work practice at the treatment and at the administration and planning levels of intervention. The Core Curriculum also provides students in social work treatment with knowledge and skill about administration and planning and vice versa. The Core Curriculum is composed of the following units: (1) human behavior and social environment, (2) social welfare policy and services, (3) research, (4) social work practice, (5) field instruction. Human behavior and social environment courses focus on community structure and process, systems theory, culture and ethnicity, role theory, small group theory, personality theory, the family, and social deviance. The social welfare policy and services courses focus on the social work profession's interest in the analysis and formulation of contemporary social policy, and the analysis of organizations that implement policy and deliver services. The research courses focus on methodology as applied to problems in social welfare. Social work practice courses, which may include a skills laboratory, focus on interviewing, formulating objectives, observing and reporting behavior, managing group discussion, and other practice skills.

Field instruction is a practicum that provides students with experience in a social welfare agency or program. At the beginning of the third quarter of the first year, the student selects a specialization—social work treatment or social welfare administration and planning. Students are required to take 12 credit-hours in their specialization. Students may take electives in the other specialization. The first-year curriculum is on a concurrent class and field plan, with students participating in the classroom study program two or three days per week and spending two days in field instruction in a social welfare agency.

In the second year, students are involved full-time in classroom courses during the fall quarter, and in a block field placement in the winter and spring quarters with at least one concurrent classroom course per quarter.

The availability of second-year field placements in social agencies in principal cities in Tennessee and in areas immediately adjacent to the state enables the student to have some choice as to field instruction assignments.

The School of Social Work recognizes and accepts the cultural pluralism of society and seeks to prepare the student for practice through the planned inclusion of significant and pertinent racial and ethnic content throughout the curriculum. Such knowledge and its application should provide the student with the educational background to take a creative and objective role in the efforts of the social work profession toward the elimination of racism, poverty, and other social ills.

A special bulletin describing the facilities, admission, fees, and degree requirements is obtainable from The School of Social Work, 2014 Lake Ave., Knoxville, Tennessee 37916.
ACCELERATED PROGRAM

The University of Tennessee School of Social Work has a special accelerated program which enables eligible candidates to complete the M.S.S.W. degree in twelve consecutive months. This Accelerated Program is approved by the Council on Social Work Education.

Students who qualify for the Accelerated Program must:
1. Have maintained a 3.0 or above grade point average (on a 4.0 scale) in undergraduate work.
2. Have an undergraduate major in social work which included a supervised field practice component, or have two years full-time practice in the field of social work.
3. Pass a qualifying examination administered by the School of Social Work faculty.

The twelve-month program begins in June in the Nashville Branch only with an intensive ten-week term from which students proceed into the field practice component, or have two years full-time practice in the field of social work.

ADMISSION REQUIREMENTS

Admission to the professional curriculum is based on the following requirements:
1. A Bachelor's degree from an accredited college or university with a satisfactory academic record and full understanding of the theories and concepts in the social sciences.
2. A grade point average of 2.5 on a 4.0 scale, with those falling below the acceptable for graduate credit, relevant to the social work field.
3. Preference is given to applicants with a substantial preparation in the social sciences.

DEGREE REQUIREMENTS

The core curriculum is essentially the same for all students.

Fall Quarter, First Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>5070</td>
<td>Social Work Research I</td>
<td>3</td>
</tr>
<tr>
<td>5110</td>
<td>Social Welfare Policy and Services I</td>
<td>3</td>
</tr>
<tr>
<td>5210</td>
<td>Human Behavior and Social Environment I</td>
<td>3</td>
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<tr>
<td>5410</td>
<td>Social Work Practice I</td>
<td>3</td>
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<tr>
<td>5910</td>
<td>Field Practice</td>
<td>4</td>
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Winter Quarter, First Year

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<tbody>
<tr>
<td>5080</td>
<td>Social Work Research II</td>
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<tr>
<td>5120</td>
<td>Social Welfare Policy and Services II</td>
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<td>5220</td>
<td>Human Behavior and Social Environment II</td>
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The Specialization

The curriculum outlined below for the spring quarter, first year, and for the second year shows typical programs for students after they have completed the Core Curriculum. A student may earn 9 hours of elective credit through completion of a Master’s thesis.

Spring Quarter, First Year

<table>
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<tr>
<td>5930</td>
<td>Field Practice</td>
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Fall Quarter, Second Year

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<th>Course Title</th>
<th>Credit Hours</th>
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<tr>
<td>5940</td>
<td>Field Practice</td>
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<td>TOTAL QUARTER HOURS</td>
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Winter Quarter, Second Year

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<th>Course Title</th>
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<tr>
<td>5950</td>
<td>Field Practice</td>
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<tr>
<td>5961</td>
<td>One Elective</td>
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<td>TOTAL QUARTER HOURS</td>
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</table>

AREAS OF SPECIALIZATION

A specialization is a focus within the student's program involving intensive study, through class and field instruction. The University of Tennessee School of Social Work offers specializations in the following areas:

Social Work Examination

Social work treatment deals with those individual, family, and group methods utilized to enhance the social functioning of individuals and effectively ameliorate problems of social dysfunction. The specialization attempts to develop a thorough knowledge of the theory and methodology basic to varied individual, family, and group methods applicable in the treatment of diverse client problems.

Social Welfare Administration and Planning

Social welfare administration and planning deals with the design, implementation, and continued operation of effective programs for client service. Specifically, the method deals with assessment of client characteristics, development of environmental resources, design of effective organizational structures, management, staff development, program evaluation, social planning, neighborhood and community development, financing, and coordination of services.
in programs of health and medical care in public health departments, hospitals, and governmental and public health services, including economic assistance and family services; mental health services to individuals and groups in mental health programs including comprehensive mental health clinics, traditionally-oriented psychiatric clinics, and hospitals; rehabilitation services in a variety of settings to individuals with medical, psychiatric, and social disabilities; school social work with children and their families concerning school-related problems; social gerontology, individual and group services to the aging in a variety of settings.

Faculty

Professors:
M. H. Bloch, M.S.S.A.; R. C. Bonovich, D.S.W.; G. W. Fryer, Ed.D.; B. P. Granger, Ph.D.; B. G. Charkin, M.S.S.A. (Emeritus);
E. J. Pawlak, Ph.D.; S. W. Spencer, M.S.; (Emeritus).

Associate Professors:
assess treatment interventions, skill in evaluating data on effectiveness of treatment intervention, and critical thinking. Prereq: Completion of core or consent of instructor.

544 Social Work Practice with the Poor (2-3) Topic: poverty and homelessness; income policies and programs; the politics of poverty; and issues related to the delivery of social services. Prereq: Completion of core or consent of instructor.

5460 Social Work Practice with Individuals and Families (3) Focuses on the development and delivery of social services to individuals and families. Prereq: Completion of core or consent of instructor.

5470 Contemporary Treatment Modalities: Individual and Family (2-3) Well-established and developing treatment modalities are examined in terms of their essential concepts. Emphasis on differential facets and theory-based linkages. Prereq: Completion of core or consent of instructor.

5560 Social Work Practice with Groups (3) Focuses on the development and delivery of social services to groups. Prereq: Completion of core or consent of instructor.

5570 Comparative Methods of Group Treatment (2-3) Comparative analysis and critical review of the theory and methodology of some of the major group treatment modalities are examined in terms of their essential concepts. Emphasis on differential facets and theory-based linkages. Prereq: Completion of core or consent of instructor.

5601 Social Work in Rural Communities (2-3) Focuses on characteristics of rural populations and communities, including their historical development, cultural diversity, and current social problems. Prereq: Completion of core or consent of instructor.

5661 Community Organization (2-3) Methods of social work practice in community organization from theoretical and practical perspectives. Prereq: Completion of core or consent of instructor.

5670 Social Planning (3) Same as Planning 5670.

5671 Planning and Management of Change in Social Welfare (2-3) Theories and models of change used by social workers in planning and analyzing change to enhance service delivery. Prereq: Completion of core or consent of instructor.

571 Administration in Social Work (2-3) Topics include the management of social welfare agencies, the organization and administration of social work practice, and the development and administration of administrative principles that may facilitate the effective provision of welfare services. Prereq: Completion of core or consent of instructor.

572 Organizational Design of Social Welfare Agencies (2-3) Critical problems of adapting organizational structure and operational patterns to new tasks, objectives, and mandates. Prereq: Completion of core or consent of instructor.

5731 Financial Management for Social Welfare Organizations (2-3) Focuses on centralization and decentralization, management of scarce resources in social service organizations, and management of financial resources. Prereq: Completion of core or consent of instructor.

5741 Supervision in Social Work (2-3) Dual roles of the supervisor in various settings, and supervision distinguishes from consultation and from direct practice. Prereq: Completion of core or consent of instructor.

5742 Consultation in Social Work (2-3) Consultation and the dilemmas and techniques of consultation. Prereq: Completion of core or consent of instructor.

5743 Management of Human Resources in Social Welfare (2-3) Examination of the personnel function in administration of human service programs. Prereq: Completion of core or consent of instructor.

5744 Education and Training in Social Welfare (2-3) Examines the impact of education and training on the social work profession. Prereq: Completion of core or consent of instructor.

5745 Professional Leadership in Social Work (2-3) Examination of leadership in social work practice. Prereq: Completion of core or consent of instructor.

5746 Social Work Treatment for Marital Adjustment (3) Focuses on theories regarding social and cultural values and personality development. Prereq: Completion of core or consent of instructor.

5747 Social Work Treatment for the Elderly (3) Examines some of the problems, issues, and dilemmas of practice in social services affecting the elderly. Prereq: Completion of core or consent of instructor.

5748 Social Work Treatment for Groups (3) Examines some of the problems, issues, and dilemmas of practice in social services affecting groups. Prereq: Completion of core or consent of instructor.

5749 Social Work Treatment for Marriage and Family (2-3) Examines the impact of education and training on the social work profession. Prereq: Completion of core or consent of instructor.

5750 Management of Residential Settings (2-3) Examines the management of residential institutions for children, the aged, mentally disabled, juvenile and adult offenders, and other groups. Prereq: Completion of core or consent of instructor.

5751 Management of Residential Institutions (2-3) Focuses on the development and delivery of social services to residential institutions. Prereq: Completion of core or consent of instructor.

5752 Management of Residential Services (2-3) Examines the management of residential services. Prereq: Completion of core or consent of instructor.

5753 Management of Residential Programs (2-3) Examines the management of residential programs. Prereq: Completion of core or consent of instructor.

5754 Management of Residential Facilities (2-3) Examines the management of residential facilities. Prereq: Completion of core or consent of instructor.

5755 Management of Residential Programs for Children and Youth (2-3) Examines the management of residential programs for children and youth. Prereq: Completion of core or consent of instructor.

5756 Management of Residential Programs for the Elderly (2-3) Examines the management of residential programs for the elderly. Prereq: Completion of core or consent of instructor.

5757 Management of Residential Programs for the Mentally Ill (2-3) Examines the management of residential programs for the mentally ill. Prereq: Completion of core or consent of instructor.

5758 Management of Residential Programs for the Seriously Mentally Ill (2-3) Examines the management of residential programs for the seriously mentally ill. Prereq: Completion of core or consent of instructor.

5759 Management of Residential Programs for the Mentally Retarded (2-3) Examines the management of residential programs for the mentally retarded. Prereq: Completion of core or consent of instructor.

5760 Management of Residential Programs for the Physically Handicapped (2-3) Examines the management of residential programs for the physically handicapped. Prereq: Completion of core or consent of instructor.

5761 Management of Residential Programs for the Chemically Dependent (2-3) Examines the management of residential programs for the chemically dependent. Prereq: Completion of core or consent of instructor.

5762 Management of Residential Programs for the Addicted (2-3) Examines the management of residential programs for the addicted. Prereq: Completion of core or consent of instructor.

5763 Management of Residential Programs for the Substance Abusers (2-3) Examines the management of residential programs for the substance abusers. Prereq: Completion of core or consent of instructor.

5764 Management of Residential Programs for the Homeless (2-3) Examines the management of residential programs for the homeless. Prereq: Completion of core or consent of instructor.

5765 Management of Residential Programs for the Homeless or the Street People (2-3) Examines the management of residential programs for the homeless or the street people. Prereq: Completion of core or consent of instructor.

5766 Management of Residential Programs for the Homeless or the Street People (2-3) Examines the management of residential programs for the homeless or the street people. Prereq: Completion of core or consent of instructor.
prepares the graduating student to assume positions of responsibility and leadership within the profession. The graduating student is helped to plan toward continuing his/her education and professional development. S/NC only.

5970 Outcomes in Social Work Practice (2-3)
Application of substantive knowledge to comprehensive problem-solving within existing service and community systems. Critical appraisal of functional relationships between problem, policy, planning, practice, and outcomes. Examination of problems from practice to determine key elements of optimal services and implications for policy decisions. S/NC only.

5980 Practicum in Governmental Social Welfare Policy Making (2-3) Practical introduction to the process of legislative and/or administrative policy making at the state or local governmental level, through assignment of students to the offices of elected or appointed proximate policy makers. Limited social welfare policy research activities. Seminar used to present normative and descriptive theory about the policy-making process, and models of policy analysis. May be repeated. Prereq: Social Work 5110 and consent of instructor.
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