try, the recommended courses (from the list above) are Mathematics 141-142, Physics 131-231, and Chemistry 371-381; although not required, certain additional courses are strongly suggested for students planning to become chemists: Mathematics 241-251 and Chemistry 230, 320, 329, and 406. Because professional chemists need a reading knowledge of foreign languages, intermediate level competency should be acquired in German, French or Russian. Students who are undecided about their career goals should consult a chemistry faculty advisor at the earliest opportunity. Unlike the Bachelor of Science in Chemistry, the B. S. degree is not approved by the Committee on Professional Training of the American Chemical Society.

A minor in chemistry shall consist of the successful completion of 15 hours of chemistry courses numbered 200 and above, including 310, 319 (4 hours) and at least one of the following sequences: 350-360, 369 (8 hours); or 370-380, 379 (8 hours); or 371-381, 379 (8 hours).

Cooperative Program

A cooperative program is available to students who are chemistry majors. After the freshman year, the student alternates a semester in school with a semester in a job in the chemical industry. The program normally requires five years and involves a total of four work semesters and eight school semesters. Students are required to have at least a 2.5 average to enter and remain in the program. Some opportunity exists for students to enter the program later than the end of the freshman year. Interested students should make application to the head of the department at least one semester in advance of the beginning of the first work period. Further information will be supplied on request.

Placement in General Chemistry Sequences

The sequences which meet all requirements of a year of general chemistry and which serve as prerequisites for upper-division courses are 120-130, 121-131, and 128-138; chemistry majors are strongly encouraged to take either of the last two sequences. Courses 100 and 110 emphasize organic and biochemical chemistry, and may be used as prerequisite only for 431.

It is possible to move from one sequence to the other if permission for substitution is obtained in advance. For example, a student who finds a need to complete the 120-130 series after having completed 100 may substitute 100 for 120 with approval of the Department of Chemistry and may then take 130. Credit may be received for only one of the courses 100, 120, 121, or 128.

In any chemistry course above the freshman level which has Chemistry 130 as a prerequisite, 110 may be used as a prerequisite with approval of the Department of Chemistry.

Chemistry 128-138 is an honors course designed for the student who has shown the ability to make considerable progress in science. Class size is limited to promote faculty-student interaction. Selection is based on ACT scores, high school chemistry grade, and, if necessary, performance on a placement examination to be given during the first class meeting. A student receiving a passing grade below B in 128 will complete the year's work by taking 130 or 131. Beginning students who have had high school chemistry and who have had additional experience (e.g. summer institute study, special research projects, home laboratory) are invited to apply during the summer to the head of the department for permission to take a proficiency examination in one or more semesters of general chemistry. If a satisfactory grade is made on the examination, credit will be allowed for the semester (or course) for which the exam was taken. The Department of Chemistry gives credit in general chemistry to students who present satisfactory scores on the Chemistry Advanced Placement Examination.

Chinese

See Cultural Studies (Asian Studies).

Classics

Professors:

H. C. Rutledge (Head), Ph. D. Ohio State;
G. C. Gesell, Ph. D. North Carolina (Chapel Hill).

Associate Professors:

C. P. Craig, Ph. D. North Carolina (Chapel Hill);
S. D. Martin, Ph. D. Michigan;
J. E. Shelton, Ph. D. Vanderbilt;
D. W. Tandy, Ph. D. Yale.

The B. A. major concentration in Greek

consists of 27 hours including 21 hours of Greek language courses numbered above 200, and including 3 hours of Classics 422 (capstone); 6 hours chosen from Classics 221-222, 331, 334, 491. The student majoring in Greek is strongly encouraged to have as background History 310 before taking the capstone course. The student concentrating in Greek is encouraged to begin or take advanced work in Latin.

There are two intermediate options in the Greek program, both of which fulfill the Liberal Arts Language requirement and prepare students for advanced work in the third and fourth years. The Classical Option is 261 followed by Upper Division. The New Testament Option in second year Greek is 261-262.

The Greek minor consists of 18 hours including 12 hours of Greek language courses numbered above 200, and 6 hours chosen from Classics 221-222, 331, 334. The student minoring in Greek is encouraged to take Classics 422 (capstone).

The B. A. major concentration in Latin

consists of 27 hours including 21 hours of Latin language courses numbered above 200, and including 3 hours of Classics 422 (capstone); 6 hours chosen from Classics 221-222, 331, 334, 491. The student majoring in Latin is strongly encouraged to have as background History 310 or 311 before taking the capstone course. The student concentrating in Latin is encouraged to begin or take advanced work in Greek.

The Latin minor consists of 18 hours including 12 hours of Latin language courses numbered above 200, and 6 hours chosen from Classics 221-222, 331, 334. The student minoring in Latin is encouraged to take Classics 422 (capstone).

Placement Examination. Students who transfer to UTK from other colleges and students who enter with high school units in Latin should register for the courses in which they would normally be placed on the basis of such credits. During freshman orientation a placement test will be given, and students will be advised if a change in registration is indicated by the results.

Proficiency Examinations. Students who have acquired a knowledge of Latin through private study or tutoring should request from the Department a proficiency test. A student who earns a grade of B or better in this examination is eligible for credit toward graduation. A student who omits any courses in a sequence may receive credit for it by passing the appropriate proficiency examination.

Comparative Literature

See Cultural Studies.

Computer Science

Professors:

J. H. Poore (Head), Ph. D. Georgia Tech;
J. A. George, Ph. D. Stanford; G. R. Sherman, Ph. D. Purdue; M. G. Thomason, Ph. D. Duke.

Associate Professors:

B. J. MacLennan, Ph. D. Purdue; Esmond N. G., Ph. D. Waterloc, C. P. Pfleger, Ph. D. Pennsylvania State.

Assistant Professors:

J. R. S. Blair, Ph. D. Pittsburgh;
J. B. Cockett, Ph. D. Leeds, UK;
D. C. Mutchler, Ph. D. Duke; D. W. Straight, Ph. D. Texas; M. Zemankova, Ph. D. Florida State.

The undergraduate major in computer science contains five areas of concentration: Computer Systems, Information Systems, Scientific Computing, Theory of Computation, and Machine Intelligence. Some courses are applicable to more than one concentration; consult the Department for details.

100 or 102 and 111, 112 are prerequisite to a major in computer science which consists of 219, 311, four out of 320, 340, 360, 380, Mathematics 371, plus fifteen hours at the 300 and 400 level. All students must take at least 9 of the 15 hours in one of the concentration areas and must also meet the requirements for the concentration as specified by the Undergraduate Committee.

Mathematics 151-152, 221-222, Physics 151-152 and English 456 or 459 are also required. Students must elect a two-semester lab science sequence in either Biology or Chemistry, or a sequence approved by the Computer Science Department.

It is highly recommended that all Computer Science majors own a personal computer with communications capability.

The undergraduate major in computer science is approved by the Computer Science Department.
Science consists of 111 and 112 plus fifteen hours of 300 or 400 level courses. Progression to the Major:
A student may progress to the major or minor program only after completing courses specified by the department. These courses are listed in the Undergraduate Handout available in the department. Students who have completed the specified courses with a minimum GPA of 3.0 and wish to progress to the major or minor program must apply to the departmental office. This should be done as soon as the stated requirements are met so that a decision can be reached prior to the registration date for the next semester. Those who are not accepted into the Computer Science degree program will be counseled and advised of educational alternatives.
For undergraduate Computer Science majors who have taken at least three computer science courses at UTK, grades in all computer science courses from UTK, excluding service courses, will be averaged. If a course is repeated, all grades received for the course will be counted.
A student must have a Computer Science grade point average (as described above) of 2.50 or better in order to be retained in the major. If a student’s Computer Science grade point average drops below 2.50, the student will be given a warning. If after one more semester’s grades have been received, the student’s Computer Science average has not risen to 2.50, the student will be dropped as a major in Computer Science.
A student who desires to be readmitted after being withdrawn as described above must attain an average in Computer Science courses (computed as described above) of at least 2.70.

**Cultural Studies**

**Director:** Dr. Mary P. Richards

**Basic Faculty:**
P. Barrette, Ph. D. Romance Languages; L. J. Champion, Ph. D. Special Programs, R. Copeland, Ph. D. Special Programs; B. K. Dumas, Ph. D. English, J. R. Ericson, Ph. D. Special Programs; D. M. Fiene, Ph. D. Russian; C. Fleming, Ph. D. Special Programs; R. W. Gwynne, Ph. D. Special Programs; M. H. Handelsman, Ph. D. Romance Languages; M. Hartsell, Ph. D. Special Programs, J. O. Hodges, Ph. D. Special Programs; W. L. Humphreys, Ph. D. Religious Studies; C. O. Jackson, Ph. D. History; E. Johnson, Ph. D. Romance Languages; W. C. Neale, Ph. D. Economics; M. L. Ochoa, Ph. D. Anthropology; M. E. Peak, M.A. Special Programs; H. C. Rutledge, Ph. D. Classics; W. L. Humphreys, Ph. D. Anthropology; G. F. Steele, Ph. D. Sociology.

Recognizing that new disciplines have developed which require the integration of knowledge from several traditional fields, the College of Liberal Arts has combined the resources of several departments to offer a series of interdisciplinary major concentrations and minors. These Cultural Studies programs are: Afro-American Studies, American Studies, Ancient Mediterranean Civilizations, Asian Studies, Cinema Studies, Comparative Literature, Latin American Studies, Linguistics, Medieval Studies, Russian and East European Studies, Urban Studies, and Women’s Studies. See individual program descriptions below for the major concentrations and/or minor requirements.

**Afro-American Studies**

The Afro-American Studies Program offers both a major concentration and a minor in Afro-American Studies. AAS courses are offered not only by the program itself but also by numerous departments within the College of Liberal Arts and some other colleges as well. This diversified sponsorship of AAS courses enables the University to offer a particularly varied range of courses in the field of Afro-American Studies. Major concentration: Afro-American Studies 201-202 are required in the concentration which consists of 24 hours from the Afro-American Studies curriculum. At least 15 hours must represent upper division credits. Majors are required to take AAS 431, preferably in their senior year. A maximum of 6 hours in AAS 492 and 493 combined can be applied toward the AAS major. In planning their program majors must include courses from at least 2 other departments which crosslist courses with Afro-American Studies in addition to the AAS core course offerings. Minor: Afro-American Studies 201-202 are required in the minor which consists of 15 hours at least 9 of which must be upper division credits. A maximum of 3 hours in AAS 492 and 493 combined can be applied to a minor. In planning their programs minors must include courses from at least 2 other departments which crosslist courses with Afro-American Studies in addition to the AAS core course offerings.

**American Studies**

Major concentration: History 251-252 (or equivalent upper division courses) are prerequisites to a major concentration in American Studies which consists of 24 semester hours including American Studies 310 and 410; two of the three following courses: English 431, 432, or 433; and 15 hours of upper-division electives dealing with the American experience. Six hours of the electives group must be from one of the following disciplines: anthropology, economics, political science, or sociology. A list of acceptable elective courses is published annually by the American Studies Committee. For further information consult the chairman of the American Studies Committee, Dr. Charles Jackson.

**Ancient Mediterranean Civilizations**

The major concentration in Ancient Mediterranean Civilizations consists of Classics 381, 382, and 21 additional hours from the following list, distributed so that no more than 15 hours are in any one of the three divisions: (a) Ancient Near Eastern Cultures: History 366; Religious Studies 311, 312; (b) Greek Culture: Classics 221, 222, 232, 331, 334, 422 (when topic is Greek cultural traditions); History 310; Philosophy 320, 420 (when topic is Greek cultural traditions); Political Science 475; and (c) Roman Culture: Classics 233, 334, 422 (when topic is Roman cultural traditions); History 311; Religious Studies 321, 326, 416.

**Asian Studies**

The Asian Studies major concentration consists of 27 credit hours from the upper-division courses in Asian Studies and approved departmental offerings. Fifteen of the hours must be taken from courses listed within one of the four geographical-cultural areas (Islamic World; South Asia; China; Japan), and no more than 9 of these 15 hours can come from one of the following subdivisions (A or B). Subdivision A includes Anthropology, Economics, Geography, History, Political Science, and Sociology. Prerequisite to the concentration is Asian Studies 101-102. Corequisite to the major concentration is competence in a major Asian language of the chosen geographical-cultural area. Competence is defined as the successful completion of the 200-level sequence of that language, or by demonstration of equivalent mastery.

The Asian Studies minor consists of Asian Studies 101-102 and 15 credit hours at the 200 level and above taken from courses within one of the four geographical-cultural areas. No more than 9 of these 15 hours can come from one subdivision.

**Cinema Studies**

The Cinema Studies minor consists of fifteen hours, including English 289 Introduction to the Film Studies, and Art 292 Film Design. It is strongly recommended that Introduction to Film Studies and Film Design be taken before selection of electives provided for in the minor.

For further information consult the chairman of the Cinema Studies Program, Charles Maland, English Department. Other related courses in such departments as history, philosophy, and sociology may be approved through consultation with Dr. Maland.

Approved Area Courses are: Art 292 Film Design (3); Art 392 Intermediate and Advanced Film Design (3-6); Broadcasting 330 Producing for Radio (3); Broadcasting 433 Producing for Television (3); English 289 Introduction to Film Studies (3); English 334 Film and American Culture (3); and English 489 Special Topics in Film (3).
Comparative Literature

A major concentration in comparative literature consists of 27 hours including Comparative Literature 201 and 401-402, and 9 hours of literature in a foreign language in courses numbered 300. The remaining 9 hours should include literature courses, either in English or in a foreign language, numbered 300 or above, from at least two of the following departments: Classics, English, Germanic and Slavic Languages, Religious Studies, Romance Languages. Certain courses in Philosophy and Speech Communication may be substituted with the approval of the chairperson of the Comparative Literature Program. Students concentrating in comparative literature are strongly encouraged to acquire a working knowledge of a second foreign language, especially if they hope to pursue comparative literature on the graduate level.

A minor in comparative literature consists of 18 hours including Comparative Literature 201 and either Comparative Literature 401-402. 6 hours of literature in a foreign language in courses numbered 300 and above, and 6 hours of literature courses numbered 300 and above in a different department. These 8 hours may be either in English or in a foreign language and should be chosen from the following departments: Classics, English, Germanic and Slavic Languages, Religious Studies, and Romance Languages. Certain Philosophy and Theatre courses may be substituted with the approval of the chairperson of the Comparative Literature Program. Minors in comparative literature are strongly encouraged to continue study of a foreign language beyond the minimum requirement.

Latin-American Studies

The major concentration consists of 27 hours including Latin American Studies 401 and 402, three hours of either History 360 or 361, three hours of an approved Spanish or Portuguese literature/culture course at either the 300 or 400 level, and fifteen additional hours selected from courses offered by three different participating departments. Majors are strongly urged to take as a prerequisite Latin American Studies 251-252.

The minor consists of 18 hours including Latin American Studies 251-252, three hours of an approved Spanish or Portuguese literature/culture course at either the 300 or 400 level, and nine additional hours selected from courses offered by three different participating departments.

A practical working knowledge of Spanish or Portuguese acquired independently is a prerequisite for majors and minors. All students are strongly encouraged to earn credit hours through UTK’s Latin American Studies Abroad Program at the Federal University of Ceara in Fortaleza, Brazil. Other foreign study programs are also available for Brazil and Spanish-speaking Latin America.

For further information, consult with Dr. Michael Handelman (831 McClung Tower), Chairperson of the Latin American Studies Program.

Linguistics

This major concentration offers a broad exposure to the various fields of linguistics (including historical, descriptive, theoretical and applied linguistics) along with an opportunity to study a second language overlaps with other disciplines such as psycholinguistics, sociolinguistics, and speech pathology. The program of study is designed to prepare a student for graduate work in linguistics or related areas or to serve as a general survey of language and linguistics. The program of study provides the additional possibility of emphasizing the teaching of English as a second language for the student interested in language-related employment at the B.A. level.

Students should consult program advisors early in planning a Linguistics major or minor. Audiology and Speech Pathology 305 should be taken as soon as possible. Other 300-level courses should, if possible, be completed before 400-level courses are begun.

Corequisites for the major concentration

Linguistics 200 (highly recommended); selection of the Foreign Studies option to fulfill the approved distribution requirement (required); and a two-semester sequence of a non-Indo-European language to be selected from the following: Asian Studies 121-122 (5.5); Arabic Studies 131-132 (5.5); Chinese Studies 141-142 (4.4); Hebrew; Asian Studies 151-152 (5.5); Japanese; Religious Studies 309-310 (3.3); Hebrew; other non-Indo-European language sequences approved by the Linguistics Committee (required).

The concentration shall consist of 30 hours distributed as follows: (a) 24 hours composed of Audiology and Speech Pathology 305 (3); English 371, 372, and 471 (3,3,3); French, German, Russian or Spanish 425-426 (3,3); and Linguistics 420-430 (3,3); and (b) 6 hours of the following, selected in consultation with the Linguistics Committee: Anthropology 411 (3); Audiology and Speech Pathology 320, 465, 579, (3,3,3); Educational Curriculum and Instruction 487 (3); Special Education 423, 522, 532-533 (3,3); English 371, 372, 472, 475, 486, 508, 509, 680 (3 hours each); French 421, 422, 521-522 (3 hours each); German 435-436 (3.3), 571-572 (3.3), Linguistics 400 (3); Philosophy 479 (3); Psychology 430, 482, 543, 571 (3 hours each); Spanish 421, 422, 531-532 (2,3,3); Theatre 426 (4).

Other hours may be substituted in (b) by approval of the Linguistics Committee.

A minor in Linguistics shall consist of 18 credit hours composed of (1) either English 471 (3) or 3 hours from section (b) of the major, selected in consultation with the Linguistics Committee; and (2) 15 hours as follows: Audiology and Speech Pathology 305 (3); English 371 (3) or 372 (3); French, German, Russian or Spanish 425 (3) or 426 (3); and Linguistics 420-430 (3,3).

Note: In addition to the above listed courses for the concentration and the minor there are occasional offerings in the Honors Series or in graduate seminars which may be substituted for certain requirements subject to written approval of the Linguistics Committee and the Office of the Dean.

Medieval Studies

A major concentration in Medieval Studies consists of Medieval Studies 201 and 403 and 21 hours of upper-division courses concerned primarily with the Medieval experience, divided among the following three categories: (1) history, philosophy, political science, and religious studies; (2) language and literature; (3) the arts - history of art, architecture, music, and speech and theatre. Courses should not be selected at random but should either form a related pattern (for example, courses in the literature and history of Medieval England or Italy, etc.) or should revolve around a particular discipline or two closely related disciplines (for example, courses in the history of art and architecture).

A concentration in Medieval Studies focuses on the period from the collapse of the Roman Empire to the 16th century. Such a concentration offers the opportunity to deepen one’s self-awareness and broaden one’s view of the range of human possibilities by studying a very different and remote culture - its conditions of life, social and political institutions, values and ideals, and modes of perception and expression.

Students are strongly urged to take as a prerequisite the most appropriate language for students in the Medieval Studies concentration and is essential for those who plan to continue their studies in graduate school. In addition, students planning to go on to graduate school are strongly advised to supplement their Medieval Studies concentration with extensive work in one of the traditional disciplines.

A minor in Medieval Studies consists of Medieval Studies 201 and 403 and 12 additional hours distributed among the categories listed above for the major. Each student’s program, major or minor, must be approved in advance and is coordinated by the Medieval Studies Coordinating Committee, chairperson Dr. Paul Barrette.

Category #1 History, Philosophy, and Political Science. History 312 Medieval History: 1000-1100 (3); History 313 Medieval History: 1100-1400 (3); History 330 History of England to 1688 (3); History 334 History of Germany to 1815 (3); History 369 History of the Middle East (3); History 474 Studies in Medieval and Early European History (3); Philosophy 322 Medieval Philosophy (3); and Political Science 475 Ancient and Medieval Political Thought (3).

Category #2 Language and Literature. Classics 435 Medieval Latin (3); English 371 Foundations of the English Language (3); English 401 Medieval Literature (3); English 402 Chaucer (3); French 410 Medieval French Literature (3); Italian 401 Dante and Medieval Culture (3); and Italian 402 Petrarch and Boccaccio (3).

Category #3 The Arts: Architecture 415 Seminar in Medieval Architecture (3); Art 371 Early Christian and Byzantine Art to 1350 (3); Art 372 Northern European Painting, 1350-1600 (3); Art 381 Medieval Art of the West, 800-1450 (3); Art 382 The Art of Italy, 1250-1400 (3); and Music History 210 History of the Music to 1750 (3).
Russian and East European Studies

The major concentration consists of 30 hours of coursework, including Geography 375, six hours from History 340-341, Philosophy 393, Political Science 459 and four additional hours from Political Science 469, 574; Russian 311-312; Russian and East European Studies 410; and additional hours in courses numbered 301 and above offered by the Russian section of the Department of Germanic and Slavic Languages. Recommended prerequisites to the major concentration are the completion of Russian 201-202 and Russian Culture 371-372.

Urban Studies

Urban Studies is a valuable major concentration for students who plan to work in such areas as housing, real estate, development, neighborhood organization, and environmental design.

A major concentration in Urban Studies consists of a minimum of 30 semester hours, including Urban Studies 250, 350, 450, 460, and at least 15 additional semester hours from the Urban Studies curriculum.

A minor consists of 18 semester hours, including Urban Studies 250 and 350 plus additional semester hours from the Urban Studies curriculum. Curricular planning should be done with an advisor in Urban Studies. For more information, contact the chairperson of the Urban Studies Committee.

Approved Courses in other departments: Geography 385 Geography of Appalachia; Rural Sociology 380 Rural Sociology; Sociology 383 The City, 462 Population; and Transportation 302 Transportation Principles and Policies.

Women's Studies

Women's Studies encourages inquiry into the full range of the human experience by raising new questions and opening new areas of research concerning women. The discipline enriches the traditional liberal arts curricula and at least 15 additional semester hours on women's lives and accomplishments.

Women's Studies can broaden the education of both male and female students by helping them to understand the limitations placed on both sexes by narrowly defined sex roles. Wherever there is a need to understand women and an interest in the new role they are playing in society, Women's Studies can enhance a student's career preparation and opportunities.

The Women's Studies Program offers a wide variety of courses, some interdisciplinary in nature and others originating in supporting departments throughout the university. These courses, may be taken as electives, may be used to satisfy requirements in various colleges, or they may serve as a concentration in Women's Studies within a Cultural Studies major or minor.

The major concentration in Women's Studies consists of 30 semester hours including one of the Images of Women in Literature courses (either 210 or 215). Women in Society (220), Emergence of the Modern American Woman (310), at least three hours of Independent Study (493), and at least one course from each of the three major areas: Women's Heritage (334, 380, 385, 432, 453, 466, 483), Contemporary Issues (375, 382, 410, 425, 434), and Literature and the Arts (330, 332, 422). As its content varies, 400 may be included in any of these areas. Students are encouraged to take at least nine hours in one of these areas.

The Women's Studies minor consists of one of the Images of Women in Literature courses (either 210 or 215), Women in Society (220), and an additional 12 hours of upper-division Women's Studies courses. Approved special topics courses related to Women's Studies may also be applied toward a major or a minor.

Ecology

Dewey L. Bunting, Director

Basic Faculty:

C. C. Amundsen, Ph. D. Botany; S. I. Auerbach, Ph. D. O. R. N. L.; B. L. Blaylock, Ph. D. O. R. N. L.; E. R. Buckner, Ph. D. Forestry; D. L. Bunting, Ph. D. Zoology; G. M. Burghardt, Ph. D.


The Graduate Program in Ecology offers Master of Science and Doctor of Philosophy degrees. This intercollegiate program provides advanced courses in contemporary ecology for students from undergraduate programs in basic and applied biology, social sciences, mathematics and engineering. Research opportunities in both fundamental and applied ecology are 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, the National Park Service, and the Tennessee Valley Authority provide advisors and research facilities. The Great Smoky Mountains, Cumberland Plateau, valley and ridge topography, TVA lakes and wild rivers provide locally a spectrum of natural habitats and consequent biological diversity that is truly unique. In addition, faculty research programs provide opportunities for student research elsewhere on this continent and abroad.

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, 37996-1610. Consult the Graduate Catalog for listing of graduate level courses.

Economics

See faculty list, page 57.

The program in economics combines a broad liberal education with the rigorous study of current issues of the day such as employment, inflation, poverty, wealth, and the benefits and costs of economic growth. The program in economics consists of: (1) Economics 201 or equivalent honors courses as a prerequisite to the major and (2) Economics 311 and 313 plus 21 additional hours in upper division economics courses. Majors are encouraged to satisfy Part II of the Natural Science Distribution Requirement with one of the mathematics packages Mathematics 115-121, 121-122, or 141-142. Students planning graduate work in Economics should elect Mathematics 141-142.

A minor consists of: (1) Economics 201 and (2) 9 additional hours in economics at the upper-level degree. Minors are encouraged to include Economics 311 and 313.

In addition, certification to teach economics in secondary schools is available. Students with such interest should consult the Certification Clerk, Room 212, Claxton Education Building as early in their program as possible to determine the appropriate requirements.
English

Prerequisites and Corequisites: (1) English 101 and 102, or the equivalents, are prerequisites to all English courses at the 200, 300, and 400 levels; and (2) as a graduation requirement for a B. A., each English major must complete the equivalent of the second year of a foreign language, maintaining a grade average of C in the courses used to fulfill this requirement (D's in some of these courses can be counted if the overall average is C or better). If a student earns less than a C average, he or she must repeat courses and/or petition the department for a waiver.

Major Requirements: At least 36 semester hours of course work in the English Department, 30 of which must be at the 300 or 400 level.

For all English Majors: (1) English 201-202 (British Literature), 221-222 (Literature of the Western World), or any two of 231-232-233 (American Literature). This requirement should be satisfied, if possible, before the student takes courses at the 300-400 level; and (2) English 371 or 372 (study of the English language).

Concentration in Literature: Nine English courses at the 300-400 level, including: (1) English 376 (Colloquium in Literature), to be taken, if possible, near the beginning of the student's major program; (2) at least four courses in literature before 1900, including at least two before 1800 (see departmental brochure, Undergraduate Study in English, for a course list); and (3) four other courses, at least one of which is based on an approach to literature other than literary history (see departmental brochure, Undergraduate Study in English, for a course list).

Concentration in Writing: Nine English courses at the 300-400 level, including: (1) a two-course sequence in expository, technical, or creative writing; (2) three other courses in writing; and (3) four other courses, at least three of which must be literature courses selected in consultation with the advisor.

Individualized Program The Director of Undergraduate Studies is empowered to approve individualized programs developed by students in consultation with their advisors. These programs should be designed to achieve academically sound objectives that are not addressed by the above requirements.

Honors For students who qualify, the English Department offers specially designed courses at the freshman, sophomore, and senior levels. The freshman and sophomore honors courses are enriched versions of regular sections in composition, in introduction to the various genres, and in American, British, and world literatures. Senior honors courses involve independent study leading to a comprehensive examination and a substantial paper. For further information, contact the Director of Undergraduate Studies in English.

An English minor consists of at least 15 semester hours of English courses, at the 300-400 level.

Certification for Teaching Students planning to teach English in public schools should consult the Director, Clerk, Room 212, Claxton Education Building.

Graduate Study. Students wishing to enter a graduate program in English should address inquiries to the Dean of the Graduate School. To be accepted for graduate study in English, the student should have had at least eighteen semester hours in English courses above the freshman and sophomore level with a better than B average and a B average in all other undergraduate courses. Students who lack eighteen semester hours of undergraduate English may be required to take and pass with a grade of B or better a designated number of undergraduate courses at The University of Tennessee before being admitted to graduate study. Admission is also dependent on satisfactory GRE scores. Consult the Graduate Catalog for specific requirements.

French

See Romance Languages.

Geography

Prerequisites: J. B. Trahar (Head), Ph. D. Princeton; P. G. Adams (Young Professor and Emeritus), Ph. D. Texas; J. M. Armstead, Ph. D. Duke; E. W. Bratton (Associate Head), Ph. D. Illinois; D. A. Carroll, Ph. D. North Carolina; D. R. Cox, Ph. D. Missouri; K. Curry (Emeritus), Ph. D. Yale; R. Y. Drake, Jr., Ph. D. Yale; W. Dykeman (Adjunct), B. A. North Carolina; J. H. Fisher (John C. Hodges Professor and Emeritus), Ph. D. Pennsylvania; N. M. Goslee, Ph. D. Yale; J. A. Hansen (Emeritus), Ph. D. Yale; R. M. Kelly, Ph. D. Duke; K. L. Knickerbrocker (Emeritus), Ph. D. Yale; B. J. Leggett, Ph. D. Florida; F. D. Miller (Emeritus), Ph. D. Virginia; R. B. Miller, Ph. D. Brown; A. R. Penner, Ph. D. Colorado; J. E. Reese (Chancellor), Ph. D. Kentucky; N. J. Sanders (Young Professor), Ph. D. Shakespeare Institute, Stratford-on-Avon; D. J. Schneider (on leave), Ph. D. Northwestern; W. R. Shurr, Ph. D. North Carolina; P. L. Soper (Emeritus), Ph. D. Cornell; B. T. Stewart (Emeritus), Ph. D. Northwestern; R. H. Walker (Emeritus), M. A. Texas; T. V. Wheeler, Ph. D. North Carolina; J. M. White (Young Professor), M. A. California; M. Waldvogel, M. A. Michigan; P. A. Tschantz, M. A. New Mexico State; M. S. Lewis, Ph. D. Tennessee; M. J. Calfee, M. A. Tennessee; M. J. Calfee, M. A. Tennessee; J. L. Ball, Ph. D. Tennessee; K. Benson, M. A. Tennessee; M. J. Cafée, M. A. Tennessee; P. F. Clark, Ph. D. Houston; W. W. Demestes, Ph. D. Wisconsin; M. Emery, M. A. New York; S. E. Farrier, Ph. D. Cornell; B. A. Fogelman, Ph. D. New York; D. E. Francisco, M. A. Tennessee; R. J. Frontain, Ph. D. Purdue; P. J. Hanse, Ph. D. Cornell; C. M. Hoffman, M. A. Iowa; N. H. Kaylor, Jr., Ph. D. Vanderbilt; M. S. Lewis, Ph. D. Tennessee; E. D. Overbey, M. A. Virginia; M. E. Papke, Ph. D. McGill; M. H. Simpson, M. A. Oregon; P. A. Troy, M. A. New Mexico State; M. Waldvogel, M. A. Michigan; J. A. Williamson, M. A. Southern Illinois.

Associate Professors: L. S. Burghardt, Ph. D. Chicago; B. K. Dumas, Ph. D. Arkansas; J. E. Gill, Ph. D. North Carolina; D. F. Goslee, Ph. D. Yale; T. J. A. Hefferman, Ph. D. Cambridge; M. Kallet, Ph. D. Rutgers; M. L. Keene, Ph. D. Texas; I. Leki, Ph. D. Illinois; M. A. Lofaro, Ph. D. Michigan; C. J. Malland, Ph. D. Michigan; M. P. Richards, Ph. D. Wisconsin; F. K. Robinson, Ph. D. Texas; R. E. Stillman, Ph. D. Pennsylvania.


Instructors: J. L. Ball, Ph. D. Tennessee; K. Benson, M. A. Tennessee; M. J. Cafée, M. A. Tennessee; P. F. Clark, Ph. D. Houston; W. W. Demestes, Ph. D. Wisconsin; M. Emery, M. A. New York; S. E. Farrier, Ph. D. Cornell; B. A. Fogelman, Ph. D. New York; D. E. Francisco, M. A. Tennessee; R. J. Frontain, Ph. D. Purdue; P. J. Hanse, Ph. D. Cornell; C. M. Hoffman, M. A. Iowa; N. H. Kaylor, Jr., Ph. D. Vanderbilt; M. S. Lewis, Ph. D. Tennessee; E. D. Overbey, M. A. Virginia; M. E. Papke, Ph. D. McGill; M. H. Simpson, M. A. Oregon; P. A. Troy, M. A. New Mexico State; M. Waldvogel, M. A. Michigan; J. A. Williamson, M. A. Southern Illinois.

French

See Romance Languages.

Geography

Prerequisites: S. R. Jumper (Head), Ph. D. Tennessee; C. S. Aiken, Ph. D. Georgia; T. L. Bell, Ph. D. Iowa; E. H. Hammond (Emeritus), Ph. D. California (Berkeley); R. G. Long (Emeritus), Ph. D. Northwestern; C. W. Minkel (Vice Provost and Dean for Graduate Studies), Ph. D. Syracuse; C. T. Paludan, Ph. D. Colorado; T. H. Schumde, Ph. D. Wisconsin; T. J. Wilbanks (Adjunct), Ph. D. Syracuse.

Associate Professors: L. W. Brinkman, Jr., Ph. D. Wisconsin; J. R. Carter (Associate Director, U. T. Computing Center), Ph. D. Georgia; R. A. Foresta, Ph. D. Rutgers; L. M. Pulipher, Ph. D. Southern Illinois; B. A. Raitson, Ph. D. Northwestern; J. B. Rehder, Ph. D. Louisiana State.

Assistant Professors: T. J. Blasing (Adjunct), Ph. D. Wisconsin; C. P. Harden, Ph. D. Colorado (Boulder); S. P. Horn, Ph. D. California (Berkeley).

A B. A. major in Geography consists of Geography 310, 320, 330, 340, 415 and 499, along with an additional 18 hours selected from geography courses at the 300 and 400 levels. At least one course must be chosen from among Geography 361, 363, 365, 372, 373, 375, and 379 and at least nine of the 18 additional hours must be at the 400 level.

Minor: Geography 101-102 are recommended as an introduction to the minor, which consists of Geography 310, 320, 330, 340, and 360. Six additional hours of upper division work in geography, including at least three hours at the 400 level.

Students who have successfully completed Geography 131-132 are considered to have satisfied this course requirement in the geography major or minor.
Geological Sciences

Professors:
K. R. Walker (Head), Ph. D. Yale; H. J. Klepser (Emeritus), Ph. D. Ohio State; O. C. Kopp, Ph. D. Columbia; K. C. Misra, Ph. D. Western Ontario; R. E. McLaughlin (Emeritus), Ph. D. Tennessee; H. Y. McSween, Ph. D. Harvard; L. A. Taylor, Ph. D. Lehigh; J. G. Walls (Emeritus), Ph. D. North Carolina.

Associate Professors:
D. W. Byerly, Ph. D. Tennessee; S. G. Driese, Ph. D. Wisconsin; M. McKinney, Ph. D. Yale.

Prerequisites to a B. S. major are: Geology 101-102; Chemistry 120-130; Mathematics 141-142; three semesters from Physics 131-132; Biology 110-120. This requirement includes a two semester sequence in one area plus a single semester in the other; the single semester may be satisfied by high school course work in that area.

Major requirement consists of: Geology 310, 320, 330, 340, 370 (16 hours); 3 courses from: Geology 410, 420, 440, 450, 460, 470, 480; and 5 hours of geography courses numbered 300 or above. Geology 440 (field camp) is strongly recommended for students planning a career in geology.

Minor requirement consists of: Prerequisites: Geology 101-102. Geology courses: at least 16 hours of courses numbered 200 or higher.

Germanic and Slavic Languages

Professors:
J. E. Falen, Ph. D. Pennsylvania; H. W. Fuller (Emeritus), Ph. D. Wisconsin; H. Kratz, Ph. D. Ohio State; Ph. D. Cornell. Assistant Professors:
D. M. Fiene, Ph. D. Indiana; N. A. Lauckner, Ph. D. Wisconsin; D. E. Lee (Head), Ph. D. Stanford; C. J. Mellor, Ph. D. Chicago; U. C. Ritzenhoff, Ph. D. Connecticut. Associate Professors:
C. Hodges, Ph. D. Chicago; J. Kolodziej, Ph. D. Indiana. Instructors:
M. H. Harris, M. A. Illinois; A. Rashkovsky, M. A. Tartu.

Placement Examination. Students who have had previous work in German or Russian either in high school or at another college should take a placement test to determine what level course they should elect. Placement tests are given for incoming freshmen during orientation in the summer, and also the first week of each semester.

Proficiency Examinations. Students who have acquired a knowledge of German or Russian through private study, tutoring, residence in foreign countries, or the like, should request a proficiency test. A student earning a grade of C or better on such a test will receive credit for an appropriate number of courses. Superior students are encouraged to proceed as rapidly as their achievement permits. Students who omit any course in a sequence may receive credit for it by passing a proficiency examination.

Foreign Study. Students are encouraged to study abroad, particularly through participation in the University's International Student Exchange Program (ISEP). The department is also prepared to recommend summer study programs and year abroad programs for students who are interested in foreign study. Credits from recognized foreign study programs can readily be transferred to UTK. For qualified students, the department also offers German 491 Foreign Study and Russian 491 Foreign Study. Students should consult their department before registering for the foreign study course.

B. A. Major in German. Majors or minors in German should carefully prepare their programs in consultation with a departmental faculty advisor. German 201-202 or the equivalent is a prerequisite to the major. The major shall consist of at least 24 hours of German courses numbered above 300, (excluding courses in English translation or 331-332), and shall usually include German 301-302. In order to graduate, majors will be required to take a proficiency test in German. It is recommended that German majors also take History 151-152 or 334-335 and 6 hours of 200 level English courses. Majors are also strongly urged to consider a minor in some other area of the humanities.

Minor in German. German 201-202 or its equivalent is a prerequisite to the minor. The minor shall consist of at least 18 hours of German courses numbered above 300, which normally include German 301-302 and 12 additional hours of courses numbered above 300 (excluding 331-332 and courses in English translation). Students taking German courses numbered above 300 in the College of Liberal Arts/Geological Sciences for personal identity. Students take history courses to develop their skills in thinking, reading, writing and speaking; to understand the links between past, present and future; and to assist them in their search for personal identity.

B. A. Major. Majors in history should prepare their programs in consultation with a departmental faculty advisor. History 151-152 (or their honors equivalents) or 161-162 are prerequisites to a major which consists of 27 hours, including: (1) 6 hours of History 251-252 (or their honors equivalents); and (2) 21 upper-division hours. The distribution of the upper-division courses shall be in such a way that they include at least one course dealing predominantly with a period prior to 1750 may count in the distribution and at least one course in each of the following:

Greek

See Classics.

Hebrew

See Religious Studies.

History

Professors:
J. H. Morrow, Jr. (Head and Alumni Distinguished Service Professor), Ph. D. Pennsylvania; P. H. Bergeron, Ph. D. Vanderbilt; E. V. Chmielewski, Ph. D. Harvard; R. E. Duncan, Ph. D. California (Berkeley); J. R. Finger, Ph. D. Washington; L. P. Graf (Benwood Distinguished Service Professor and Emeritus), Ph. D. Harvard; Y. P. Hao (Lindsay Young Professor), Ph. D. Harvard; A. G. Haas, Ph. D. Chicago; R. W. Hawkins (Emeritus), Ph. D. California (Berkeley); C. O. Jackson (Associate Dean, Liberal Arts College), Ph. D. Emory; M. M. Klein (Alumni Distinguished Service Professor, Lindsay Young Professor and Emeritus), Ph. D. Columbia; L. A. Ratner (Dean, Liberal Arts), Ph. D. Cornell.

Assistant Professors:
S. D. Becker, Ph. D. Case Western Reserve; J. D. Bing, Ph. D. Indiana; J. Bohstedt, Ph. D. Harvard; C. W. Johnson, Ph. D. Michigan; M. J. McDonald, Ph. D. Pennsylvania; J. Muldowry (Associate Head), Ph. D. Yale; P. J. Pinckney, Ph. D. Vanderbilt; E. H. Trainer, Ph. D. Emory; J. G. Uteley, Ph. D. Illinois; W. B. Wheeler, Ph. D. Virginia.

Assistant Professors:
P. H. Brummett, Ph. D. Chicago; J. R. Farr, Ph. D. Northwestern; W. W. Farris, Ph. D. Harvard; C. G. Fleming, Ph. D. Duke; C. L. Lansing, Ph. D. Michigan; C. D. Matson, Ph. D. Columbia; J. D. Miller, Ph. D. Duke. Instructor:
D. B. Morrow, M. A. Tennessee.

The department's program is designed to provide students with a knowledge of their cultural traditions and of their world, past and present, and thus to prepare them for the responsibilities of citizenship in today's complex society. Students take history courses to develop their skills in thinking, reading, writing and speaking; to understand the links between past, present and future; and to assist them in their search for personal identity.

B. A. Major. Majors in history should prepare their programs in consultation with a departmental faculty advisor. History 151-152 (or their honors equivalents) or 161-162 are prerequisites to a major which consists of 27 hours, including: (1) 6 hours of History 251-252 (or their honors equivalents); and (2) 21 upper-division hours. The distribution of the upper-division courses shall be in such a way that they include at least one course dealing predominantly with a period prior to 1750 may count in the distribution and at least one course in each of the following:

Foreign Study. Students are encouraged to study abroad, particularly through participation in the University's International Student Exchange Program (ISEP). The department is also prepared to recommend summer study programs and year abroad programs for students who are interested in foreign study. Credits from recognized foreign study programs can readily be transferred to UTK. For qualified students, the department also offers German 491 Foreign Study and Russian 491 Foreign Study. Students should consult their department before registering for the foreign study course.

Minor in German. German 201-202 or its equivalent is a prerequisite to the minor. The minor shall consist of at least 18 hours of German courses numbered above 300, which normally include German 301-302 and 12 additional hours of courses numbered above 300 (excluding 331-332 and courses in English translation).
areas: (a) Europe-Latin America, (b) United States, and (c) Asia-Africa.

Minor. History 151-152 (or honors equivalents) are prerequisites to a minor which consists of 15 hours of courses numbered 200 or above, including at least: (1) 6 hours in United States history; and (2) 9 upper-division hours.

History for Non-Majors. The department welcomes non-majors in its courses. Few history courses have formal prerequisites.

Honors Program. The Department of History offers honors sections of the Western Civilization and United States history survey course. Some entering freshmen are invited to participate; other interested students may apply. These survey courses are open to non-majors. An honors major requires successful completion of two special courses at the junior level (307-308), and a senior thesis (407-408). The honors major consists of 33 hours, including 27 hours as outlined above, plus 307-308. All rising juniors who are declared history majors with an overall GPA of at least 3.0 are invited to join the Junior-Senior Honors Program. Students interested in honors work should consult the department’s honors coordinator.

Human Services

The interdisciplinary program in Human Services is comprised of applied social sciences operating within the tradition of humanism, liberal thought, and concern for the values and dignity of persons. See the Department of Special Services Education in the College of Education for a statement of requirements for progression into the major. Courses offered in the Department of Special Services Education in the College of Education provide opportunity for a major in the College of Liberal Arts.

Requirements for a B. A. in Human Services include: (1) Special Services Education 220, 330, 380, 420, 430, 440, 441; (2) 9 hours from a departmentally-developed list of professional electives; (3) Special Services Education 220, Psychology 360, and Sociology 375 to be used to fulfill the College Social Science distribution requirement; and three additional hours of Mathematics.

Italian

See Romance Languages.

Japanese

See Cultural Studies (Asian Studies).

Latin

See Classics.

Latin American Studies

See Cultural Studies.

Linguistics

See Cultural Studies.

Mathematics

Professors:

J. S. Bradley (Head), Ph. D. Iowa; G. E. Albert (Emeritus), Ph. D. Wisconsin, D. F. Anderson, Ph. D. Chicago; G. A. Baker, Ph. D. Cornell; J. H. Carruth, Ph. D. Louisiana State; C. E. Clark, Ph. D. Louisiana; R. E. Cline, Ph. D. Purdue; R. J. Davenier, Ph. D. Wisconsin; D. J. Desert, Ph. D. Maryland; D. E. Dobbs, Ph. D. Cornell; E. D. Eaves (Emeritus), Ph. D. Texas; H. Frandsen, Ph. D. Illinois; J. A. George, Ph. D. Stanford; T. G. Hallam, Ph. D. Missouri; D. B. Hinton, Ph. D. Tennessee; A. S. Householder (Emeritus), Ph. D. Chicago; I. S. Husch, Ph. D. Florida State; G. S. Jordan, Ph. D. Wisconsin; B. A. Kuperansmidt (Space Institute, Tullahoma), Ph. D. Massachusetts Institute Technology, J. H. T. Mathews, Ph. D. Tulane; R. M. McConnel, Ph. D. Duke; D. D. Miller (Emeritus), Ph. D. Michigan; B. S. Rappaport, Ph. D. Illinois; K. C. Raddy (Space Institute, Tullahoma), Ph. D. Indian Institute of Technology; P. W. Schaefer, Ph. D. Maryland; S. M. Serbin, Ph. D. Cornell; K. Soni, Ph. D. Oregon State; F. W. Stammann (Emeritus), Ph. D. Jensen (Germany); K. R. Stephenson, Ph. D. Wisconsin; E. Wachspress, Ph. D. Rensselaer Polytechnic Institute; W. R. Wade, Ph. D. California (Riverside); C. G. Wagner, Ph. D. Duke; J. J. Walsh, Ph. D. SUNY (Binghamton).

Associate Professors:

V. Alexiades, Ph. D. Delaware; N. Alkakos, Ph. D. Brown; J. Dydak, Ph. D. Warsaw (Poland); L. T. Gross, Ph. D. Cornell; O. Karakashian, Ph. D. Harvard; K. R. Kimberly (Space Institute, Tullahoma), Ph. D. Ohio State; Y. Kuo, Ph. D. Cincinnati; S. Lenhart, Ph. D. Kentucky; J. Rosinski, Ph. D. Wroclaw University, W. H. Row, Jr., Ph. D. Wisconsin, H. Simpson, Ph. D. California Institute of Technology; J. Smith, Ph. D. California (Berkeley); B. K. Soni (Space Institute, Tullahoma), Ph. D. Texas; R. P. Soni, Ph. D. Oregon State; C. Sundberg, Ph. D. Wisconsin.

Assistant Professors:

L. Baies, Ph. D. Cornell; J. A. Haefner, Ph. D. Wisconsin; M. Kot, Ph. D. Arizona; S. Mulay, Ph. D. Purdue; B. K. Soni (Space Institute, Tullahoma), R. Svirsky, Ph. D. John Hopkins.

Instructor:

C. G. Doss, M. A. Tennessee.

B. S. Major: Mathematics 141-142 (or the Honors version, 147-148) is prerequisite to a major in Mathematics. Majors must also have computer programming skills sufficient to take 371; students without other computing experience should take Computer Science 100, 101, or 102. The courses required for the major are: 221 Discrete Mathematics (3); 231 Differential Equations I (3); 241 calculus III; or 247 Honors: Calculus III (4); 251 Matrix Algebra I; or 257 Honors: Matrix Algebra I (3); 323 Probability I (3); 341 Analysis I (3); 351 Algebra I (3); 371 Numerical Algorithms I (3) and nine additional hours selected from Mathematics courses numbered 421 through 472.

Honors B. S. Major: Candidates for an honors degree in Mathematics must fulfill all of the requirements for the B. S. degree in Mathematics, but take 12 (rather than 9) hours in Mathematics courses numbered 421 through 472. The grade point average computed on the 24 hours of Mathematics courses consisting of 323, 341, 351, and 371, plus the aforementioned 12 hours, will determine the honors category: GPA at least 3.4 - Honors; GPA at least 3.6 - High Honors; GPA at least 3.8 - Highest Honors. Students with credit for more than 12 hours in courses numbered 421 through 472 may designate the 12 hours to be included in the above average.

Minor: Mathematics 141-142 (or 147-148) is prerequisite to a minor in Mathematics. A minor in Mathematics consists of (1) 241 and 251; (2) 221 or 231; and (3) nine additional hours in Mathematics courses numbered 300 or higher. The grade in each of the above courses must be at least C.

Medieval Studies

See Cultural Studies.

Medical Biology/Memorial Research Center

The Department of Medical Biology of The University of Tennessee College of Medicine-Knoxville Unit was formed from the faculty of The University Memorial Research Center and Hospital in 1978. The Research Center was established in 1956. The faculty has research, education, and service interests in cancer, blood diseases, metabolism, neuroscience, birth defects, cytogenetics and clinical genetics. Courses in these areas are offered to students at the graduate and undergraduate levels. Elective courses are also available to students in the College of Medicine.

The faculty with the College of Veterinary Medicine participates in the graduate program leading to M. S. and Ph. D. degrees in Comparative and Experimental Medicine. Other advanced degree students can do thesis research in the department by arrangement with other life science departments at the University.

Microbiology

Professors:

A. Brown (Head), Ph. D. Chicago; R. W. Beck, Ph. D. Wisconsin; J. M. Becker, Ph. D. Cincinnati; D. A. Brian, Ph. D. D. V. M. Michigan State; T. C. Montie, Ph. D. Maryland; W. S. Riggby, Ph. D. Yale; B. T. Rosenthal, Ph. D. Ottawa (Canada); B. V. Sc., Bristol (England); G. S. Sayler,
W. S. MacMorran, M. M. Wisconsin; C. F. Leach, M. M. New Mexico; W. W. Hawthorne, Ph. D. Cincinnati; Assistant Professors; S. E. Young, Ph. D. North Carolina.


D. K. McClelland, M. A. Columbia; D. M. A. Eastman; J. Coker, M. A. Sam Houston; R. N. Moore, Ph. D. Rockefeller; M. M. Indiana.

J. P. Weir, Ph. D. Vanderbilt. Assistant Professors:

B. M. Curriculum in Sacred Music (Organ or Piano)

Music Minor (a) Concentration in Applied Music - consists of 17 hours in courses numbered 200 and above, distributed as follows: Music History 200, 8 hours in applied music, and 6 hours in music electives. Pre-requisites are Music General 100 or equivalent and two semesters of applied music study (Music Performance) at the 103-190 levels. (b) Concentration in Music History and Literature - consists of 17 hours in courses numbered 200 and above, distributed as follows: Music History 200, 9 hours in Music History and Literature courses, and 5 hours in music electives. Pre-requisites are Music General 100 or equivalent and two semesters of applied music study at the 103-190 levels.

B. M. Curriculum in Sacred Music (Organ or Piano)

Music Education 330
Music General 200
Music General 200
Music General 200

Junior
Mathematics, or Natural Science

Music History Elective

Music Theory 310
Music Keyboard 230-240*
Music History 480, 490
Music Performance 390
Music Education 310-320
Music Ensemble
Music General 200
Music General 200
Music General 301

Senior
General Education

Music Keyboard 310-320*
Music Keyboard 460-470*
Music Performance 490*
Music Ensemble
Electives*

Music General 200
Music General 200
Music General 401

Total: 130 hours

1 Humanities-Arts (non-music), Literature, Philosophical Perspectives, Interdisciplinary Studies.
3 Piano majors substitute: Music Keyboard 410-420, 430-440-450 (total 10 hours) for Music Keyboard 240-310-320-460-470 (total 9 hours).

B. M. Curriculum in Sacred Music (Voice)

B. M. Curriculum in Sacred Music (Voice)
<table>
<thead>
<tr>
<th>Course</th>
<th>Hours Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Music General 200</td>
<td>0</td>
</tr>
<tr>
<td>Music General 401</td>
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</tr>
</tbody>
</table>

**Total: 130 hours**

1. Humanities-Arts (non-music), Literature, Philosophical Perspectives, Interdisciplinary Studies.

### B. M. Curriculum in Composition

#### Hours Credit

<table>
<thead>
<tr>
<th>Freshman</th>
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<tbody>
<tr>
<td>English Composition</td>
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<tr>
<td>Music Theory 110, 120</td>
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<td>Music Theory 130, 140</td>
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<tr>
<td>Music History 200</td>
<td>3</td>
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<td>Applied Music</td>
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<td>Applied Music</td>
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<tr>
<td>Senior</td>
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<tr>
<td>Foreign Language</td>
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<tr>
<td>Music General 200</td>
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<td>Music General 200</td>
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**Sophomore**

<table>
<thead>
<tr>
<th>Non-U.S. History or Social Science</th>
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<tbody>
<tr>
<td>Music Theory 210, 220</td>
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<tr>
<td>Music History 230, 240</td>
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<tr>
<td>Music General 200</td>
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<td>Music General 200</td>
<td>0</td>
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<tr>
<td>Non-U.S. History, Social Science</td>
<td>6</td>
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</tbody>
</table>

**Junior**

| Music Performance 392           | 6            |
| Applied Music                   | 1            |
| Music Theory 310, 320, 420, 430, 440 | 15         |
| Music History Elective          | 3            |
| Music Ensemble                  | 1            |
| Music General 200               | 0            |
| Music General 200               | 0            |
| Electives                       | 4            |

**Senior**

| Music Performance 492           | 6            |
| Applied Music                   | 1            |
| Music Theory Elective           | 1            |
| Applied Music                   | 1            |
| Music General 120               | 2            |
| Music General 200               | 0            |
| Music General 200               | 0            |
| Non-U.S. History, Social Science| 6            |

**Total: 129 hours**

1. Humanities-Arts (non-music), Literature, Philosophical Perspectives or Interdisciplinary Studies.

### B. M. Curriculum in Multiple Woodwind Instruments

<table>
<thead>
<tr>
<th>Freshman</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>English Composition</td>
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</tr>
<tr>
<td>Music Theory 110, 120</td>
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<tr>
<td>Music Theory 130, 140</td>
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<tr>
<td>Music History 200</td>
<td>3</td>
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<tr>
<td>Applied Music Principal (100 level)</td>
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<tr>
<td>Music Ensemble</td>
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<tr>
<td>Music Theory 210, 220</td>
<td>6</td>
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<tr>
<td>Music Theory 230, 240</td>
<td>2</td>
</tr>
<tr>
<td>Applied Music Principal (200 level)</td>
<td>4</td>
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<tr>
<td>Music Ensemble</td>
<td>2</td>
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</tbody>
</table>

**Sophomore**

| Music Theory 210, 220         | 6            |
| Applied Music Principal (300 level) | 4        |
| Applied Music Secondary       | 4            |
| Music Ensemble                | 4            |
| Music Instrument 320          | 4            |
| Music General 200             | 0            |
| Music General 200             | 0            |
| Elective                      | 6            |
| General Education             | 3            |
| Music History Elective        | 3            |

**Senior**

| Music Education 310           | 6            |
| Applied Music Principal (400 level) | 6        |
| Applied Music Secondary       | 2            |
| Music Theory 310              | 3            |
| Mathematics, Natural Science  | 6            |
| Music Keyboard Literature?    | 8            |
| Music General 200             | 0            |
| Music General 301             | 0            |

**Junior**

| Music History Elective        | 3            |
| Applied Music Principal (300 level) | 6        |
| Applied Music Secondary       | 2            |
| Music Theory 310              | 3            |
| Mathematics, Natural Science  | 6            |
| Music Keyboard Literature?    | 8            |
| Music General 200             | 0            |
| Music General 301             | 0            |

**Total: 128 hours**

1. Humanities-Arts (Non-music), Literature, Philosophical Perspectives or Interdisciplinary Studies.

### B. M. Curriculum in Multiple Woodwind Instruments

<table>
<thead>
<tr>
<th>Freshman</th>
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</thead>
<tbody>
<tr>
<td>English Composition</td>
<td>6</td>
</tr>
<tr>
<td>Music Theory 110, 120</td>
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<tr>
<td>Music Theory 130, 140</td>
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<tr>
<td>Music History 200</td>
<td>3</td>
</tr>
<tr>
<td>Applied Music Principal (100 level)</td>
<td>4</td>
</tr>
<tr>
<td>Music Ensemble</td>
<td>2</td>
</tr>
<tr>
<td>Music Theory 210, 220</td>
<td>6</td>
</tr>
<tr>
<td>Music Theory 230, 240</td>
<td>2</td>
</tr>
<tr>
<td>Applied Music Principal (200 level)</td>
<td>4</td>
</tr>
<tr>
<td>Music Ensemble</td>
<td>2</td>
</tr>
<tr>
<td>Music Instrument 320</td>
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<tr>
<td>Music General 200</td>
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<tr>
<td>Music General 200</td>
<td>0</td>
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<td>Elective</td>
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</tr>
<tr>
<td>General Education</td>
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</table>

**Senior**

| Music Education 310           | 6            |
| Applied Music Principal (300 level) | 6        |
| Applied Music Secondary       | 4            |
| Music Theory 310              | 3            |
| Mathematics, Natural Science  | 6            |
| Music Keyboard Literature?    | 8            |
| Music General 200             | 0            |
| Music General 301             | 0            |

**Junior**

| Music History Elective        | 3            |
| Applied Music Principal (300 level) | 6        |
| Applied Music Secondary       | 2            |
| Music Theory 310              | 3            |
| Mathematics, Natural Science  | 6            |
| Music Keyboard Literature?    | 8            |
| Music General 200             | 0            |
| Music General 301             | 0            |

**Total: 128 hours**

1. Humanities-Arts (Non-music), Literature, Philosophical Perspectives or Interdisciplinary Studies.

### B. M. Curriculum in Music History and Literature

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<td>Music Theory 110, 120</td>
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<td>Music Theory 130, 140</td>
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<td>Music History 200</td>
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<td>Applied Music</td>
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<tr>
<td>Music Ensemble</td>
<td>2</td>
</tr>
<tr>
<td>Foreign Language</td>
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<tr>
<td>Music General 200</td>
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<tr>
<td>Music General 200</td>
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</table>

**Sophomore**

| Music Theory 210, 220         | 6            |
| Applied Music Principal (400 level) | 4        |
| Applied Music Secondary       | 2            |
| Music Theory 210, 220         | 6            |
| Music Theory 230, 240         | 2            |
| Applied Music Principal (200 level) | 4        |
| Music Ensemble                | 2            |
| Art History                   | 6            |
| Foreign Language              | 6            |
| Music General 200             | 0            |
| Music General 200             | 0            |

**Junior**

| Music Theory 310, 320         | 6            |
| Music History 210, 220        | 6            |
| Music History 230, 240        | 2            |
| Music Theory 210, 220         | 6            |
| Applied Music Principal (200 level) | 4        |
| Music Ensemble                | 2            |
| Music History Elective        | 3            |
| Foreign Language              | 6            |
| Music General 200             | 0            |
| Music General 200             | 0            |

**Total: 126 hours**

1. Humanities-Arts (Non-music), Literature, Philosophical Perspectives or Interdisciplinary Studies.
**B. M. Curriculum in Music Theory**

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<td>Music Ensemble</td>
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<tr>
<td>Natural Science or Mathematics</td>
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<tr>
<td>Music General 200</td>
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Total: 129 hours

1. Humanities-Arts (non-music), Literature, Philosophical Perspectives or Interdisciplinary Studies.
2. Must be two years in either French or German.

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**B. M. Curriculum in Studio Music and Jazz**

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<td>Music History 210, 220</td>
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<td>Music Theory 250, 290</td>
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<tr>
<td>Music Ensemble</td>
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</tr>
<tr>
<td>Mathematics, Natural Science; Humanities-Arts (non-music), Literature, Philosophical Perspectives, Interdisciplinary Studies</td>
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<tr>
<td>Music General 200</td>
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<tr>
<td>Music General 200</td>
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<tr>
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<tr>
<td>Music Theory 310, 320</td>
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<tr>
<td>Music Theory 420, 430, 440</td>
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<tr>
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<td>Music General 200</td>
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<tr>
<td>Music General 200</td>
<td>0</td>
</tr>
<tr>
<td>Senior Music Education 310</td>
<td>3</td>
</tr>
<tr>
<td>Music History/Literature (300 or above)</td>
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<td>Music Ensemble</td>
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<td>Music Theory 401</td>
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Total: 129 hours

1. Humanities-Arts (non-music), Literature, Philosophical Perspectives, Interdisciplinary Studies.

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**B. M. Curriculum in Organ**

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<td>Music Theory 110, 120</td>
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<td>Music History 200</td>
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<tr>
<td>Foreign Language</td>
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<td>Music General 200</td>
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<tr>
<td>Sophomore</td>
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<tr>
<td>Music Theory 210, 220</td>
<td>6</td>
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<tr>
<td>Music Theory 230, 240</td>
<td>6</td>
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<tr>
<td>Music History 210, 220</td>
<td>6</td>
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Total: 130 hours

1. Humanities-Arts (non-music), Literature, Philosophical Perspectives, Interdisciplinary Studies.

---

**B. M. Curriculum in Piano**

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</thead>
<tbody>
<tr>
<td>English Composition</td>
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</tr>
<tr>
<td>Music Theory 110, 120</td>
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<tr>
<td>Music Theory 130, 140</td>
<td>2</td>
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<tr>
<td>Music History 200</td>
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</tr>
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<td>Music Performance 280</td>
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</tr>
<tr>
<td>Mathematics, Natural Science</td>
<td>6</td>
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<tr>
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<tr>
<td>Music General 200</td>
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<tr>
<td>Music General 200</td>
<td>0</td>
</tr>
<tr>
<td>Senior Music Keyboard 230, 410</td>
<td>3</td>
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<tr>
<td>Music Performance 480</td>
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<td>Music General 200</td>
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<tr>
<td>Music General 200</td>
<td>0</td>
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<tr>
<td>Senior Music Keyboard 230, 410</td>
<td>3</td>
</tr>
<tr>
<td>Music Performance 480</td>
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</table>

Total: 130 hours

1. Humanities-Arts (non-music), Literature, Philosophical Perspectives, Interdisciplinary Studies.

---

**B. M. Curriculum in Piano Pedagogy and Literature**

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<tr>
<td>Music General 200</td>
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<tr>
<td>Music General 200</td>
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<tr>
<td>Senior Music Keyboard 230, 410</td>
<td>3</td>
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<td>Music Performance 480</td>
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<td>Music General 200</td>
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Total: 130 hours

1. Humanities-Arts (non-music), Literature, Philosophical Perspectives, Interdisciplinary Studies.
<table>
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<td>Class Piano Pedagogy</td>
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<td>Music Performance 480</td>
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<td>Music Ensemble 309</td>
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<td>General Education</td>
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<td>Music Electives</td>
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<td>Music General 401</td>
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<td>Electives</td>
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<td>Total: 130 hours</td>
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1. Humanities-Arts (non-music), Literature, Philosophical Perspectives, Interdisciplinary Studies.

### B. M. Curriculum in String Pedagogy

#### Freshman

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<td>Music Theory 130, 140</td>
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<tr>
<td>Music History 200</td>
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<tr>
<td>Applied Music Principle (100 level)</td>
<td>8</td>
</tr>
<tr>
<td>Music Keyboard 110, 120</td>
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<td>Mathematics, Natural Science</td>
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#### Sophomore

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<td>Music History 210, 220</td>
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<td>Music Keyboard 210, 220</td>
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<td>Applied Music Principle (400 level)</td>
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1. Humanities-Arts (non-music), Literature, Philosophical Perspectives, Interdisciplinary Studies.

### B. M. Curriculum in Voice

#### Freshman

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<td>Music Keyboard 220, 220</td>
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<td>Music Education 310</td>
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<td>Music General 200</td>
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<td>Music General 401</td>
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<tr>
<td>Junior Music Education 310</td>
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<td>Music Theory 310</td>
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<td>Music Performance 355</td>
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<td>Theatre 220</td>
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1. Humanities-Arts (non-music), Literature, Philosophical Perspectives, Interdisciplinary Studies.

### B. M. Curriculum in Woodwind, Brass and Percussion Instruments

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<tr>
<td>Total: 130 hours</td>
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</tbody>
</table>

1. Must take 1 year of 2 languages chosen from French, German or Italian.

### Organizational Psychology Program

See Graduate School.

### Philosophy

Professors:


Associate Professors:


Assistant Professors:

- H. P. Hamlin, Ph. D. Georgia; E. R. Jones III, Ph. D. Chicago; M. Lavin, Ph. D. Stanford.
Physicists and
Astronomy

Professors:
W. M. Bugg (Head), Ph. D. Tennessee;
C. R. Bingham, Ph. D. Tennessee;
W. E. Blass, Ph. D. Michigan State;
J. E. Brau, Ph. D. Massachusetts Institute of
Technology; M. A. Breazeale, Ph. D. Michigan State;
T. A. Callcott, Ph. D. Purdue;
L. G. Christophorou, Ph. D. Manchester
(England); G. T. Condo, Ph. D. Illinois;
C. J. Craven (Emeritus), Ph. D. North
Carolina; W. E. Deeds, Ph. D. Ohio State;
J. B. Dicks, Jr. (Space Institute, Tullahoma),
Ph. D. Vanderbilt; K. Fox, Ph. D. Tennessee;
D. J. Pegg, Ph. D. New
Jr., Ph. D. Pittsburgh;
L. R. Painter, Ph. D. Tennessee;
H. H. Bartlett, Ph. D. New Hampshire;
P. J. Rennings, Ph. D. Dallas;
R. H. Ritchie, Ph. D. Tennessee;
W. R. Rusk (Emeritus), M. S. Tennessee;
H. C. Schweinler, Ph. D. Massachusetts
Institute of Technology; J. F. Sellin (Alumni
Distinguished Service Professor and
Chancellor's Research Scholar), Ph. D.
Chicago;
C. C. Shih, Ph. D. Cornell;
P. J. Siemens (Distinguished Scientist,
Science Alliance Center of Excellence), Ph. D.
Cornell;
P. H. Stelson, Ph. D.
Massachusetts Institute of Technology;
J. R. Thompson, Ph. D. Duke;
J. O. Thompson, Ph. D. Illinois;
J. W. White (Emeritus), Ph. D. North
Carolina.

Associate Professors:
M. J. Breinig, Ph. D. Oregon;
J. Burgdorfer, Ph. D. Freie Universität, Berlin;
R. W. Childers, Ph. D. Vanderbilt;
J. R. Correll (Space Institute, Tullahoma),
Ph. D. Colorado State; H. W. Crater (Space
Institute, Tullahoma), Ph. D. Yale;
W. A. Dunill (Space Institute, Tullahoma),
Ph. D. Florida; S. B. Elston, Ph. D.
Massachusetts; W. M. Farmer (Space
Institute, Tullahoma), Ph. D. Tennessee;
T. Ferrell, Ph. D. Clemson; T. H. Handler,
Ph. D. Rutgers; D. R. Keffer (Space Institute,
Tullahoma), Ph. D. Florida; R. H. Kohli (Space
Institute, Tullahoma), Ph. D. Ohio State;
R. W. Lide, Ph. D. Michigan; S. V. Shieh,
Ph. D. Maryland; B. G. L. Ward, Ph. D.
Princeton.

Assistant Professors:
S. J. Daunt, Ph. D. Quaers; R. DeSario,
Ph. D. Chicago; R. Harms, Ph. D. Ohio
State; S. P. Sorensen, Ph. D. Copenhagen.

Research Professor:
H. D. Cohn, Ph. D. Indiana.

Research Associate Professors:
D. L. McCorkle, Ph. D. Tennessee;
S. R. Nave, Ph. D. Tennessee.

Research Assistant Professors:
C-S, O. Ph. D. New York University;
K. L. Tsang, Ph. D. Alabama; J. A. Vrba,
Ph. D. Tennessee; R. J. Warmack, Ph. D.

Lecturer:
T. Rieding, M. S. Vanderbilt.

B. S. Major

The undergraduate physics major provides a thorough introduction to all of the core disciplines of physics so that all students are prepared to pursue related specialties at a later point in career. Students with special interests are encouraged to pursue those interests through research projects and/or independent study under the direction of members of the physics faculty through Physics 493.

Prerequisites to the major are: Physics 131-132 or 137-138; Mathematics 141-142.

The major consists of: Physics 231-232 or 237-238; Mathematics 231 and 241; Physics 311 (students intending to pursue graduate studies in Physics should also take 312 and 421 as electives); Physics 321, 322, 330, 331, 332, 340, 374, 410, 411, 412, 420, 421, 422, 430, 431, 440, 441 and 442.

Comparative Government and Politics:
311, 350, 355, 361, 452, 454, 458, 460, 461, 463 and 464

International Relations:
365, 366, 370, 455, 489 and 470

Political Theory: 374, 475 and 476

Honors in Political Science: The Honors concentration encourages highly motivated students to obtain a superior liberal education and more rigorous preparation in the discipline. Admission is selective. The Honors concentration is normally a two year program. Political Science 101, 107 and 102 are prerequisites to the major which consists of thirty-six hours, Political Science 301, 387-388, and 21 additional hours numbered 300 and above. These 21 hours must include at least one course in each of the four areas of the discipline: United States Government and Politics/Public Administration; Comparative Government and Politics; International Relations; and Political Theory.

To graduate with Honors in Political Science, the student must have a minimum GPA of 3.5 in Political Science, and a minimum cumulative GPA of 3.0.

Major in Political Science with a Concentration in Public Administration: Students majoring in Political Science who wish to prepare for a career in the public service may select to follow the concentration in Political Science. Political Science 101 or 107 and 102 and Economics 201 are prerequisites to a major in Political Science with a concentration in Public Administration. Corequisite courses are Mathematics 121 and 122 and Accounting 201 and 202. Majors must earn a "C" or better in prerequisite and corequisite courses. The concentration consists of 24 hours of upper division course work in Political Science and 12 hours of upper division course work in Economics. In Political Science, students must include one course in each of the four fields of Political

Associate Professors:
R. B. Cunningham, Ph. D. Indiana;
J. W. Dodd, Ph. D. Tulane; G. C. Evans,
Ph. D. Columbia; M. R. Fitzgerald, Ph. D.
Oklahoma; W. Fierman, Ph. D. Harvard;
P. K. Freeman, Ph. D. Wisconsin; M. M. Gant,
Ph. D. Michigan State; R. A. Gorman, Ph. D.
New York; R. L. Peterson, Ph. D. Yale;
T. McN. Simpson, III, Ph. D. Johns Hopkins.

Assistant Professors:
D. H. Fol, Ph. D. Tennessee; J. M. Sheb,
Ph. D. Florida.

B. A. Major

Political Science 101 or 107 and 102 are prerequisites to the major which consists of 24 hours of courses numbered 300 and above. These 24 hours must include at least one course in each of the areas of the discipline:

United States Government and Politics/
Public Administration: 301, 310, 312, 315,
320, 321, 332, 330, 331, 340, 347, 410, 411,
412, 420, 421, 422, 430, 431, 440, 441 and 442.

Comparative Government and Politics:
311, 350, 355, 361, 452, 454, 458, 460, 461,
463 and 464

International Relations:
365, 366, 370, 455, 489 and 470

Political Theory: 374, 475 and 476

Majors must earn a "C" or better in prerequisite courses.

Minor: Political Science 101 or 107 and 102 plus 12 hours of courses numbered 300 and above.

Honors in Political Science: The Honors concentration encourages highly motivated students to obtain a superior liberal education and more rigorous preparation in the discipline. Admission is selective. The Honors concentration is normally a two year program. Political Science 101, 107 and 102 are prerequisites to the major which consists of thirty-six hours, Political Science 301, 387-388, and 21 additional hours numbered 300 and above. These 21 hours must include at least one course in each of the four areas of the discipline: United States Government and Politics/Public Administration; Comparative Government and Politics; International Relations; and Political Theory.

To graduate with Honors in Political Science, the student must have a minimum GPA of 3.5 in Political Science, and a minimum cumulative GPA of 3.0.

Major in Political Science with a Concentration in Public Administration: Students majoring in Political Science who wish to prepare for a career in the public service may select to follow the concentration in Political Science. Political Science 101 or 107 and 102 and Economics 201 are prerequisites to a major in Political Science with a concentration in Public Administration. Corequisite courses are Mathematics 121 and 122 and Accounting 201 and 202. Majors must earn a "C" or better in prerequisite and corequisite courses. The concentration consists of 24 hours of upper division course work in Political Science and 12 hours of upper division course work in Economics. In Political Science, students must include one course in each of the four fields of Political
Science: American Government and Politics/Public Administration, Comparative Government and Politics, International Relations, and Political Theory. Students must also take Political Science 340, 440, 441 and 442. In Economics students must take Economics 311, 471, and 472.

Psychology


Associate Professors: J. M. Barlow, Ph. D. Tennessee; M. G. Johnson, Ph. D. Johns Hopkins; J. Kandelis, Ph. D. Tennessee; K. A. Lawler, Ph. D. North Carolina; S. Loucks, Ph. D. Tennessee, J. W. Lounsbury, Ph. D. Michigan State; A. McIntyre, Ph. D. Yale; W. G. Morgan, Jr., Ph. D. Tennessee; R. S. Saudargas, Ph. D. Florida State; C. B. Travis, Ph. D. California (Davis).

Assistant Professors: L. Beavers-Laurence, Ph. D. Tennessee; W. Berez, Ph. D. Tennessee; L. M. Coleman, Ph. D. Harvard; J. W. Erickson, Ph. D. Tennessee; L. T. Laurence, Ph. D. Tennessee; R. E. Levey, Ph. D. California School of Professional Psychology.

Major: Psychology 110 or 117 is prerequisite to a major consisting of 36 credit hours: (1) Psychology 210 or 220; (2) Three basic courses chosen from the following: 300; 310; 320; 330; 360; (3) Three courses on research, quantitative methods, and their application: Psychology 356 (or equivalent and 395), plus one of the following: 396, 399, 445, 459, 459, or 489; (4) Two upper-division courses chosen from the following: 400, 410, 420, 430, 440, 450, 461, 470, 480, 496; and (5) Three elective courses in Psychology, including at least two courses numbered 400 through 490.

For students who plan to seek graduate training in Psychology: Applicants to most graduate programs in Psychology are expected to take the Graduate Record Examination in Psychology by December of the year preceding the year they plan to graduate. The Psychology Department recommends that a prospective graduate student complete as many of the requirements for the major as possible before taking the examination. In addition to the minimum requirements for the major, the following courses are strongly recommended for prospective graduate students in psychology: one year of Biology or Zoology, one year of Calculus, one course in Computer Science; three or four additional Psychology courses chosen from 400, 410, 420, 430, 440, 445, 450, 461, 470, 480, 496.

Minor: Consists of 110 or 117; 210 or 220; 395 plus 12 additional upper-division hours.

Religious Studies

Professors: C. H. Reynolds (Head), Ph. D. Harvard; F. S. Lusby, B. D. Colgate (Rochester); D. L. Dungan, Th. D. Harvard; W. L. Humphreys, Th. D. Union; D. E. Linge, Ph. D. Vanderbilt; R. V. Norman, Jr. (Vice Provost), Ph. D. Yale.

Associate Professors: J. L. Fitzgerald, Ph. D. Chicago; M. L. Laverling, Ph. D. Harvard.

Assistant Professor: R. J. Hackett, Ph. D. Aberdeen

Adjunct: J. D. Hodges, Ph. D. Chicago; L. M. Tober, Ph. D. Vanderbilt.

Major: Religious Studies 211 is recommended as a preliminary course for each of the two concentrations available. The basic concentration is designed to assure that students attain skills to analyze and interpret religious phenomena in different cultures and in different historical periods, including how sacred texts and traditions, and interpretations of critical reasoning, inform and are informed by religion. The basic concentration consists of at least 24 hours of religious studies courses numbered 300 level or above, including one course from each of the first five categories listed below, and two courses from category six: (1) The roots of western religion, 311, 321, or 322; (2) religion and culture in South Asia, 374 or 376; (3) religion and culture in East Asia, 379 or 383; (4) religion and culture in the United States, 351 or 352; (5) critical thinking about religion, 301, 305, 342, or 371; and (6) two 400 level seminars on methods of interpreting religious phenomena, at least one of which must be 499. The remaining 3 hours which complete this major shall not include related language courses.

As an alternative to the basic concentration, a student-initiated concentration is available for students with special educational needs, such as those who intend to enter a graduate or professional school (seminary, law, medicine) who recommends a specific course of undergraduate study. A faculty member in religious studies will assist a student to formulate this major consisting of at least 27 hours of credit at the 300 level or above, including 499. Up to 9 hours in this major may be taken in approved courses from other programs or departments in the College of Liberal Arts. Students whose vocational goals would best be served by such a major would consult with a faculty member in the department, who will submit any specific proposal to the faculty in religious studies for approval.

Further details on the major and on department courses are available in the department office, located in 501 McClung Tower, or from any member of the religious studies faculty.

Minor: Fifteen hours of courses at the 300 level or above, not including related language courses. It is recommended that students minor in religious studies discuss their program with a member of the department faculty.

Romance Languages

Professors: John B. Romee (Head), Ph. D. Vanderbilt; P. E. Barrette, Ph. D. California (Berkeley); C. W. Cobb, Ph. D. Tulane; J. C. Elliott, M. A. Illinois; W. H. Haffin, Jr., Ph. D. Florida State; T. B. Irving (Emeritus), Ph. D. Princeton; F. D. Maurino (Emeritus), Ph. D. Columbia; C. R. M. Pinsky (Emeritus), Ph. D. California (Berkeley); M. Peterson, Ph. D. Kentuck; A. M. Vazquez-Big, Ph. D. Minnesota; G. E. Wade (Emeritus), Ph. D. Ohio State; A. H. Wallace, Ph. D. North Carolina; Y. M. Washburn, Ph. D. North Carolina.

Associate Professors: W. F. Byess (Emeritus), Ph. D. Wisconsin; E. J. Campion, Ph. D. Yale; R. M. E. DerRycke, Ph. D. Illinois; D. M. DiPuccio, Ph. D. Kansas; M. H. Handelman, Ph. D. Florida; K. D. Levy, Ph. D. Kentucky.

Assistant Professors: A. S. Allen, Ph. D. California (Berkeley); Charlotte G. Cox (Emeritus), M. A. Tennessee; C. K. Duncan, Ph. D. Illinois; Margot Millieret, Justin; F. Perez-Pineda, Ph. D. Penn State; C. V. Rogers, Ed. D. Georgia; B. S. West, Ph. D. North Carolina; Paula Wilson (Emeritus), M. A. Tufts.

Instructor: M. T. Rabot, Cert. de Lic. Poitiers.

French Major: Consists of 27 hours in courses numbered 311 and above. All majors must have the following courses (or their equivalent with consent of the department): 311-312, 313, 341 or 342 or 345, 421; 422; 440; 3 hours of language-oriented or civilization courses at the 300 or 400 levels. Literature concentration students must also have 6 hours of literature at the 400 level, 3 hours of which must be either 410, 411, 412, 413, or 414.

Language concentration students must also have 9 hours of language-oriented or civilization courses at the 300 or 400 levels.

French Minor: The minor consists of 18 hours in courses numbered 311 and above distributed accordingly: 311-312; 313; 341 or 342, 421; plus 3 hours of electives at the 300 or 400 levels.
Italian Major: Consists of 27 hours in courses numbered 311 and above. All majors must take 311, 312, 341, 342, and 401.

Italian Minor: Consists of 18 hours in courses numbered 311 or above. Students pursuing a minor must consult with a departmental advisor.

Portuguese Minor: Consists of 18 hours in courses numbered 300 or above. Students pursuing a minor must consult with a departmental advisor.

Spanish Major: Consists of 26 hours in courses numbered 311 or above. The following are required: 311; 312; 421; 422. Students must also have a minimum of 3 hours of conversation, either 431 or 471; a minimum of 6 hours of conversation and composition from 323, 324, 423 or 424; and a minimum of 6 hours of literature from 432, 433, 435, 456, 472, 473, 474, 479.

Students are encouraged to take as many hours as possible, especially the surveys, 435-436 and 473-474. Students must also take 459 and 460.

Spanish Minor: Consists of 18 hours in courses numbered 311 or above, including 311 and 312; 422; one course in Conversation and Composition from among the following: 323, 324, 423, 424; and the remaining courses to be chosen among Conversation and Composition, civilization, phonetics, or literature. Students pursuing a minor are strongly advised to consult with a departmental advisor.

Courses which are the equivalents of the foregoing may be substituted with the consent of the department. Courses in Spanish literature in English translation, however, may not be counted toward either a major or minor.

Placement Examination: Students who have had two or more year's work in French, Italian, or Spanish in high school or one year's work in another college should register for a placement test in the Department of French. During the first week of the semester a placement test will be given, and students will be advised if a change in registration is indicated.

Proficiency Examinations: Students who have acquired a knowledge of French, Italian, or Spanish through private study, tutoring, residence in foreign countries, or the like should initiate a request for a proficiency test in the Office of the Dean of Admissions and Records. A student earning a grade of C or better on such a test will receive credit for a limited number of courses. Superior students are encouraged to proceed as rapidly as their achievement permits.

**Russian**

See Germanic and Slavic Languages.

**Russian and East European Studies**

See Cultural Studies.

**Sociology**

Professors: T. C. Hood (Head), Ph. D. Duke; D. M. Betz, Ph. D. Michigan State; J. A. Black, Ph. D. Iowa; D. J. Champion, Ph. D. Purdue; D. Clelland, Ph. D. Michigan State; D. W. Hastings, Ph. D. Massachusetts; D. R. Ploch, Ph. D. North Carolina; N. E. Shover, Ph. D. Illinois (Urbana); S. E. Wallace, Ph. D. Minnesota.

Associate Professors: Robert D. Bullard, Ph. D. Iowa State; S. Kurth, Ph. D. Illinois (Chicago); R. G. Perrin, Ph. D. British Columbia; K. D. Van Liere, Ph. D. Washington State.


Instructor: D. K. Harris, M. A. Tennessee.

**Major:** Prerequisites to the major are six lower-division hours in sociology which must include either 100 or 110, followed by 200. The major consists of 24 upper-division hours in sociology and must include 321 and 331. Students should complete these two courses by the end of their junior year.

**Concentration in Criminal Justice:** All prerequisites and upper-division courses required for general majors are required for this concentration. In addition, the concentration consists of 18 hours of upper-division sociology as follows: 350, 351, 451, 459, 492, and one course selected in consultation with advisor.

**Minor:** The minor consists of 12 upper-division hours in sociology which must include 321 and 331. Prerequisites to the minor are six lower-division hours in sociology which must include 200.

**College Scholars Honors**

Director: Dr. Harry C. Jacobson

College Scholars is a major with selective admission. For details contact the director.

All Scholars must enroll in one of the College Scholars Seminars 317-318 each term. They are encouraged to complete work in College Scholars Honors 491-492-493. Each student must complete a substantial piece of research, scholarship or creative imagination. College Scholars 498 is the appropriate course to use to receive credit for this work.

**Speech Communication**


Associate Professors: J. E. Buckley, Ph. D. Northwestern; N. C. Cook, M. A. Alabama; R. W. Glenn, Ph. D. Northwestern.

Assistant Professor: R. S. Ambler, Ph. D. Ohio State.

**Major:** Speech Communication 100 is prerequisite to a major which consists of Speech Communication 270, 300, 310, 330, either 350 or 460, and 12 additional hours in Speech Communication courses, of which 9 must be in courses numbered 300 and above. No more than 5 hours from Speech Communication 200, 271-272, 371-372, 491, 492, and 493 may be counted toward the major. Students interested in broad applications (e.g., teacher certification or religious training) may complete their required hours from a wide range of Speech Communication courses. In addition, specially designed options are available in (1) Interpersonal/Organizational Communication and in (2) Public Communication. Students should inquire in the Department Office for information and recommended advisors.

**Minor:** Speech Communication 100 is prerequisite to a minor which consists of 18 additional hours in Speech Communication courses numbered 200 or above. Additional information for planning minor areas of focus which will complement a wide variety of majors in other Liberal Arts fields as well as in other colleges is available in the Department Office.

**Theatre**


Associate Professors: M. Custer, M. F. A. Wisconsin; L. C. Harman, M. F. A. Wisconsin.


**Major:** Theatre 100 is prerequisite to a concentration which consists of (1) Theatre 210, 211, 220, 245, 250, 260, 310, and 311; (2) 12 additional hours of Theatre courses numbered 200 and above, 8 hours of which may be in cognate areas approved by the
**Zoology**

Professors:

A. C. Echternacht (Head), Ph. D. Kansas; R. M. Bagby, Ph. D. Illinois; D. L. Bunting, II, Ph. D. Oklahoma State; J. G. Carlson (Emeritus), Ph. D. Pennsylvania; D. A. Ehler, Ph. D. Minnesota; B. Hochman, Ph. D. California (Berkely); E. T. Howley, Ph. D. Wisconsin; K. W. Jeon, Ph. D. London (England); D. C. Joy, Ph. D. Oxford (England); J. R. Kennedy, Ph. D. Iowa; J. N. Liess, Ph. D. Ohio State; J. A. MacCabe, Ph. D. California (Davis); S. L. Pimm, Ph. D. New Mexico State; S. E. Riechert, Ph. D. Wisconsin; L. E. Roth, Ph. D. Chicago; C. A. Shivers, Ph. D. Michigan State; J. T. Tanner (Emeritus), Ph. D. Cornell; H. G. Welch (Emeritus), Ph. D. Florida; G. L. Whitson, Ph. D. Iowa.

Associate Professors:

K. D. Burnham, Ph. D. Iowa; T. T. Chen, Ph. D. Florida; D. J. Fox, Ph. D. Johns Hopkins; N. B. Greenberg, Ph. D. Rutgers; M. A. Handel, Ph. D. Kansas State; G. F. McCracken, Ph. D. Cornell; M. L. Pan, Ph. D. Pennsylvania; G. L. Vaughn, Ph. D. Duke.

Assistant Professors:

C. Boake, Ph. D. Cornell; J. Drake, Ph. D. Purdue; R. Ganguly, Ph. D. Nebraska; L. Rome, Ph. D. Harvard.

Research Associate Professors: T. Ashley, Ph. D. Florida State; T. Tindall, Ph. D. Pennsylvania.

Research Assistant Professor:

J. L. Gittleman (Distinguished Scientist, Science Alliance Center of Excellence), Ph. D. Sussex (England).

**Prerequisites to upper division courses:**

Biology 110-120 or Biology 150 or Zoology 117-118 and Chemistry 120-130. Corequisites are Mathematics 151-152 or 141-142 and a year sequence in physics (except 141-142). Physics 221-222 are recommended and are required for admission to some professional schools.

The major consists of Biology 210-220-230, 18 hours of upper division Zoology courses and two semesters of chemistry or biochemistry at the 200 level or above. Acceptable second year chemistry sequences include: Chemistry 350-360-369; Chemistry 350 and 310-319; Chemistry 350 and Nutrition 200; Chemistry 350, 431 and Biochemistry 310; Chemistry 310-319 and Biochemistry 310. All Zoology majors are required to take at least 4 hours at the 400 level, including at least one laboratory or field course. The upper division Zoology courses must include at least one course from three of the following four areas: (1) Cellular and Developmental Biology (330, 420); (2) Physiology (440, 445); (3) Animal Diversity (350, 360), and (4) Evolution and Behavior (450, 460).

**Minor:** Prerequisites to the minor are Biology 110-120 or 150 or Zoology 117-118 and Chemistry 120-130 or 100-110. The minor consists of Biology 210-220-230 and 9 hours of upper division Zoology. Note: Certain Zoology courses require organic chemistry or other prerequisites; consult the catalog description for each course.

Many courses in this department are offered only in specific semesters. Students should plan in advance the proper sequence. Information on the semesters a course is to be offered is available in the departmental office.

**Women’s Studies**

See Cultural Studies.
College of Nursing

Sylvia E. Hart, Dean
Barbara M. Reid, Associate Dean

Professors:
S. E. Hart (Dean), Ph. D. New York;
D. H. Goodfellow, Ph. D. Peabody;
M. E. Groer, Ph. D. Illinois; J. N. Mozingo,
Ph. D. Walden.

Associate Professors:
M. M. Davis, Ph. D.
Tennessee; P. G. Droppleman, Ph. D.
Tennessee; M. Fenske, Ph. D. Vanderbilt;
M. L. Jolly, Ed. D. Kentucky; B. M. Reid,

Assistant Professors:
M. T. Boynton, M. S. N. Emory; J. Brenson,
M. S. N. Vanderbilt; K. P. Conlon, M. S. N.
SUNY (Buffalo); G. A. Evans, M. S. N.
Tennessee; C. Goforth, M. S. N. Vanderbilt;
S. M. Helton, M. S. N. Texas Woman's;
S. M. Hodson-Fitzgerald, M. S. Tennessee;
J. Joziwiak, M. S. N. Tennessee; M. Kollar,
M. S. N. Vanderbilt; S. L. McGuire, M. P. H.
Michigan; H. E. Overton, M. S. N. Tennessee;
M. A. Pierce, M. S. N. Tennessee;
V. M. Redford, M. S. Colorado; J. H. Rice,
M. S. N. Emory; D. H. Shoffner, M. S. N.
Tennessee; P. L. Smith, M. S. N. Medical
College of Georgia; M. S. Theodoropolous,
M. S. N. Boston, S. P. Thomas, Ph. D.
Tennessee.

Instructors:
S. M. Bowen, M. S. Tennessee;
K. B. Hennoer, M. S. N. Vanderbilt;
N. Gaylord, M. S. N. Colorado.

The College of Nursing at The University of
Tennessee, Knoxville, was established in
July 1971 in response to a long-recognized
and well-established need for nurses pre-
pared at the collegiate level. The
undergraduate program combines the unique
resources of the UTK campus with those of
the university's comprehensive teaching hos-
pital and several other cooperating health
care agencies in a manner that enables both
faculty and students to participate fully in all
facets of the health care delivery system.
The program is accredited by the National
League for Nursing and has full approval
status from the Tennessee Board of Nursing.

The baccalaureate nursing program has
as its central focus and frame of reference
human beings, society, and health. It is
based on the belief that nursing has equal
concern for the prevention of illness, the
promotion of health, and the care of the sick.
General education courses, nursing courses,
and electives are organized in a manner
designed to promote and develop creative
thinking and other cognitive, affective, and
psychomotor processes that are essential
for effective nursing practice and for full and
meaningful involvement as a contributing
member of society.

A broad base of general education, a
thorough study of human behavior, emphasis
on health maintenance, health promotion,
and health restoration and a strong family
and community orientation are essential
components of baccalaureate education in
nursing. By maintaining a high quality, rele-
vant program that is responsive to the
increasing complexity of health care delivery,
the ever changing health needs of society,
and the changing and expanding role of the
nurse, graduates of the program are able to:
(1) assume beginning leadership positions in
nursing in a variety of settings; (2) work col-
laboratively with other health professionals;
(3) function as socially conscious and con-
tributing citizens; and (4) pursue advanced
education on either a formal or an informal
basis.

General Requirements

In order to obtain a Bachelor of Science
in Nursing degree students are required to
successfully complete eight semesters of
full-time study or the equivalent in part-time
study. Students may complete the entire pro-
gram at UTK or they may take most or all of
the lower division component of the program
at any regionally accredited college or uni-
versity. One hundred-twenty semester hours
are required for graduation. The program is
designed to accommodate high school grad-
uates, transfer students from within or
equal to UTK, and registered nurses who
hold associate degrees in nursing or who
are graduates of diploma nursing programs.

Progression Policies and
Procedures

(1) During the spring semester of the year
the student expects to meet all lower division
course requirements, she/he must complete
a Petition for Progression form and submit it
to the college's Student Affairs Office no
later than the second Friday of UTK's spring
semester. If the number of petitions exceeds
the number of students that can be accom-
modated students will be selected on the
basis of: (a) cumulative GPA for courses
completed; (b) grades in required courses;
(c) number of course withdrawals and repeti-
tions; (d) grade improvement over time; and
(e) probability of completing all lower division
requirements prior to the following fall.

(2) If a student is selected for progression
to upper division nursing courses but then
fails to successfully complete all lower divi-
sion requirements prior to the fall semester,
the student will not be permitted to enroll in
nursing courses and must submit another
petition the following year.

(3) Registered nurses must also complete
all lower division courses but, at the discre-
tion of the faculty RN advisor, they may
enroll in Nursing 305 once they are within 16
semester hours of meeting these require-
m ents. Nursing 305 must be successfully
completed before RN's may challenge or
take Nursing 312, 402, or 412.

Grading and Continuation
Policies

(1) The minimum acceptable grade for all
courses in the curriculum except humanities

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electives is a "C". The satisfactory/no credit grading option is not available for nursing courses.

(2) No nursing course may be repeated more than once. If a "D" or "F" grade is earned on the second attempt the student will be required to withdraw from the program.

(3) Any student who receives a grade of "D" or "F" for more than two nursing courses will be required to withdraw from the program even if previous courses for which "D’s" or "F’s" were awarded have been repeated with a grade of "C" or higher.

(4) If a student receives an Incomplete "I" in a nursing course, the "I" must be removed prior to enrolling in any course for which the uncompleted course is a prerequisite.

(5) If a student’s clinical performance for any nursing course is found to be unsatisfactory, the grade for that course will be an "F" regardless of any other grades earned in other components of the course. If the unsatisfactory clinical performance is characterized by unethical, unprofessional, or unsafe behavior, behavior that actually or potentially places the client in jeopardy, the student will be required to withdraw from the program.

Health and Insurance Requirements

Students must meet specific physical examination and immunization requirements as specified by state law and by the rules and regulations set forth by the various clinical agencies. All non-nurse students must participate in the college's group malpractice and liability insurance program. All registered nurses must provide proof that they have appropriate malpractice-liability insurance coverage. Specific information concerning these requirements will be provided to the students at appropriate times by the nursing faculty and or the Associate Dean for Student Affairs.

Course Load

The maximum credit hours per semester for which a nursing student may register without special permission is 18.

The Bachelor of Science in Nursing Curriculum

<table>
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<tr>
<th>Hours Credit</th>
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<tbody>
<tr>
<td>Freshman</td>
</tr>
<tr>
<td>English 101, 102 ........................................... 6</td>
</tr>
<tr>
<td>Mathematics 110, 115 ........................................ 6</td>
</tr>
<tr>
<td>Chemistry 100, 110 ........................................... 8</td>
</tr>
<tr>
<td>University Core ............................................. 6</td>
</tr>
<tr>
<td>Psychology 110 ................................................. 3</td>
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<tr>
<td>Sociology or Anthropology ................................ 3</td>
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<tr>
<td>Sophomore</td>
</tr>
<tr>
<td>Zoology 240 ..................................................... 3</td>
</tr>
<tr>
<td>Zoology 230 ..................................................... 3</td>
</tr>
<tr>
<td>Microbiology 210 .............................................. 3</td>
</tr>
<tr>
<td>Nutrition ....................................................... 3</td>
</tr>
<tr>
<td>Child and Family Studies 210 ................................ 3</td>
</tr>
<tr>
<td>Sociology or Anthropology ................................ 3</td>
</tr>
<tr>
<td>History .......................................................... 6</td>
</tr>
<tr>
<td>Humanities Electives ...................................... 3</td>
</tr>
<tr>
<td>Junior</td>
</tr>
<tr>
<td>Philosophy 345 ................................................ 3</td>
</tr>
<tr>
<td>Nursing 301, 302, 304, 311, 313 ............................ 29</td>
</tr>
<tr>
<td>Senior</td>
</tr>
<tr>
<td>University Core or Humanities Electives .................... 3</td>
</tr>
<tr>
<td>Nursing 401, 403, 404, 411 ................................... 24</td>
</tr>
<tr>
<td>Total: 120 hours</td>
</tr>
</tbody>
</table>

Registered nurses must successfully complete all of the non-nursing courses listed above as well as the nursing courses listed below. Courses with an asterisk may be challenged.

<table>
<thead>
<tr>
<th>Hours Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>*301 Pharmacology .................................................. 3</td>
</tr>
<tr>
<td>304 Nursing Assessment and Health Promotion ................... 4</td>
</tr>
<tr>
<td>305 Transition to Professional Nursing .......................... 4</td>
</tr>
<tr>
<td>*312 Acute Care Nursing Theory .................................. 6</td>
</tr>
<tr>
<td>313 Nursing Research ........................................... 3</td>
</tr>
<tr>
<td>315 Clinical Nursing Practicum ................................. 2</td>
</tr>
<tr>
<td>*402 Family Health Nursing Theory ................................ 3</td>
</tr>
<tr>
<td>403 Community Health Nursing .................................... 4</td>
</tr>
<tr>
<td>404 Nursing Management and Strategies ........................ 8</td>
</tr>
<tr>
<td>*412 Psychosocial Long Term Nursing Theory .................... 3</td>
</tr>
</tbody>
</table>

Total: 40 hours

Because the curriculum for RN's requires only 40 semester hours of nursing courses instead of the 53 hours required for non-nurse students, RN's must complete an additional 13 hours of electives to meet the 120 credit hours required for conferral of the degree.

The following courses are open to all university students: 214, 301, 317.

Graduate

General requirements for the Master of Science in Nursing degree are given in the Graduate Catalog.
Social work is a helping profession which fosters growth in both individual and societal problems. The program builds on a strong liberal arts base. The humanities and social sciences are emphasized to help students understand human diversity and the transactions between people and their environment. The curriculum combines classroom experience and agency-based field placements. Courses provide a knowledge base in social work practice theory, human behavior, social welfare policy, and research. Educationally directed field placements, which consist of over 400 clock hours of supervised field instruction in agency settings throughout greater Knoxville, provide extensive and challenging opportunities for students to apply the lessons of the classroom to the problems of society. The program is accredited by the Council on Social Work Education.

The undergraduate social work program (BSSW) started in 1982 in the College of Liberal Arts. It was granted initial accreditation by the Council on Social Work Education in January 1984, and reaffirmation was given in 1989. The program was transferred to the College of Social Work in September 1985. The three programs, BSSW, MSSW and Ph. D., in the College represent the full continuum of social work education.

Facilities

The College of Social Work is housed in Henson Hall, located on the corner of Cumberland Avenue and Volunteer Boulevard. This building houses the administrative and faculty offices, along with classrooms for the BSSW, MSSW and Ph. D. programs. Video and computer resources are available to facilitate instruction.
3. Successful completion of a minimum of 60 semester hours. Initial progression must be completed prior to enrollment in any 300-level social work courses.

4. Favorable review of the student's application for entry into the junior level social work courses by the faculty admissions committee. The application requires an essay discussing the student's interest in and preliminary understanding of the profession.

FULL PROGRESSION
1. Successful completion of junior level social work courses with a grade of C or better.

2. Cumulative grade point average of 2.0 or above.

3. Successful completion of a minimum of 90 semester hours. Full progression must be completed prior to enrollment in 400-level social work courses.

4. Favorable approval by the BSW faculty prior to entry into senior level classes. This process will include a close review of the student's performance in junior field practice.

Full progression is based on the recognition that social work has an intensive field component in which students demonstrate aptitude and ability to work with other people. While review is ongoing, full progression provides an additional opportunity to review the students' potential for entry-level practice.

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**Curriculum**

<table>
<thead>
<tr>
<th>Hours</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Freshman</strong></td>
<td></td>
</tr>
<tr>
<td>English 101, 102</td>
<td>6</td>
</tr>
<tr>
<td>Foreign Language (Intermediate Level)</td>
<td>6</td>
</tr>
<tr>
<td>Mathematics 110</td>
<td>3</td>
</tr>
<tr>
<td>History 151-152 or 161-162</td>
<td>6</td>
</tr>
<tr>
<td>Physiology or Biology Sequence with lab</td>
<td>6</td>
</tr>
<tr>
<td>Women’s Studies 229</td>
<td>3</td>
</tr>
<tr>
<td><strong>Sophomore</strong></td>
<td></td>
</tr>
<tr>
<td>Zoology 210, 220</td>
<td>6</td>
</tr>
<tr>
<td>Anthropology 130</td>
<td>3</td>
</tr>
<tr>
<td>Humanities (Literature Package)</td>
<td>6</td>
</tr>
<tr>
<td>Humanities (Philosophy Package)</td>
<td>6</td>
</tr>
<tr>
<td>Psychology 220</td>
<td>3</td>
</tr>
<tr>
<td>Social Work 200, 250</td>
<td>6</td>
</tr>
<tr>
<td>Economics 201</td>
<td>4</td>
</tr>
<tr>
<td><strong>Junior</strong></td>
<td></td>
</tr>
<tr>
<td>Social Work 312, 313, 314</td>
<td>9</td>
</tr>
<tr>
<td>United States Studies*</td>
<td>3</td>
</tr>
<tr>
<td>Foreign Studies*</td>
<td>3</td>
</tr>
<tr>
<td>Political Science 101</td>
<td>3</td>
</tr>
<tr>
<td>Sociology 336 or Psychology 385</td>
<td>3</td>
</tr>
<tr>
<td>Social Work 310, 380</td>
<td>6</td>
</tr>
<tr>
<td>Child and Family Studies 220</td>
<td>3</td>
</tr>
<tr>
<td><strong>Senior</strong></td>
<td></td>
</tr>
<tr>
<td>Social Work 412, 416</td>
<td>8</td>
</tr>
<tr>
<td>Social Work 480, 481</td>
<td>8</td>
</tr>
<tr>
<td>Social Work 460</td>
<td>2</td>
</tr>
<tr>
<td>Anthropology 312</td>
<td>3</td>
</tr>
<tr>
<td><strong>Electives</strong></td>
<td>9</td>
</tr>
</tbody>
</table>

*The following sequences may be selected: Astronomy 161-162; Botany 110-120; Chemistry 120-130; Geography 131-132; Geology 101-102; Physics 121-122.

*The following literature packages may be selected: Classics 253-254; English 201-202; English 221-222; English 231-232 or 233; Germanic and Slavic Languages 221-222; Religious Studies 312-313; French 291-292; Spanish 291-292.

The following philosophical perspective packages may be selected: Classics 221-222; Philosophy 110-111; Philosophy 120-121; Philosophy 240-244; Philosophy 380-382.

One course selected from: Anthropology 310; Anthropology 315; Geography 363; History 379; History 380; History 440; Philosophy 390; Political Science 311; Political Science 374; Religious Studies 352; Sociology 343; Sociology 340; Speech 456.

One course selected from: Anthropology 314; Classics 381; Classics 382; English 302; Geography 372; Geography 373; Geography 375; Geography 379; Germanic and Slavic Languages 363; History 320; History 374; Philosophy 326; Political Science 309; Political Science 361; Political Science 469; Religious Studies 332; French 432; Spanish 431; Spanish 471; Sociology 446.

Total: 124 hours
University Honors

Susan Becker, Director

TENNESSEE SCHOLARS PROGRAM
Each year, twenty-five outstanding high school students will be selected for a four year program of honors work. These students may have any major in any college offering the Bachelor’s degree. In addition, Tennessee Scholars’ work includes: a minimum of four lower division honors courses; a close relationship with a faculty mentor; a one credit hour Tennessee Scholars seminar each term for four years; and a senior honors paper or project. The Tennessee Scholars program is administered by the University Honors committee which includes representatives from each of the ten baccalaureate colleges and schools. Students are selected on the basis of ACT/SAT scores, high school GPA and the difficulty of the high school course of study, academic references, and a personal statement. Students who are selected as Tennessee Scholars are awarded substantial four year scholarships.

UNIVERSITY HONORS COURSES
Seminars and colloquia focused on various topics, issues, and problems, and limited in size to 15-20 students. These are taught by faculty from all ten undergraduate colleges and schools, and may be repeated. University Honors courses are open to all undergraduate students on the basis of high school GPA, ACT/SAT scores, UTK GPA of 3.25 or better, or by strong professorial recommendation.
University Studies

Glenn C. Graber, Director

The University Studies Program has three general objectives: (1) to foster interdisciplinary teaching and scholarship, especially across college boundaries; (2) to promote active, integrative, and personal training; and (3) to nurture the personal and intellectual development of faculty and students.

In pursuit of these objectives, University Studies sponsors three types of activities: FACULTY COLLOQUIES, which are ongoing, structured, interdisciplinary conversations on a topic or nexus of topics; LEARNING COMMUNITIES, which are year-long clusters of courses in which a group of faculty and students work together to integrate material from several disciplines dealing with a common theme; and INTERDISCIPLINARY COURSES, often team-taught, many stemming from the colloquy discussions.

Faculty Colloquies explore important contemporary issues which are sufficiently fundamental to involve the attention of faculty and students from all colleges. Current colloquies are: Technology, Society and the Common Good; Aging and Society; Land and People (Tennessee Appalachian Forum); Learning, Thinking, Creating; Forum on International Development; Humanistic Perspectives on Science and Society; and Freshman Year Experience.

The University Learning Community at the sophomore level has as its goals: (a) To form a community of learners, including both faculty and students; (b) To promote active involvement in learning by making use of case studies, active class exercises, small-group projects, and other alternatives to a lecture method of instruction; (c) To promote integrative learning by focusing on a common theme from the point of view of a variety of disciplines throughout a year-long series of courses; and (d) To integrate classroom learning with wellness activities and social interaction with other students and faculty of the learning community.

For further information, contact: Dr. Glenn C. Graber, Director; University Studies Program; 401 Student Services Building — PHONE: 974-4932.
Reserve Officers Training

Department of Military Science
Army ROTC
LTC Hugh E. Howard, III, Professor of Military Science

The military program at The University of Tennessee predates that of any other state university in the country, having been introduced in 1844. In that year, Professor Albert Miller Lea, a West Point graduate, organized an infantry company. With the outbreak of the Mexican War, the entire company, as well as thousands of other Tennesseans, volunteered for service in the war. Thus, Tennessee became known as the “Volunteer State”.

When The University of Tennessee reopened after the Civil War, a system of military discipline was adopted. A Code of Military Regulations was drawn up and a copy was provided each student when he matriculated. The whole institution was put under regular West Point discipline. The student body was organized into a battalion of cadets, which consisted of four companies fully officered, armed and equipped under the command of the commandant and his staff of cadet officers. The University of Tennessee remained as a Military Garrison for a period of six years, until 1877. Military Science continued to be taught, since the University of Tennessee was a Land Grant Institution and instruction in Military Science was required by the 1862 Act of Congress.

The National Defense Act of 1916 changed the old military organization into a ROTC unit. For the first time, the Federal Government began to pay a part of the uniform cost for basic course students; uniforms and other equipment were provided by the Government for Juniors and Seniors, and a monthly subsistence allowance was given to advanced course students.

From 1928-1930, Major (later Brigadier General) Robert R. Neyland was the Professor of Military Science and football coach at The University of Tennessee. Today, Neyland Stadium stands in tribute to his great accomplishments.

The purpose of Army ROTC is to provide professional education which will prepare students for appointment as commissioned officers in the Regular Army or the United States Army Reserve components.

Objectives of the program are to provide students with an understanding of the fundamental concepts and principles of military art and science; to develop a basic understanding of associated professional knowledge, a strong sense of personal integrity, honor, and individual responsibility, and an appreciation of the requirements for national security; and to establish a sound basis for the students’ future professional development.

ROTC draws young men and women for training from all geographical, economic, and social strata of our society as well as from the many educational disciplines required for the modern Army. The program insures that men and women educated in a liberal and broad spectrum of American institutions of higher learning are commissioned annually into the officer corps.

Satisfactory/No Credit Courses

Since Military Science is not a major course of study that leads to a degree in a specific academic discipline, the number of satisfactory/no credit courses is decided by the college of the student’s academic major. All ROTC courses are offered on a letter grade basis only.

Course Load

No more than one Military Science course may be taken during any given semester, unless an exception to policy is approved by the Professor of Military Science on a case-by-case basis. Students enrolled in the advanced program (upper division Military Science 300 and 400 level courses) and ROTC scholarship cadets are required to be full-time students, taking at least 12 hours each semester.

Course Substitution

On the basis of previous honorable active military service in any branch of the Armed Services, or participation in a Junior ROTC Program at a Secondary School, a student may request exemption from portions of the Basic Course (Military Science 100 and 200 level courses). Placement credit may also be authorized for completion of basic training and advanced individual training. Exemption allowed will be determined by the Professor of Military Science. Military Science courses taken at other colleges or universities are transferable as approved by the Professor of Military Science.

Requirements for Enrollment and Continuance

The general requirements for enrollment and continuation in the Army ROTC program are:

1. Basic Military Studies
   a. Be a citizen of the United States.
   b. Be physically qualified.
   c. Freshman and Sophomore standing. Student with higher standing requires consent of instructor.

2. Advanced Military Studies Cadets
   applying for enrollment in the Advanced ROTC program who seek a Commission must:
   a. Have successfully completed Military Science 110, 120, 210, 220 or have accomplished one of the following: Prior Military Service, ROTC Basic Military Studies - Practicum (MS 200), 3-Year High School ROTC Basic Course.
b. Have two years remaining at the University (either undergraduate, graduate or in pursuit of additional course work).
c. Have completed a minimum of 30 semester hours.
d. Be under 30 years old at time of commissioning.
e. Be enrolled as a full-time student, either at The University of Tennessee or at a nearby institution in a cooperative program.
f. Meet military screening and physical requirements.
g. Maintain a 2.0 G.P.A.
h. Maintain B average in Military Science Courses as a scholarship student.

NOTE: Regularly enrolled students who meet the academic prerequisites and do not desire a commission, may take individual courses as electives with the permission of the department head and academic advisor.

**Requirements For All Military Science Commissionees**

The following Military Science (MS) Advanced Course Curriculum must be successfully completed:
- Military Science 310 (4) - Advanced Military Studies I
- Military Science 320 (4) - Advanced Military Studies II
- Military Science 400 (4) - Advanced Camp-Practicum
- Military Science 410 (4) - Command and Staff Functions
- Military Science 420 (4) - Military Ethics and Law

In addition to a baccalaureate degree, there are required and recommended courses in designated fields of study that students must complete prior to commissioning. Students meet these prerequisites by successful completion of required and elective courses taken from the university's curriculum in the required areas of concentration.

Courses in the following designated fields of study are required of students seeking a commission in the United States Army:
- a. One course in written communications.
- b. One course in human behavior.
- c. One course in military history.
- d. One course in a foreign language (scholarship students only).

Courses in management and national security studies are strongly recommended but are not required.

**Special Programs**

**Pay and Entitlements** All students enrolled in the Army ROTC program are furnished texts by the Army through the Military Property Office. Students enrolled in the ROTC Advanced Course receive uniforms and equipment plus an allowance of $100 per month during the academic year. While attending the ROTC summer studies each cadet receives approximately $650 for Advanced Summer Studies, $450 for Basic Summer Studies, plus meals and clothing are provided.

**Army ROTC Scholarship Program** The Army ROTC scholarship program offers financial assistance to outstanding young men and women in the Army ROTC program who are interested in the Army as a career. Each scholarship provides for free tuition, textbooks subsidy, and laboratory fees in addition to a subsistence allowance of $100 per month for the period that the scholarship is in effect. Scholarships may be awarded for either two, three, or four years. High school seniors should contact their guidance counselors early in August or September of their senior year to apply for the four-year scholarship. Two- and three-year scholarship applicants should contact the Professor of Military Science for further information. Certain other privately financed scholarships and grants are available to ROTC cadets.

**Simultaneous Membership Program** The "SMP" option combines the Army ROTC living allowance ($100/month) with membership in the Army Reserve or Army National Guard. Six credits are earned from each program.

**Military Science Curriculum**

<table>
<thead>
<tr>
<th>Hours Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Course</td>
</tr>
<tr>
<td>Freshman</td>
</tr>
<tr>
<td>Military Science 110, 120</td>
</tr>
<tr>
<td>Military Science 210, 220</td>
</tr>
<tr>
<td>Sophomore</td>
</tr>
<tr>
<td>Military Science 310, 320</td>
</tr>
<tr>
<td>Summer</td>
</tr>
<tr>
<td>Military Science 400</td>
</tr>
<tr>
<td>Senior</td>
</tr>
<tr>
<td>Military Science 410, 420</td>
</tr>
</tbody>
</table>

**Basic Military Studies - Practicum**

<table>
<thead>
<tr>
<th>Hours Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer</td>
</tr>
<tr>
<td>Military Science 200</td>
</tr>
<tr>
<td>Junior</td>
</tr>
<tr>
<td>Military Science 310, 320</td>
</tr>
<tr>
<td>Summer</td>
</tr>
<tr>
<td>Military Science 400</td>
</tr>
<tr>
<td>Senior</td>
</tr>
<tr>
<td>Military Science 410, 420</td>
</tr>
</tbody>
</table>

**VARIATIONS TO THESE SEQUENCES OF STUDY MAY BE APPROVED BY THE PROFESSOR OF MILITARY SCIENCE ON A CASE-BY-CASE BASIS.**

**Progression Requirements**

1. Minimum semester hours/GPA for entrance into Basic Military Studies - Practicum (Military Science 200): 30 semester hours/2.00 GPA
2. Minimum overall GPA for entrance into the advance course (Military Science 310, 320, 400, 410, 420): 2.00
3. Minimum GPA in Military Science Courses: 2.00
4. Minimum overall GPA for commissioning: 2.00
5. Quarterly counseling sessions with advisor required for Advance Course and scholarship students only
6. Officer Selection Battery test
Department of Air Force

Air Force ROTC Program

Professor of Air Force Aerospace Studies: Colonel Arthur W. Ahl (Head); M. S. Troy State.

Assistant Professors:
Captain Robert J. Dowd, M. S. University of Southern California; Captain Richard E. Lee, M. S. University of Southern California; Captain Richard L. Modell, M. S. AF Institute of Technology.

Purpose

The Air Force Reserve Officers Training Corps (AFROTC) is an educational program designed to provide the college student an opportunity to earn an Air Force commission as a Second Lieutenant while completing the University requirements for a bachelor's degree. The program provides education that will develop the skills and attitudes vital to the professional Air Force officer. Upon successful completion of the program and graduation from the University, students are commissioned as Second Lieutenants and enter active duty.

The Programs

The Four-Year Program: Students entering the Four-Year Program may register for the program at the same time and in the same manner as they enroll in other college courses and there is NO MILITARY OBLIGATION. During their freshman and sophomore years, students enroll in the General Military Course (GMC). They then may compete for entry into the Professional Officer Course (POC) which is normally taken during the last two years of college. Selection into the POC is highly competitive and is based on being medically qualified; scores achieved on the Scholastic Aptitude Test (SAT) or American College Test (ACT); scores achieved on the Air Force Officer Qualifying Test (AFQT); successful completion of a four-week field training course at an Air Force base; and the recommendation of the Professor of Aerospace Studies.

The Two-Year Program: The Two-Year Program consists of the Professional Officer Course (POC), the last two years of the Four-Year Program. It is designed to provide greater flexibility to meet the needs of students desiring Air Force opportunities. The basic requirement is that applicants have two academic years remaining at either the undergraduate or graduate levels, or a combination of both. After being nominated by the Professor of Aerospace Studies, applicants seeking enrollment in the Two-Year Program are evaluated using the same criteria used for the four-year program except the length of the field training course is six weeks. Additionally, every POC applicant must agree to take and successfully complete a course in mathematical reasoning or its equivalent before graduation and commissioning.

Since the processing procedure must be completed approximately six months in advance of intended enrollment, interested students must apply early in the academic year preceding the fall term in which they intend to enter the program. Application should be made in person to the Department of Aerospace Studies.

Women in AFROTC

AFROTC at The University of Tennessee has been coeducational since 1970. Women complete the same courses as men and have the same opportunities. Upon successful completion of the AFROTC program and degree requirements, women are commissioned in the Air Force as Second Lieutenants. Pay and job opportunities are equal for women and men. Virtually all career fields in the Air Force are open to women, including pilot and navigator positions.

Scholarship Program

Air Force ROTC Scholarships are available to qualified applicants in both the Four- and Two-Year Programs. Each scholarship provides full tuition, laboratory and incidental fees, and book fee. In addition, scholarship cadets receive a non-taxable $100 stipend each month during the school year while on scholarship status.

High School Students: Competitive four-year scholarships are available to high school male and female students who enroll in certain scientific and engineering career fields. Some scholarships are also available to male and female students who enroll in certain non-technical majors. Four-year scholarship applications are contained in the "Air Force ROTC Four-Year College Scholarship Program Application Booklet". Booklets may be obtained directly from Air Force ROTC Public Affairs, Maxwell, AFB, AL 36112.

College students: Other scholarship opportunities exist for students already in college. Four-, three-, and two-year scholarships are available on a competitive basis and the student must have at least four, three, or two undergraduate or graduate years of study remaining in order to compete. Applications for these scholarships should be made directly to the Department of Aerospace Studies.

In order to retain an AFROTC scholarship, students must maintain the minimum grade point average prescribed by the University and must take and complete an English composition course or its equivalent before completing the GMC.

Pay and Entitlements

All cadets enrolled in AFROTC are furnished texts and uniforms. Enrollees are required to deposit $75 as security to the University against loss or damage to the uniforms. The deposit, minus a nominal fee to cover cost of shoes, is returned to the student upon early withdrawal or disenrollment from the program. Professional Officer Course cadets receive a subsistence allowance of $100 per month during the academic year. In addition they are paid mileage to and from field training, plus pay commensurate with active duty rates while at field training.

Active Duty Commitments

Commissioned graduates going into non-flying duties will be required to serve four years of active duty. Those graduates going into pilot assignments will be required to serve eight years active duty after completion of pilot training. Those graduates going into navigator assignments will be required to serve five years active duty after completion of navigator training.
Graduate Studies

The College of Law

Marilyn Yarbrough, Dean
Mary Jo Hoover, Associate Dean
Julie P. Harbin, Associate Dean
Patrick Harbin, Associate Dean
John A. Sebert, Jr., Associate Dean
N. Douglas Wells, Assistant Dean

The College of Law has, since 1890, continuously sought to provide high quality legal education in a University community. The college offers a professional curriculum leading to the degree of Doctor of Jurisprudence. The College of Law and the College of Business Administration offer a coordinated dual degree program leading to the conferral of both the Doctor of Jurisprudence and the Master of Business Administration degrees.

Information regarding admission, financial aid, academic policies, extracurricular activities, and student services is available in the "College of Law Bulletin". A copy may be obtained from the Admissions Office.

The College of Veterinary Medicine

Hyram Kitchen, Dean
W. H. Grau, Jr., Associate Dean
C. F. Reed, Jr., Associate Dean

The College of Veterinary Medicine, established in 1974, offers a professional curriculum leading to the degree of Doctor of Veterinary Medicine (D. V. M.). The college offers graduate studies leading to the degrees of Master of Science (M. S.) and Doctor of Philosophy (Ph. D.). Residency training programs in the various clinical specialties are also offered. The Graduate Catalog contains complete information concerning the programs in the college.

Forms and instructions for making application for admission may be obtained from the Director of Admissions, 202 Student Services Building, The University of Tennessee, Knoxville, Tennessee 37996. Applications must be received by January 15 of the year of expected admission. All pre-veterinary requirements must be completed by the end of the spring term of the year in which the student plans to enroll in the college.

The Graduate School

C. W. Minkel, Vice Provost and Dean of The Graduate School
Wayne T. Davis, Assistant Dean of The Graduate School
Linda R. Painter, Assistant Dean of The Graduate School
Diana Lopez, Director, Graduate Admissions and Records
S. Kay Reed, Graduate Recruitment Coordinator
Ann L. Lacava, Thesis/Dissertation Coordinator
Rose Ann Trantham, Assistant Director, Graduate Admissions and Records

The University of Tennessee, Knoxville, is the official land-grant institution for the State of Tennessee. It is a comprehensive institution offering a wide range of graduate programs leading to the Master's and doctoral degrees. The University offers Master's programs in 93 fields of specialization and doctoral work in 52. Approximately 5,700 graduate students are enrolled, both on and off campus. Administration of graduate student policies and procedures, and associated record keeping, is the responsibility of the Dean of The Graduate School. Much of the day-to-day administration of graduate study is conducted by department heads or faculty advisors and committees responsible for particular programs. In addition to departmental units, numerous interdisciplinary programs, institutes and centers have been developed on campus and in locations throughout the state.

The Graduate School brings together faculty and graduate students as a community of scholars with a common interest in creative work and advanced study. Graduate programs are available to students desiring full-time study toward the Master's and doctoral degrees or professional certification, those interested in continuing education for updating and broadening knowledge, and those pursuing postdoctoral research. Traditionally, universities have provided graduate programs primarily for full-time, degree-oriented students. Serving the needs of students engaged full-time in intensive study and pursuit of a degree continues to be a major emphasis of UTK's graduate effort. At the same time, the University employs a variety of modes, traditional and non-traditional, in offering quality programs designed to serve students.

Complete information concerning graduate study at The University of Tennessee, Knoxville is available in the Graduate Catalog published annually. For a copy, write or visit the Office of Graduate Admissions and Records, 218 Student Services Building, The University of Tennessee, Knoxville, Tennessee 37996-0220 or call (615) 974-3251.

Graduate School of Biomedical Sciences

Raymond A. Popp, Acting Director

FULL-TIME FACULTY

Professors:
D. Billen, Ph. D. Tennessee; D. E. Olins, Ph. D. Rockefeller.

Assistant Professor:
C. Soumoff, Ph. D. California (Los Angeles).
The Graduate School of Biomedical Sciences offers programs leading to the Master of Science and Doctor of Philosophy. The School publishes supplementary information in addition to the regular Graduate Catalog. All inquiries concerning admission should be addressed to: Director, The University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences, Biology Division, ORNL, P. O. Box Y, Oak Ridge, Tennessee 37831. Consult the Graduate Catalog for listing of graduate level courses.

Comparative and Experimental Medicine Joint Graduate Program

Coordinating Committee:

H. Kitchen (Chairperson); J. E. Fuhr; R. A. Griesemer; J. E. Lawler; R. L. Michel.

The Comparative and Experimental Medicine degree program (M. S. and Ph. D.) is jointly administered by the College of Veterinary Medicine, the College of Medicine/Knoxville Unit, and the UTK Graduate School. The graduate program is intended to prepare students for teaching and/or research careers in the health sciences, emphasizing the comparative approach to the study of pathology, immunopathology, aberrant metabolism, oncology, genetic disorders. For complete information, refer to the Graduate Catalog.

The UTCHS College of Medicine/Knoxville Unit offers the courses listed on page 162-163.

Energy, Environment, and Resources Center

E. William Colglazier, Director

The Energy, Environment, and Resources Center was created to encourage interdisciplinary research directed at 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, environmental, resource, and technology policy issues. The Center has a close working relationship with Oak Ridge National Laboratory and the Tennessee Valley Authority.

Graduate School of Library and Information Science

Ann E. Prentice, Director

Professors:


Associate Professors:


Assistant Professor:

M. H. Karrenbrock, Ed. D. University of Georgia.

The Graduate School of Library and Information Science provides a program leading to the preparation of librarians and information scientists for work in all types of libraries and information centers.

The Undergraduate Program

The undergraduate library education program leads to a minor in the College of Education or the College of Liberal Arts. Students in other colleges may elect a minor in library and information science with the approval of their faculty advisors. The undergraduate minor is planned for the following groups of people: (1) students preparing for positions as school librarians in elementary and secondary schools; (2) teachers who wish to become better acquainted with books and other instructional materials; (3) school administrators who wish to explore the place of the library in the instructional program; (4) prospective candidates for the graduate program in library education; (5) persons seeking a position at the level of Library Associate as described in the manpower policy of the American Library Association.

The minimum requirements for a full-time position as school librarian in the state of Tennessee (both elementary and secondary) can be met through fulfilling the requirements for teacher certification and completion of the following library courses: 330, 340, 475, 510, 530, 551, 564, and 574.

The Graduate Program

The goal of the program is to prepare graduates to function effectively in libraries and information centers. For further information, write for a Graduate Catalog.

Life Sciences

Coordinating Council

H. I. Adler (Chair); Physiology: R. Bagby; Biotechnology: D. K. Douglas; Cellular, Molecular and Development Biology: J. M. Becker; Environmental Toxicology: W. R. Farkas; Ethology: G. B. Burghardt; Plant Pathology and Genetics: O. J. Schwarz.

The programs leading to the M. S. and Ph. D. degrees in Life Sciences are interdepartmental and intercollegiate programs which augment the programs of individual departments.

The graduate program in Life Sciences supports studies and research in the following concentrations: physiology; biotechnology (M. S. only); cellular, molecular and development biology; ethology; environmental toxicology; and plant physiology and genetics. Students interested in any of these areas should contact either the chair of Life Sciences or the Director of the area of interest. For complete information, refer to the Graduate Catalog.

Graduate School of Planning

J. A. Spencer, Director

Professors:


Associate Professors:

G. E. Bowen, M. A. George Washington; P. Fisher, Ph. D. Florida State.

The Graduate School of Planning offers a program of study leading to the professional degree of Master of Science in Planning.

Space Institute

Kenneth E. Harwell, Dean

Richard M. Roberds, Associate Dean

The Space Institute is a graduate education and research institution established in 1964 on a 365 acre lakeshore campus in Middle Tennessee. UTSI has evolved into an internationally recognized institution for graduate study and research in engineering, physics, mathematics, and computer science. The accredited academic programs and educational policies of the Space Institute have their origins in appropriate departments of The University of Tennessee, Knoxville. The more than 40 faculty members of the Institute carry out these accredited academic programs through classroom teaching, informal seminars, active research, and directing the research of their students in an environment of creative work and advanced study. Programs are available to students devoting full-time effort toward M. S. and Ph. D. degrees those
interested in continuing education for updating and broadening knowledge, and those who wish to pursue post-doctoral research.

Graduate degree programs are available with majors in Aerospace Engineering, Aviation Systems, Computer Science, Electrical Engineering, Engineering Science, Industrial Engineering (engineering management concentration), Mathematics, Mechanical Engineering, and Physics. In addition to the fundamental studies characteristic of each discipline, research opportunities are available in many areas including aerodynamics, atmospheric science, fluid mechanics, computer graphics, knowledge engineering, energy conversion processes, thermal sciences, space systems, remote sensing, propulsion, computational fluid dynamics, and other aspects of atmospheric and space flight.

The Institute has an established Center of Excellence in Laser Applications and offers graduate studies and research opportunities in laser diagnostics, laser materials interactions, picosecond processes, and coherent and non-linear optics.

The Institute was established in part to increase the research and engineering resources of Tennessee through education and practice in relevant scientific and technical areas and in part to interface University faculty and student research with the Air Force Arnold Engineering Development Center. The faculty, research activities, and facilities of the Institute and those available at Arnold Center through appropriate contractual arrangements provide students an unusual opportunity for significant research in these areas. Students who enroll at UTSI and admitted to The Graduate School, The University of Tennessee, Knoxville. Graduate Research Assistantships are available for qualified students. Further information may be obtained from the Dean, The University of Tennessee Space Institute, Tullahoma, Tennessee 37388.

Transportation Center
E. William Colglazier, Director

The Transportation Center, utilizing an interdisciplinary approach to transportation research, brings together both University faculty and students in a setting conducive to the solution of problems associated with the transportation of goods and people. The Center provides support for undergraduate and graduate students, as well as faculty, in projects associated with research in the field of transportation. Such support, while providing needed financial assistance to students, enables the Transportation Center to undertake research that ultimately contributes to the solution of the nation's transportation problems.

Water Resources Research Center
E. William Colglazier, Director

The Water Resources Research Center is a federally designated institute for the conduct of water research for the state. The purposes of the Center are: (1) to assist and support all the academic institutions of the state, public and private, in pursuing water resources research which addresses a wide range of problems of interest to the state, region, and nation; (2) to provide information, dissemination and technology transfer services to state and local government bodies, academic institutions, professional groups, environmental organizations, and others, including the general public, who have an interest in water resources matters; and (3) to promote education in fields relating to water resources and to encourage the entry of promising students into careers in these fields.
Majors and Degree Programs

College of Agriculture
Agricultural Extension Education
Agricultural Economics
Agricultural Engineering
Agricultural Engineering Technology
Animal Science
Entomology and Plant Pathology
Food Technology and Science
Forestry
Ornamental Horticulture and Landscape Design
Plant and Soil Science
Wildlife and Fisheries Science

College of Business Administration
Accounting
Business Administration
Economics
Management Science
Statistics

College of Communications
Communications

College of Education
Adult Education
Art Education
Business Education
College Student Personnel
Curriculum and Instruction
Education
Educational Administration and Supervision
Educational Psychology
Educational Psychology and Guidance
Guidance
Health Education
Industrial Education
Physical Education
Public Health
Recreation & Leisure Studies
Rehabilitation Counseling
Safety Education and Service
School Health Education
Special Education
Vocational-Technical Education

College of Engineering
Aerospace Engineering
Chemical Engineering
Civil Engineering
Electrical Engineering
Engineering Science
Environmental Engineering
Industrial Engineering
Mechanical Engineering
Metallurgical Engineering
Nuclear Engineering
Polymer Engineering

College of Human Ecology
Child and Family Studies
Food Science

College of Liberal Arts
Anthropology
Art
Audiology
Biochemistry
Botany
Chemistry
Computer Science
English
French
Geography
Geology
German
History
Mathematics
Microbiology
Modern Foreign Languages
Music
Philosophy
Physics
Political Science
Psychology
Public Administration
Sociology
Spanish
Speech and Hearing Science
Speech Pathology
Theatre
Zoology

College of Nursing
Nursing

College of Social Work
Social Work
(Memphis, Nashville, and Knoxville)

School of Biomedical Sciences
Biomedical Sciences

School of Library and Information Sciences
Library Science

School of Planning
Planning

DEGREE
M.A., Ph.D.
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## ACCOUNTING

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>201</td>
<td>Principles of Financial Accounting (3)</td>
<td>Introduction to financial accounting theory and practice with emphasis on preparation and reporting of financial information. Prerequisite to all other courses in accounting. Prereq: Mathematics 110 or 121 or equivalent. E</td>
</tr>
<tr>
<td>202</td>
<td>Principles of Managerial Accounting (3)</td>
<td>Introduction to managerial and cost accounting concepts with emphasis on uses of accounting data by managers in planning operations, controlling activities, and decision making. Prereq: 201. E</td>
</tr>
<tr>
<td>311-312</td>
<td>Intermediate Financial Accounting (3,3)</td>
<td>Theory, principles, and procedures related to valuation of assets, liabilities and equities, measurement of periodic income, and preparation of financial statements. Prereq: 202 for 311; and 311 and 312 with a grade of C or better and Management 303 for 312. E</td>
</tr>
<tr>
<td>321</td>
<td>Cost and Managerial Accounting (3)</td>
<td>Analysis of costing for products, projects, and management control. Topics include cost behavior, cost prediction, budgeting, and responsibility accounting. Prereq: 202. Prereq or Coreq: Management 303. E</td>
</tr>
<tr>
<td>380</td>
<td>Special Topics (3)</td>
<td>Critical consideration of selected current topics. May be selected from managerial/financial, systems or auditing. May include written reports and cases. Prereq: 312, 321, and 341 and consent of instructor.</td>
</tr>
<tr>
<td>411</td>
<td>Auditing (3)</td>
<td>Role of auditing in society, operational auditing, professional auditing standards, auditor's legal responsibilities, audit evidence and reporting, role of internal control and statistical sampling in auditing, applications to specific transaction cycles. Prereq: 312, 541, F, Sp</td>
</tr>
<tr>
<td>414</td>
<td>Advanced Accounting (3)</td>
<td>Issues and alternatives in advanced theory and problem areas including financial accounting theory, partnership accounting, business combinations, consolidated financial statements, and not-for-profit accounting. Major writing requirement. Prereq: 312, F, Sp</td>
</tr>
<tr>
<td>431</td>
<td>Federal Income Taxation (3)</td>
<td>Fundamentals of gross income, deductions, credits, and tax determination. Introduction to taxation of corporations and partnerships. Prereq: 311 or consent of instructor. E</td>
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</table>

## ADVERTISING

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>250</td>
<td>Advertising Principles (3)</td>
<td>Survey of the role of advertising in American business and society. Relationship between advertising and marketing; functional components of the advertising process: research, media, creative, and management.</td>
</tr>
<tr>
<td>340</td>
<td>Advertising Research Methods (3)</td>
<td>Secondary data and primary research techniques for advertising decisions. Prereq: 250 with a grade of C or better and Statistics 201.</td>
</tr>
<tr>
<td>350</td>
<td>Advertising Creative Strategy (3)</td>
<td>Basic concepts of creative strategy with intensive practice in developing creative platforms, writing and designing advertisements, and judging creative work. Prereq: 250 with a grade of C or better.</td>
</tr>
<tr>
<td>360</td>
<td>Advertising Media Strategy (3)</td>
<td>Assessment of markets, vehicle audiences and mathematical techniques for advertising planning. Instruction in media planning, buying, and evaluation. Prereq: 340 with a grade of C or better.</td>
</tr>
<tr>
<td>380</td>
<td>Advertising Professional Seminar (1)</td>
<td>Exploration of career choices in mass communications. Resume and letter writing, interviewing, and portfolio preparation. Prereq: Progression as a major in the Department of Advertising.</td>
</tr>
<tr>
<td>450</td>
<td>Advertising Management (3)</td>
<td>Case-study approach to advertising decisions. Data analysis and interpretation, generating alternative strategies, oral and written presentation of recommendations. Prereq: 350 and 360 with grades of C or better. Open to marketing seniors in the College of Business Administration with consent of Head of Department of Advertising.</td>
</tr>
<tr>
<td>470</td>
<td>Advertising Campaigns (3)</td>
<td>Group-based development, execution and evaluation of an advertising campaign for a regional or national client. Prereq: 450 with a grade of C or better.</td>
</tr>
<tr>
<td>490</td>
<td>Special Topics (3)</td>
<td>Detailed study of a specialized area of advertising. Topics vary by semester and include advanced media strategy, advanced creative strategy, direct marketing, and advertising and social issues.</td>
</tr>
<tr>
<td>492</td>
<td>Advertising Practicum (1)</td>
<td>Experience in a functional area of advertising. Ten hours laboratory each week. May be repeated once. Prereq: Progression as a major in the Department of Advertising. Satisfactory/No credit.</td>
</tr>
<tr>
<td>493</td>
<td>Independent Study (1-3)</td>
<td>Individual study in a specialized area under the supervision of a faculty member. Prereq: Consent of instructor.</td>
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</tbody>
</table>

## AFRO-AMERICAN STUDIES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>201</td>
<td>Introduction to Afro-American Studies (3)</td>
<td>Multidisciplinary approach to the Afro-American experience through the Civil War period which examines such issues as traditional African societies, the institution of slavery, the development of Afro-American culture, and the Civil War and Reconstruction.</td>
</tr>
<tr>
<td>202</td>
<td>Introduction to Afro-American Studies (3)</td>
<td>Multidisciplinary approach to the Afro-American experience from the Civil War through the Civil Rights era which focuses on such topics as Afro-American rural and urban societies, the Afro-American church and education, and the evolution of Afro-American intellectual and protest movements.</td>
</tr>
<tr>
<td>310</td>
<td>Introduction to Afro-American Music (3)</td>
<td>(Same as Music History 310.)</td>
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<tr>
<td>314</td>
<td>Peoples and Cultures of Africa (3)</td>
<td>(Same as Anthropology 314.)</td>
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<tr>
<td>315</td>
<td>Afro-American Anthropology (3)</td>
<td>(Same as Anthropology 315.)</td>
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<tr>
<td>322</td>
<td>Minority Group Politics in the United States (3)</td>
<td>(Same as Political Science 322.)</td>
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<tr>
<td>343</td>
<td>Race and Ethnicity (3)</td>
<td>(Same as Sociology 343.)</td>
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<tr>
<td>350</td>
<td>History of Jazz (3)</td>
<td>(Same as Music History 350.)</td>
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<tr>
<td>352</td>
<td>Afro-American Religion in United States (3)</td>
<td>(Same as Religious Studies 352.)</td>
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<tr>
<td>353</td>
<td>Topics in Afro-American Religion (3)</td>
<td>(Same as Religious Studies 353.)</td>
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<tr>
<td>364</td>
<td>Contemporary Issues in Afro-American Education (3)</td>
<td>1954 to the present. Issues relevant to the current dilemma of providing quality education for the Afro-American student including professional school quotas, intelligence testing, homogeneous grouping, Afro-American college survival, busing, Black English/Standard English controversy.</td>
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<tr>
<td>371-372</td>
<td>African History (3,3)</td>
<td>(Same as History 371-372.)</td>
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<tr>
<td>373</td>
<td>African Religions (3)</td>
<td>(Same as Religious Studies 373 and Anthropology 373.)</td>
</tr>
<tr>
<td>379</td>
<td>Geography of Africa (3)</td>
<td>(Same as Geography 379.)</td>
</tr>
<tr>
<td>420</td>
<td>Families: Race, Class and Culture (3)</td>
<td>(Same as Child and Family Studies 420.)</td>
</tr>
</tbody>
</table>
421 Comparative Studies in African and Afro-American Societies (3) Comparative studies of African and Afro-American societies in such areas as education, religion, and social stratification. Includes the respective economic systems and the significance of each other and the concept of Pan-Africanism.

429 History and Philosophy of Afro-American Education (3) Attempts by Afro-Americans to secure an education for themselves and their children from slavery to the present. Black perceptions of the importance of education and special obstacles confronting Blacks.

431 Research Seminar in Afro-American Studies (3) Basic approaches to the research process and development of research skills. Students design and implement a research project of their choice in the field of Afro-American Studies. Prereq: 201-202 and senior standing.

445 The Afro-American Experience From the Colonial Period to the Present (3) (Same as History 445.)

450 Issues and Topics in Afro-American Studies (3) Problems, topics, issues, and individuals from the field of Afro-American Studies. May be repeated. Maximum 6 hours.

452 Black African Politics (3) (Same as Political Science 452.)

461 African Prehistory (3) (Same as Anthropology 461.)

473 Black Male in American Society (3) Historical images, myths and stereotypes which have developed concerning Black males in American society. Impact and influence of critical factors as Black feminism, violence, concepts of masculinity, the family, white males, white females, homosexuality, nationalism, and athletics on Black males in America.

480 Black Communities in Urban America (3) Benevolent and historical influence of three major institutions: the church, the family, and the school upon the Afro-American struggle to survive. Includes political, economic, and social factors utilized by Blacks in developing coping strategies and mechanisms.

483 Afro-American Women in American Society (3) Historical and contemporary socio-economic-political factors in American society as they relate to the Black woman. (Same as Woman's Studies 483.)

491 Foreign Study (1-15) Prereq: 201-202 and consent of instructor. See page 97.

492 Off-Campus Study (1-15) Prereq: 201-202 and consent of instructor. See page 96.

493 Independent Study (1-15) Prereq: 201-202 and consent of instructor. See page 96.

496 Biology of Human Variability (3) (Same as Anthropology 496.)

AGRICULTURAL AND EXTENSION EDUCATION

201 Field Experience in Agricultural Education (1) Field experience in public school programs in agricultural and education. Satisfactory/No Credit grading only. Prereq: Consent of instructor. May be repeated. F, Sp.

245 Agricultural Experience, Leadership and Adult Programs (3) Developing supervised agricultural experience programs, conducting leadership development activities for Ag-Arm-Farm-Futures of America, Row and Methods for adult education in agriculture.

246 Strategies for Teaching and Program Planning in Agriculture (3) Methods and techniques for teaching agriculture, preparing teaching plans and courses of study, supervising programs of activities for agriculture.

411 Fundamentals of Agricultural Extension (3) History; philosophy; organizational structure; clientele served; major areas of program emphasis-teaching mission of research unit and other educational agencies. Sp.

420 Methods of Teaching Agricultural Mechanics (2) Methods and techniques for teaching agriculture students. Special competencies for planning, conducting and evaluating agricultural mechanics programs. Prereq: Agricultural Technology 201 on consent of instructor.


492 Agricultural and Extension Education Internship (2-6) Student work experience in approved county Extension offices, agricultural businesses, or agriculture related agencies. (Requires living off-campus for a specified term.) Prereq: 411 and consent of instructor. Sp, Su.

493 Special Problems in Agricultural and Extension Education (1-3) Individualized study of a special project or problem in Agricultural and Extension Education. Must be selected in consultation with the instructor. Prereq: Consent of instructor. May be repeated for credit. Maximum 6 hours. E

AGRICULTURAL ECONOMICS

210 Introduction to Agricultural Economics (3) Application of economic principles of demand, supply, price determination, and market structure to agriculture, natural resource, rural community development, and international trade and development. Economic aspects of current issues and problems associated with production, market and government use of government intervention in the agricultural, rural, and international sectors. Prereq: Economics 201. F, Sp.

310 Farm and Agribusiness Law (3) Survey of law applicable to the farmer, agricultural manager, and agricultural industry. Property, contracts, torts, drainage and water rights, landlord-tenant relationships, taxation and insurance, forms of business organization, estate planning, corporate and personal income tax planning, regulatory laws, and other selected topics. Prereq: Junior standing or consent of instructor. F.

342 Farm Business Management (3) Principles and procedures for determining most profitable farm organization and system of operation: nature of managerial processes; farm records and their uses; budgeting; economic aspects of acquisition and management of capital, land, labor and machinery resources. Prereq: Economics 201 and Junior standing; F.

350 Marketing of Agricultural Products (3) Survey of U.S. food and fiber marketing systems: marketing function; involvement of channels; marketing options of farmers; basic analysis of marketing problems. Prereq: 210 or consent of instructor. Sp.

352 Commodity Futures Markets (2) Futures market as an instrument for protection of industry and products; process of passing to others the risk of adverse price changes; price analysis from two viewpoints: supply and demand and history fundamentalists and chartists. Prereq: Junior standing; F, Sp.

412 Agricultural Finance (3) Macroe-finance, financial objectives, acquisition of debt and equity funds, capital investments, capital allocation, credit repayment, credit analysis, borrower and lender loan application analysis, insurance strategies, computer applications, kinds and sources of agricultural credit, and financial intermediation. Prereq: Economics 201; Junior standing or consent of instructor.

430 Agricultural and Trade Policy (3) Values, goals, and policy process; historical development and current characteristics of commodity, credit, food, and trade policy; relationship between domestic and international agricultural policy. Prereq: 210 or consent of instructor. Sp.

440 Agricultural Production Economics (3) Application of microeconomic theory to problem of resource allocation, enterprise selection; scale of operation of agricultural systems; economics interpretation of technical and agricultural production relationships. Prereq: 210 and Economics 311.

442 Farm Business Management II (3) Advanced topics in farm business management. Prereq: 342; familiarity with spreadsheets and mainframe computers: linear programming applications in farm planning; spreadsheet analysis of wholesale business; systems analysis and management control; risk analysis and management, income tax management; farm growth and intergeneration transfer. Prereq: 342. Sp.

450 Agricultural Price Analysis (3) Demand and supply analysis and applied discussion in agriculture; price determination, spatial equilibrium; temporal price patterns; pricing institutions. Prereq: 350 and Economics 311.


456 Rural Economic and Community Development (3) Historical and theoretical perspective on problems facing rural communities; linkages between family and nonfarm sectors; models and tools for analyzing rural development. Prereq: 210 or consent of instructor. F.

470 Natural Resource Economics (3) Nature of natural resources, economic efficiency as a basis for natural resource use; externalities in natural resource use; factors influencing environmental quality; alternative public policy tools for influencing natural resource use or improving environmental quality. Prereq: 210 or consent of instructor. Sp.

493 Independent Study (1-3) Directed individual or team research and report writing. Off-campus intern experience and reporting. Special courses in specific topics. Student must arrange with instructor before registering. May be repeated. Maximum 6 hours. Prereq: Junior standing. E.

AGRICULTURAL ENGINEERING

200 Specialty Areas of Agricultural Engineering (1) Activities and opportunities in five areas of specialization; required training for each area; projected career activities. 1 hour. F.

300 Environmental Relationships (2) Applications of thermodynamics principles to agriculture. Psychrometrics, thermodynamics cycles, photobiodynamics, the plant-animal-environment interaction. 2 hours. Sp.

310 Power Units and Machinery (2) Components and operating characteristics of internal combustion engines and tractor power transmission systems; functional analysis, selection and evaluation of agricultural machinery for implement system performance. Prereq: Mechanical Engineering 331: 1 hour and 1 lab. Sp.

320 Structures and Environment (2) Environmental control systems; ventilation, heat and moisture balance of agricultural buildings; production in clean environments. Prereq: Junior standing. 1 hour and 1 lab. Sp.

330 Processing (2) Application of basic engineering sciences to processing and handling of agricultural products; physical properties; thermal processing, curing, drying and materials handling. Prereq: 300, Engineering Mechanics 341, Nuclear Engineering 342; 1 hour and 1 lab. Sp.


350 Properties of Biological Materials (2) Mechanical, thermal, and electrical properties of biological systems and their effect on engineering design and utilization. Prereq: Engineering Science and Mechanics 210. 1 hour and 1 lab. F.

400 Professional Development (1) Engineering ethics; professional registration; opportunities for professional development and continuing education. 1 hour. F.
410 Electronic Measurements and Control for Agriculture (3) Sensing and controlling physical and environmental parameters electronically; sensor selection and interfacing; analog and digital I/O signal conditioning; programming, reconfiguration, and operation of programmable controllers. Prereq: Electrical Engineering 302 or senior standing. 2 hours including project laboratory.

420 Agricultural Engineering Design Fundamentals (2) Nature of design; creativity; analysis and synthesis; design; decision-making; selection and functional analysis of design project. Prereq: Senior standing. 1 hour and 1 lab. F

425 Agricultural Engineering Design Project (2) Synthesis of design; structure, kinematic, control system analysis; preparation of design drawings, specifications, model of device; written and oral report of project. Prereq: 420. 1 hour and 1 lab. Sp

430 Mobile Hydraulic Power System Design (2) Functional and operational characteristics of mobile hydraulic system components including pumps, valves and actuators; analysis and synthesis of power transmission and control circuits. Prereq: Engineering Science and Mechanics 341, 1 hour and 1 lab. Sp, AO

435 Design of Mechanisms for Agricultural Machines (2) Types of mechanisms; transmission angles; synthesis of plane mechanisms; introduction to space mechanisms. Prereq: Mechanical Engineering 465 or equivalent. 1 hour and 1 lab. Sp, AE

440 Irrigation and Drainage Design (2) Design of irrigation and drainage systems including crop response, climate, water quantity and quality, and system characteristics. Prereq: Mechanical Engineering 465 or equivalent. 2 hours and 1 lab (lab on alternate weeks). Sp, AO

445 Processing and Materials Handling Design (2) Systems and components for processing and utilization of crops including product characteristics, energy and mass balance, storage, handling and economic merit. Prereq: 330. 1 hour and 1 lab. Sp, AO

450 Electrical Distribution and Utilization Design (2) Design of on-farm electrical systems; control motors, stra voltage; special electrical loads; safety. Prereq: Electrical Engineering 301. 1 hour and 1 lab. Sp, AE


460 Design of Agricultural Structures (2) Design fundamentals for wood, steel, concrete, and composite materials; compression and tension members; beam and column design. Prereq: 320. 1 hour and 1 lab. Sp, AO

470 Special Problems in Agricultural Engineering (1-3) Selection, analysis solution and report of problem. May be repeated. E

480 Selected Topics in Agricultural Engineering (1-3) Current trends and problems in agricultural engineering. May be repeated. E

Agricultural Engineering Technology

201 Materials and Fabrication (3) Properties of materials including wood, metals, concrete, plastics and lubricants; drafting and planning; fabrication, selection and functional properties; welding; testing and mechanical properties. Prereq: 200. 2 hours and 2 labs.

211 Surveying and Engineering Technology in Agriculture (2) Agricultural surveying including measurement of distances, angles, and areas; differential and profile layouts; planimetric surveying; mapping; engineering fundamentals applied to problems in soil and water conservation, agricultural machinery, and structures. Prereq: 200. 2 hours and 1 lab. F

221 Surveying and Engineering Technology in Agriculture (3) Agricultural surveying including measurement of distances, angles, and areas; differential and profile layout; planimetric surveying; mapping; engineering fundamentals applied to problems in soil and water conservation, agricultural machinery, and structures. Prereq: 200. 2 hours and 1 lab. F

222 Food and Process Engineering Technology (3) Analysis and application of agricultural and food processing principles. Prereq: 220. 3 hours and 2 labs.

243 Agricultural Machinery and Tractors (3) Agricultural machinery and power units; adaptation to agricultural practices; management considerations. Prereq: 230. 2 hours and 1 lab. F

244 Small Internal Combustion Engines (3) Concepts and mechanics of small internal combustion engines; selection, operation, adjustment, troubleshooting, and repair of single-cylinder engines. Prereq: Physics 121 or consent of instructor. 2 hours and 1 lab. Sp

246 Agricultural Chemical Application Technology (3) Equipment for application of liquid, solid, and gaseous agricultural chemicals, system components; operational characteristics; calibration; selection and management; safety considerations; materials handling and rinsing. Prereq: Mathematics 121. 2 hours and 1 lab. F

247 Irrigation and Drainage (3) Irrigation and drainage systems including crop response, climate, water quantity and quality, and system characteristics. Prereq: Mechanical Engineering 465 or equivalent. 2 hours and 1 lab (lab on alternate weeks). Sp, AO

248 Agricultural Management Systems Analysis (3) Interdisciplinary management oriented course for the management of systems, including: livestock; crop production; economic principles, planning and operation of farm business. Team work, application of technical knowledge to a practical farm situation and evaluation of interrelationships among various subsystems. Open to juniors and seniors by invitation only.

Air Force Aerospace Studies (2,2) Mis sions, functions, and organization of the Air Force. Emphasis on Air Force Commands, environment in which the Air Force operates, and how the Air Force works with other services. Prereq: 200. 2 hours and 1 lab. F

250 Field Training (Academic Program) (1-4) Role of United States military forces in contemporary world, with particular attention to United States Air Force. Its organization and missions, various coding font forces of U.S. military power; organization of America's defense structure, policies of major powers, and elements and processes in making of defense policy. Conducted at Field Training bases throughout the country. Open only to two-year program applicants.


401-402 Air Force Aerospace Studies (3,3) Role and function of professionals in a defense organization; socialization process, public attitudes, and value orientations associated with professional military service, and decision-making processes of Department of Defense; political, economic, and social constraints affecting formulation of U.S. military strategy; technological and international developments upon strategic preparedness; emphasis on developing communicative skills. Prereq: Air Force ROTC approval.

American Studies

310 Introduction to American Culture: Voices of Dissent (3) Explores dynamics and nature of American culture through discussion of various forms of dissent. Topics include abolition, women's rights, civil disobedience, and nuclear disarmament.

334 Film and American Culture (3) (Same as English 334.)

410 Topics in American Culture (3) Content varies. May be repeated once.

Animal Science

101 Orientation to Animal Science (1) For Animal Science majors and Prevet students in their first year. Discussion of student services, activities, and careers; student participation in plans, the college experience. Satisfactory/No Credit. F

241 Breeds of Farm Animals (2) Evolution and formation of breeds of cattle, goats, horses, poultry, sheep and swine. Breeding structure, history, development, characteristics, and improvement programs of various breeds and strains. Prospects forpurebread industry and impact of crossbreeding programs. 1 hour and 1 lab. Sp-AE.

261 Fundamentals of Food Animal Evaluation (3) Structure and production principles of food animal industries. Criteria for food animal evaluation, market classes and grades of cattle, poultry and pork products, lamb and wool, and swine; subjective and objective techniques for evaluation of beef cattle, dairy cattle, poultry, sheep and swine. Introduction to and utilization of species specific performance programs. F

281 Farm Animal Health and Management Practices (4) Integration of herd/flock programs and management practices into cattle, horse, poultry, sheep, goats, and swine enterprises; characteristics and syndrome problems, prevention and treatment of major diseases, internal and external parasites. Animal health programs and regulations. Application of animal behavior to knowledge, handling animals, including facilities and restraint. Includes age determination, pre- and post-natal care, identification, dehorning, castrating, docking, implanting, doctoring, foot care, preparing for show and sale, record keeping, reproductive and milking management. 2 hours and 2 labs. F, Sp.

321 Anatomy and Physiology of Farm Animals (3) Skeletal and joint systems; muscular and microcirculation; the nervous, endocrine, cardiovascular, respiratory and digestive systems; demonstrations of physiological phenomena. Prereq: Biology 120. 2 hours and 1 lab. F

322 The Physiology of Reproduction and Lactation (3) Biology of sex and sexual differentiation, functional anatomy of male and female genital systems, reproduction and lactation, gametogenesis, neuroendocrinology and endocrinology of reproduction and lactation, sex cycles, folliculogenesis, ovulation, spermatogenesis, fertilization, embryonic development, implantation, pregnancy, parturition, initiation of lactation and maintenance of lactation. Prereq: Biology 120. 2 hours and 1 lab. Sp (Same as Zoology 322.)

331 Animal Nutrition and Feeds (3) Properties, func-
332 Ration Formation and Linear Programming Applications (3) Nutrient requirements and ration formulation for poultry, swine, cattle, sheep and laboratory animals. Mathematical and computer solutions for formulating complex rations with constraints. Prereq: Consent of instructor. 3 hours and 3 lab. AE

341 Principles of Animal Breeding (3) Genetic and environmental factors affecting heritability and genetic variation. Selection and mating systems as mechanisms of genetic change. Prereq: Consent of instructor. 2 hours and 3 lab. F


362 Dairy Cattle Judging and Selection (2) Comparative judging, oral reasons, breed classification programs, economic value of conformation traits. Prereq: 261. 2 labs. Sp

363 Judging Poultry and Poultry Products (2) Grading, judging and selection of breeds of common household pets, zoo animals and animals used in scientific research. Prereq: Consent of instructor. 2 hours. F

374 Horse Selection and Judging (2) Selection of horses for soundness and functional efficiency and the relationship of form to function in various breeds of horses. 2 labs. F

421 Applied Reproduction in Farm Animals (3) Collection, evaluation and preserve of ova, spermatozoa and embryos. Application of methods of natural breeding and techniques of artificial insemination and embryo transfer; herd sire and dam evaluation; pregnancy determination; gestation and parturition; infertility; recent advances in theriogenology. Prereq: 322 and consent of instructor. 1 hour and 2 lab. F

461 Advanced Beef Cattle, Dairy Cattle, Horse, Poultry, Sheep and Swine Judging (1) Specialization in judging; evaluation, selection and presentation of oral reasons for classes of beef cattle, dairy cattle horses, poultry, sheep, and swine. Prereq: Consent of instructor. 2 labs. F

483 Pork Production and Management (3) Integration of principles of nutrition, physiology, and breeding into complete pork management program. Prereq: Consent of instructor. 2 hours and 1 lab. F

484 Poultry Production and Management (3) Structure of industry, enterprise establishment, systems of production, production practices, and herd improvement programs. Prereq: Consent of instructor. 2 hours and 1 lab. F

485 Horse Production and Management (3) Integration of principles of selection, nutrition, breeding, physiology and ethology into a comprehensive horse production and management program. Prereq: Consent of instructor. 2 hours and 1 lab. F
students. Topics may include practical experience in laboratory study of archaeological materials. May be repeated. Maximum 6 hours. Prereq: 123 or consent of instructor.

461 African Prehistory (3) African cultural history from the earliest evidence of human activity to the time of European contact. Emphasis on the stone age of Africa south of the Sahara. Prereq: 120 or consent of instructor. (Same as Afro-American Studies 461.)

462 Early European Prehistory (3) Origins and evolution of human culture in Europe through the beginnings of settled life. Primary focus on Paleolithic and Mesolithic chronology and lifestyle. Prereq: 120 or consent of instructor.

463 Rise of Complex Civilizations (3) Development of complex societies in Old World from origins of agricultural economics to rise of States. Focus on Mesolithic, Neolithic, and Metal Age lifeways in Africa, Europe, and Asia. Prereq: 120 or consent of instructor.

464 Principles of Zoarchaeology (3) Basic osteological studies of major vertebrate groups, with emphasis on the aboriginal's use of animals in subsistence and culture. Identification and interpretation of archaeologically derived molluscan and vertebrate remains, with introduction to laboratory use of comparative collections. Prereq: 120 or consent of instructor.

480 Human Osteology (4) Intensive examination of the human skeleton. Prereq: 110 or consent of instructor. 3 hours and 1 hour lab.

481 Museology I: Museums, Purpose and Function (3) (Same as Art 481.)

482 Museology II: Exhibition Planning and Installation (3) (Same as Art 482.)

484 Museology III: Field Projects (1-12) (Same as Art 484.)

490 Primate Evolution (3) Living and fossil primate taxonomy, ecology, and comparative anatomy. Survey of primate fossil record with emphasis on the origin or major primate lineages. Prereq: 110.

491 Forestry Study (1-15)

492 Off-Campus Study (1-15)

493 Independent Study (1-15)

494 Primate Behavior (3) Social organization and behavior of selected primates including group composition, size, and structure; patterns of mating; other social interrelationships; and cultural behavior. Application of primate studies to human ethology. Prereq: 110 or consent of instructor.

495 Human Paleontology (4) Introduction to human fossil record from the earliest human remains to the earliest representative of modern human form. Prereq: 110.

496 Biology of Human Variability (3) Introduction to human populations; human adaptation, biological features of major human races, relationships of major groups to one another. Prereq: 110. (Same as Afro-American Studies 496.)

ARCHITECTURE

101 Introduction to Architecture (3) Scope and definition of architecture in relation to contemporary society, building industry, and allied design professions. Architectural design as a creative process. Orientation to courses and programs of the School. F

102 Visual Design (2) Principles of visual design and techniques of representation. Coreq: 172. Sp

171 Design Fundamentals I (3) Definition, ideas, and processes of design. Sketch design studies and freehand drawing. Introduction to drafting techniques; graphic and visual skill development. Coreq: 101. F


203 Second Degree Program: Seminar I (2) Theory and practice of architecture. Selected readings in history, theory, and design methodology with emphasis on contextual issues and architectural ordering principles. Coreq: 281. F

204 Second Degree Program: Seminar II (2) Selected readings in history, theory, and design methodology with emphasis on analysis of architectural exemplars. Prereq: 203. Coreq: 282. Sp

211 History of Architecture I (3) Architectural thought and ideas of building and community form. Ancient times to the Renaissance. Prereq: History 151, 152. F

212 History of Architecture II (3) Architectural thought and ideas of building and community form. Renaissance to mid-twentieth century. Prereq: 211. Sp

213 History and Theory of Contemporary Architecture (3) Architectural thought in design practice in late twentieth century. Examples of contemporary works and review of theoretical issues. Prereq: 212. F

231 Computer Applications in Architecture (3) Survey of the role of the computer in architecture, its potential and limitations. Recent developments in computer graphics with specific applications and demonstrations. F

232 Introduction to Architectural Technology (3) Place of building technology in architectural design. Introduces concepts and theory of structures; building materials and construction; and environmental controls. Sp

271 Architectural Design I (6) Fundamentals of architecture. Study of design determinants and emphasis on ideas of place and aspects of use. Prereq: 172. F


281 Second Degree Program: Design I (6) Principles of architectural design emphasizing approaches to site planning and design of buildings in relation to function and context. Circulation patterns, structural order, and space allocation. Coreq: 203. F


312 Materials and Methods of Construction (3) Properties of interior and exterior building materials and their relation to construction methods and detailing. Theory of material selection and application and the role materials and methods play in the design process. Prereq: 232. Sp

323 Advanced Computer Applications (3) Computer applications in architecture, with special emphasis on structural calculations. Prereq: 231.


332 Architectural Structures II (4) Continuation of analysis and design of simple structures of steel, wood and concrete based upon specific loading requirements. Use of construction and building codes, handbooks and design tables - selection of structural members. Prereq: 331. Sp

333 Advanced Structural Design (3) Analysis and design of basic building structures. Structural and constructional aspects of building, including structures in steel, concrete, masonry, and timber to satisfy loading and building code requirements. Prereq: 332 or equivalent.

334 Advanced Architectural Structures I (3) Philosophy of structural design in relation to materials and form. Advanced mathematical and experimental analysis of structures, including use of computer programs. Prereq: 332 or equivalent.


336 Advanced Design of Concrete Buildings (3) Precast and on-site concrete construction and maintenance, foundations, floor and wall systems. Domes and shell roofs. Prereq: 323 or equivalent.

341 Environmental Control Systems I (4) Heating, ventilation, and air conditioning. Introduction to passive and active solar energy systems. Plumbing and fire protection systems. Prereq: 231 and 232. F


400 Service Practice (6) Experience in architectural or equivalent office. Minimum of 3 months to be completed prior to fifth year entrance. E

403 Introduction to Preservation (3) History, theory, and legal aspects of architectural preservation and restoration.

404 Preservation Technology (3) Techniques of preservation: methods of analysis, history of materials and technology used in old buildings.

405 Descriptive Analysis of Historic Buildings (3) Identification and analysis of characteristic elements of buildings from various architectural periods, with emphasis on American architecture. Survey techniques.

406 Ideas in Architecture (3) Historical and critical review of the major ideas of architecture through the ages. Open to all students.

409 Cultural Comparison of Housing Patterns (3) Patterns of spatial organization and discrete elements of design for specific cultures with emphasis on housing, cultural, social, economic, climatic, and technical factors. Prerequisites: 324 or equivalent.

410 History and Theory of Urban Form (3) Patterns of community development. Selected historical and contemporary examples. Basic urban design issues and exemplary design approaches examined through lectures, readings, essays, and sketch studies including historical change in urban form and design.

411 Architecture Since 1945 (3) Recent architectural developments and views of the future.

412 Non-Western and Indigenous Architecture (3) Building responses to climate, material availability, and economic level, as designed by anonymous builders. Examples from pre-historic times to the present including Chinese, Japanese, Inca, Maya, Indian, Buddhist, and Mughal architecture of India, China, and Japan.

413 Tennessee Architecture (3) History of settlement patterns and building in Tennessee. Selected examples examined through reading assignments, lectures, discussion, and field trips. Historical research using primary material.

414 History of Architectural Technology (3) Building materials and construction techniques from antiquity to the present.

415 Medieval Architecture (3) History of architecture from the decline of Rome to the beginning of the Renaissance. (Same as Medieval Studies 415.)

416 Forms of Utopia (3) Ideas and architectural expres-


420 American Architecture II (3) Stylistic periods from the Gothic Revival through the twentieth century.

421 History of Landscape Architecture (3) Intellecutal, societal, and geographical influences which provide the theoretical basis for design throughout history. Selections from the development of landscape architecture analyzed in terms of design.

422 Modern East European Architecture (3) Twentieth century architecture in Russia, Czechoslovakia, Poland, Hungary, East Germany, Rumania, Bulgaria, Yugoslavia.

425 Special Topics in Architecture (1-4) Individual topics under faculty direction. Credit adjusted to project complexity and level of effort. May be repeated. Maximum credit 6 hours.

426 Special Topics in History, Theory and Criticism (1-4) Special topics in history-related subjects. May be repeated. Maximum credit 6 hours.

431 Structural and Mechanical Applications (4) Analysis and selection of structural and mechanical systems for a specific case study to integrate technical information into a unified design solution. Prereq: 332, Coreq: 471. F

432 Earthquake-Resistant Structures (3) Analysis and design of structures to resist earthquake effects. Earthquake phenomena, vibration of single degree structural systems, damping and testing. Introduction to dynamic analysis of structures, instrumentation and structural response, frame and shear wall behavior, ground structure interaction. Prereq: Consent of instructor. (Same as Civil Engineering 433.)

434 Elementary Structural Matrix Methods (3) Introduction to generalized matrix methods of analysis of structures. 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 434.)

435 Planning and Design of Tall Buildings (3) Architectural, economic and urban design considerations in design of tall buildings. Environmental and service systems; wind, fire and earthquake resistance; structural and construction considerations; building standards; steel, concrete, and masonry structures; foundations. Prereq: Consent of instructor.

436 Building Energy Analysis (3) Balancing heat flow through external skin of residential and small and large commercial buildings; local climate evaluation; site planning, building size and orientation, window area, wall treatments. Energy conservation, energy analysis, quantification methods and economic analysis of energy efficient design features. Architectural program analysis of external and internal load dominated buildings. Prereq: 341.

444 Advanced Environmental Control Systems (3) In-depth analysis and innovative concepts in design of heating, ventilating, and air conditioning. Prereq: 341.

445 Advanced Lighting (3) In-depth analysis and innovative concepts in design of lighting. Prereq: 342.

462 Professional Practice (4) Management and organizational theories and practices for delivering professional design services. Included are assessment of the building industry and its influence on practice; analysis of the basic management functions within professional firms; and legal and ethical concerns facing practicing designers today. Special obligations and privileges of the design professional.

463 Architectural Development (3) Principles and practice of the architect as a developer. Impact of economic, political, and social forces on urban policy on the design and development of real estate. Open to all students.

464 Project and Construction Management (3) Principles, methods, and application of project and construction management in the building process. Project manager's and construction manager's function; responsibilities, and liability investigated through case studies. Methods and theories of estimating project cost and building cost in current practice. New techniques of cost analysis.


468 Marketing Services (3) Theories of marketing for architectural practice. Case studies. Public relations procedures.

469 Codes, Zoning, and Fire Protection (3) Theory, review, and research of codes, zoning, and fire protection. History and development of fire safety and building codes; history and development of zoning emphasizing architect's responsibility for specific project application. Characteristics of fires in buildings, fire codes, building evacuation, sprinklers and other fire protection systems. Emergency power and lighting. Fire resistant materials and construction.


472 Architecture Design VI (6) Ordar and form in complex designs developed to address programmatic, structural, energy, and environmental issues. Prereq: 471. Sp

473 Architectural Photography (3) Photography as a design, research, and presentation medium. Application of photographic techniques, printing and processing. Color, black and white.


481 Advanced Architectural Design Topics I (3) Special areas which effect architectural design, such as alternative approaches to design, energy, urban design, urban development, structural studies, historic preservation, and special building types. Work from this program may relate to the student's Comprehensive Design Project. Prereq: 472. Certain architectural electives may be stipulated as prerequisite for specified sections.

482 Comprehensive Design Project II (3) Student selected project under faculty direction. Exploration of design hypothesis which informs the character of a substantial building design. (See Architecture 480. Completed project will address all issues of environment, structure, enclosure, use, and aesthetic consideration of design appropriateness. Design is expected to stand up to rigorous scrutiny regarding strength of idea, economy of means, durability, validity for stipulated use, quality of cultural expression, and character of setting. Prereq: 480 and satisfactory completion of all design courses. Sp

491 Foreign Study (1-15) Research and design projects conducted abroad, F, Sp.

492 Off-Campus Study (1-15) Studies conducted under direction of architect or expert in an allied profession in service to public service organizations or agencies of government, and public groups. Not a Design Course elective.

493 Independent Study (6) Faculty initiated studies and projects which are approved by the dean and conducted in a studio. May be repeated once. Prereq: Consent of instructor.

ART

101 Studio Fundamentals: Drawing (2) Development of observational skills and perception of reality. Fundamental aspects of drawing—line, tone, space, form, organization. Primarily for art, architecture, interior design, and art education majors.

102 Studio Fundamentals: Two Dimensional Design (2) Surface composition and color. Primarily for art, architecture, interior design, and art education majors.

103 Studio Fundamentals: Three Dimensional Design (2) Projects dealing with real space and three dimensional materials. Primarily for art, architecture, art education, and interior design and housing majors.


105 Fiber: Three Dimensional Non-Woven Structures (3) Contemporary approaches to fiber art including exploration and experimentation with various fiber media and techniques in development of sculptural fiber forms.

106 Introduction to Metalsmithing and Jewelry (3) Basic metalworking and jewelry fabrication techniques including repoussé, annealing, forging, chasing, embossing, dapping, drawing, rolling, sinking, soldering, fusing, polishing, and patination with individual studio projects to develop a personal style of expression.

151 History of Graphic Design/Illustration (2) Major movements and pivotal artists/designers/art directors, 1850 to the present, and their impact on current graphic design trends. (Does not apply to art history requirement.)

161 Basic Printmaking (3) An introductory survey of print-making with studio experience in xerography, monotype, silkscreen, relief and collograph.


172 Western Art I (3) Major monuments in Western Art with emphasis on Europe from prehistory through the Middle Ages.

173 Western Art II (3) Major monuments in Western Art with emphasis on Europe and America from 1400 to the early 20th century.

176 Experiencing Art (3) Form and meaning in the visual arts. Lecture-discussion. Especially for non-majors.

183 Asian Art (3) Art of Central and Southeast Asia, India, China, Korea, and Japan from prehistory through common Buddhist forms and into modern media.

191 Introduction to Studio Art: Various Media (3) Individual sections for various artistic disciplines. For non-majors only. Course may be repeated, medium may not be repeated. Maximum 12 hours.

192 Intermediate Design and Color (3) Further exploration of basic techniques of two-dimensional design, with emphasis on color theory and technique. Prereq: 101, 102, 103.

201 Fabric: Painting and Dyeing (3) Painting and dyeing processes in the development of surface design on fabric, including batik, direct drawing, and/or other resist approaches.


203 Fabric: Soft Sculpture (3) Fabric as a medium. Development of relevant skills in the manipulation of fiber media in development of architecturally scaled wall works.
205 Jewelry (3) Metalworking and jewelry techniques emphasizing integration of casting and fabricating methods (including stonesetting, fastenings, and mechanisms) with individual studio problems to develop a personal style of expression. Prereq: 106. May be repeated. Maximum 6 hours.

206 Enameling (3) Graphic, painterly, and dimensional capacities of vitreous enamel techniques (including basse-taille, ciselonné, plaque-a-jour, imoge, sgraffito, grisaille, champlevé) with individual studio problems to develop an individual style of expression. May be repeated. Maximum 6 hours.

209 Special Topics in Fiber and Fabric (3) Student or instructor-initiated course to be offered at convenience of department. Prereq: Determined by department for individual topic. May be repeated. Maximum 12 hours.


212 Drawing II: Life Drawing (3) Development of drawing and observational skills with special emphasis on structure and dynamics of the human figure and of the figure in environment. Prereq: 211. May be repeated. Maximum 6 hours.

213 Painting I: Introduction (3) Capacities of oil and acrylic painting on canvas. Prereq: 101, 102, 103 for art majors; none for non-art majors.

214 Painting II (3) Techniques of expression in oil and/or acrylic. Prereq: 213 for art majors; 181-Painting for non-art majors. May be repeated. Maximum 6 hours.


216 Watercolor II (3) Capacities of transparent watercolor, with attention to individual exploration of surface, space, and concept. Prereq: 215 for art majors; Art 191-Watercolor for non-art majors. May be repeated. Maximum 6 hours.

219 Special Topics in Painting/Drawing (3) Student or instructor-initiated course offered at convenience of department to enhance and expand the painting, drawing, and watercolor curricula. Prereq: Determined by department for individual topic. May be repeated. Maximum 12 hours.

221 Ceramics I: Handbuilding (3) All ceramic handbuilding techniques including forming methods, glazing, clay preparation, firing, small and large scale pieces. Ceramic history through slide lectures.

222 Ceramic II: Throwing (3) Thrown ceramic forms including functional utilitarian pottery techniques, glazing and firing methods. Prereq: 221 for art majors; 191-Watercolor for non-art majors. May be repeated. Maximum 6 hours.

229 Special Topics in Ceramics (3) Student or instructor-initiated course to be offered at convenience of department. Prereq: Determined by department for individual topic. May be repeated. Maximum 12 hours.

231 Photography I (3) Art of black and white photography. Field and studio shooting, history of photography, basic developing and enlarging techniques.

232 History of Photography (3) Photography as a fine art. Emphasis on work of Steiglitz, Strand, Weston, and White. (Does not apply to art history requirement.) Prereq: 231.

239 Special Topics in Photography (3) Student or instructor-initiated course offered at convenience of department. Prereq: Determined by department for individual topic. May be repeated. Maximum 12 hours.

241 Sculpture I (3) Problems which explore basic material and techniques including clay modeling, plas- ter construction, moldmaking. Limited work in plastics, wood, or metal.

242 Life Sculpture I (3) Modeling techniques in clay and development of seeing possibilities of expression with human figure as subject. Modeling process as both observational and material handling technique. Prereq: 101, 102, 103, or consent of instructor. May be repeated. Maximum 6 hours.

243 Metal Cast Sculpture I (3) Metal casting methods including bronze, aluminum. May include foundry wax, styrofoam sand, ceramic shell casting methods. May be repeated. Maximum 6 hours.

244 Wood Sculpture I (3) Wood as sculptural medium. May include use of hand and power tools, carving, and construction.

245 Steel Sculpture I (3) Problems to introduce steel as a material and course of study of sculpture. Development of welding techniques.

246 Mixed Media Sculpture I (3) Use of two or more materials, and a variety of sculptural techniques, joined to create dimensional form. May include carving, modeling, joining, building, welding techniques. May be repeated. Maximum 6 hours.

249 Special Topics in Sculpture (3) Student on instructor initiated course offered at convenience of department. Prereq: Determined by department for individual topic. May be repeated. Maximum 12 hours.

251 Beginning Graphic Design (3) Survey of graphic design: tools, materials, techniques, lettering, and use of type; layout and design. Prereq: 101, 102, 103.

252 Production (3) Design and layout; practice of mechanical preparation of art for various printing processes; skills and craftsmanship emphasized. Prereq: 251.

253 Advertising Design (3) Fundamentals of lettering and layout for newspaper, magazine, television, outdoor advertising. Non-art majors only.

256 Individual Projects in Graphic Design/ Illustration (3) Prereq: Consent of instructor. May be repeated. Maximum 8 hours.

259 Special Topics: Graphic Design/Illustration (3) Student or instructor initiated course offered at discretion of department. Prereq: Determined by department for individual topic. May be repeated. Maximum 12 hours.

262 Intaglio I (3) Metal plate intaglio printing in traditional and contemporary techniques of etching, softground, drypoint, mezzotint, aquatint, and photo etching. May be repeated. Maximum 6 hours.

263 Lithography I (3) Stone and aluminum plate lithography applying traditional and contemporary techniques of crayon, tusche, transfer methods, and state proofs. May be repeated. Maximum 6 hours.

264 Screen Printing I (3) Screen printing as a fine art medium including development and application of various basic stencils in compositional printing. May be repeated. Maximum 6 hours.

269 Special Topics in Printmaking (3) Student or instructor-initiated course offered at discretion of department. Prereq: Determined by department for individual topic. May be repeated. Maximum 12 hours.

279 Special Topics in Art History (3) Student or instructor-initiated course offered at convenience of department. Prereq: Determined by department for individual topic. May be repeated. Maximum 12 hours.

291 Papermaking Workshop (3) Papermaking as a medium for two and three-dimensional art, includes sheet forming, insetting, laminating, embellishing, pulp dyeing, inlaying, casting, and other related techniques. Emphasis on development of a personal form.

292 Film Design (3) Introductory theory and practice of film making. Emphasis on graphic elements through use of motion picture camera.

299 Special Topics (3) Student or instructor-initiated course offered at convenience of department. Prereq: Determined by department for individual topic. May be repeated. Maximum 12 hours.

300 Inter-area Portfolio Review (0) Review of prior studio work. Successful completion required prior to registration for junior and senior courses. Prereq: Consent of department. Satisfactory/No credit only.

301 Fibre: Individual Class Projects (3-6) Prereq: 104, 201, 203 or consent of instructor. May be repeated. Maximum 8 hours.

302 Fiber: Individual Class Projects (3-6) Prereq 102, 202, 204 or consent of instructor. May be repeated. Maximum 6 hours.

308 Silversmithing (4) Intensive metalsmithing techniques including forging, raising, shell forming, lathe, mokume, and laminating with individual studio problems to develop a personal style of expression. Prereq: 106, 205 or consent of instructor. May be repeated. Maximum 8 hours.

311 Drawing III (4) Development of personal drawing techniques and concepts through class problems. Prereq: 212 and 312 or consent of Instructor. May be repeated. Maximum 8 hours.

312 Drawing Portfolio Review (0) Review of prior work in drawing. Successful completion required prior to registration for junior and senior courses. Prereq: Consent of department. Satisfactory/No credit only.

313 Painting III (4) Individual expression with varied media on canvas. Prereq: 214 and 314 or consent of instructor. May be repeated. Maximum 8 hours.

314 Painting Portfolio Review (0) Review of prior work in painting. Successful completion required prior to registration for junior and senior courses. Prereq: Consent of department. Satisfactory/No credit only.

320 Ceramics Portfolio Review (0) Review of prior work in ceramics. Successful completion required prior to registration for junior and senior courses. Prereq: Consent of department. Satisfactory/No credit only.


331 Photography II (4) Individual expression in photographic medium. Prereq: 231. May be repeated. Maximum 8 hours.


334 Photographic Techniques Workshop (4) Theories and practices of film exposure and development. Introduction to zone system. Prereq: 331.

340 Sculpture Portfolio Review (0) Review of prior work in sculpture. Successful completion required prior to registration for junior and senior courses. Prereq: Consent of department. Satisfactory/No credit only.

341 Sculpture II (3) Further exploration and development of sculptural concepts and materials. Prereq: 240 and 340. May be repeated. Maximum 6 hours.

342 Life Sculpture II (3) Advanced modeling techniques in clay and wax working from the figure. Includes casting a minimum of one piece. Prereq: 242 and 340 or consent of instructor. May be repeated. Maximum 6 hours.


344 Wood Sculpture II (3) Extension of skills and techniques begun in 244. Prereq: 244 and 340 or consent of instructor. May be repeated. Maximum 6 hours.
345 Steel Sculpture I (3) Further exploration of con-struction in steel and other metals. Prereq: 245 and 340.

346 Mixed Media Sculpture II (3) Further problems in the sculptural use of two or more distinctive materi-als. Prereq: 246 and 340.

350 Graphic Design/Illustration Portfolio Review (0) Review of prior work in graphic design illustration. Successful completion required prior to registration for junior and senior courses. Prereq: 252 or consent of instructor. Satisfactory/No credit only.


352 Corporate Design (3) Concepts of corporate graph-ics. Problems include all areas of graphic design and illustration. Prereq: 351.

353 Black and White Illustration (3) Black and white media and techniques as applied to product and edi-torial illustration. Prereq: 350.

354 Color Illustration (3) Flat and process color media and techniques as applied to product and editorial illustration. Prereq: 353.


356 Introduction to Computer Enhanced Design I (1) The computer as a design tool. Prereq or Coreq: 351.

360 Printmaking Portfolio Review (0) Review of prior work in printmaking. Successful completion required prior to registration for junior and senior courses. Prereq: Consent of department. Satisfactory/No credit only.

362 Intaglio II (4) Color intaglio printing from a single metal plate, including a la poupée', chine colle', and relief rolls. Prereq: 262 and 350. May be repeated. Maximum 8 hours.

363 Lithography II (4) Color lithography from stone and plates using mylar registration. Extra techniques; including xerox and monotype transfers, acid tinting, reversals, chine colle' and photo-lithography. May be repeated. Maximum 8 hours.

364 Screen Printing II (4) Advanced work with basic screen printing techniques including photo screen-printing. Emphasis upon image development and personal concept. Prereq: 264 and 360. May be repeated. Max-imum 8 hours.

371 Early Christian and Byzantine Art, to 1350 (3) Art in Italy and the Eastern Empire from the beginnings of Christian art to c. 1350. Mosaic and painting, sculp-ture and architecture. (Same as Medieval Studies 371.)

372 Northern European Painting, 1350-1600 (3) From courtly art of late Middle Ages to Northern Renaiss-ance. Jan van Eyck, Roger van der Weyden, and Durer; early printmakers. (Same as Medieval Studies 372.)

374 Art of Northern Europe, 1600-1765 (3) Concentrated study of Bruegel, Rubens, Rembrandt, Georges de La Tour, Vermeer, Poussin, and Hals.

375 History of Modern Sculpture in Europe and America I (3) From 1800 to 1900: Neoclassicism to Rodin. From 1900 to present: emphasis on Cubism, Con-surrealist, abstract expressionism, pop and Pop Art, Primary Forms, Environments, and Earthworks.

381 Medieval Art of the West, 800-1400 (3) Western European art of the "Dark Ages," Romanesque, and Gothic periods. (Same as Medieval Studies 381.)

382 The Art of Italy: 1250-1450 (3) Development of exploration of naturalism. Revival of antiquity and devel-opment of theories of perspective in the Early Renaissance, including Duccio, Giotto, Masaccio, Don-atello, Botticelli. (Same as Medieval Studies 382.)


384 Art of Southern Europe: 1575-1700 (3) Concentrated study of Caravaggio, Bernini, and Italian Baroque deve-lopments in all media. Spanish Baroque painting and sculpture with special attention to Velazquez.

385 Chinese Art (3) Survey from pre-Shang Dynasty to contemporary movements in China, Taiwan, and Hong Kong. New discoveries are stressed.

386 Japanese Art (3) Survey from ancient Joman art in clay to the present-day painting style of style. Variety of media emphasized.

392 Film Design (3-6) Theory and practice of film making. Prereq: 292.

396 Beginning Airbrush (3) Techniques of airbrush drawing; skills and creative applications emphasized. For art majors only.

401 Fiber: Advanced Projects (3-6) Prereq: 302 or consent of instructor. May be repeated. Maximum 12 hours.

402 Fabric: Advanced Projects (3-6) Prereq: 301 or consent of instructor. May be repeated. Maximum 12 hours.

404 Intermediate Computer Enhanced Design III (3) Exploration of computer systems, software and tech-niques. Prereq: 356 or consent of instructor.

405 Advanced Computer Enhanced Design (3) Prereq: 364 or consent of instructor. May be repeated. Maxi-mum 6 hours.

406 Goldsmithing (3-6) Advanced metalsmithing techniques including granulation, electroforming, elec-tropainting, electropolishing, anodization, and photo processes with individual studio problems to develop a personal style of expression. Prereq: 6 hours of metalsmithing or consent of instructor. May be repeat-ed. Maximum 12 hours.

409 Special Topics in Fiber/Fabric (3) Student or instructor-initiated course to be offered at convenience of department. Prereq: Determined by department for individual topic. May be repeated. Maximum 12 hours.

411 Drawing IV (6) Individualized pursuit of personal drawing techniques and concepts, supplemented by individual and group critiques and weekly life drawing sessions. Prereq: 311. May be repeated. Maximum 12 hours.

413 Painting IV (6) Advanced painting stressing indi-vidual concepts and personal expression with varied media. Prereq: 313. May be repeated. Maximum 12 hours.


419 Special Topics in Drawing and Painting (3) Student or instructor-initiated course offered at convenience of department to enhance and expand the painting, drawing, and watercolor curriculum. Prereq: Determined by department for individual topic. May be repeated. Maximum 12 hours.

421 Ceramics: Individual Projects (3-6) Special topic each semester, e.g., low fire ceramics, alternative firing methods, specialized clay techniques. Individual direc-tion stressed. Prereq: 321 and 322. May be repeated. Maximum 12 hours.

422 Ceramics: Advanced Projects (3-6) Each stu-dent is responsible for developing a thematic investigation of a specific concept using appropriate methods, materials and presentation. Prereq: 421. May be repeated. Maximum 12 hours.

423 Ceramics: Surface Design (3) High and low fire glaze techniques. Use of stains, slips, underglazes, airbrush, and lusters, etc. Relationship between form and surface emphasized. Individual direction expected. Prereq: 321 and 322.

424 Ceramics: Clay and Glazes (3) Clay chemistry, clay bodies, glaze theory, glaze calculation, intensive formulating, mixing and testing of clay bodies and glaze formules. Prereq: 321 and 322.

425 History of Ceramics Seminar (3) Survey of the history of ceramics from ancient through contempo-rary. Emphasis on ceramics sculpture, and the vessel aesthetic. Slide lectures and individual presentations. (Does not apply toward art history requirement.) Prereq: 321 and 322.

426 Kilns: Design, Construction and Operation (3) Designing kilns, traditional and modern refractories, construction methods, and operation of wood, gas and electric kilns. Prereq: 252 or consent of instructor.

429 Special Topics in Ceramics (3) Student or instructor-initiated course offered at convenience of depart-ment. Prereq: Determined by department for individual topic. May be repeated. Maximum 12 hours.

431 Photography III (3-6) Individual development of photographic problems and techniques. Prereq: 239 and 331. May be repeated. Maximum 12 hours.

439 Special Topics in Photography (3) Student or instructor initiated course offered at convenience of depart-ment. Prereq: Determined by department for individual topic. May be repeated. Maximum 12 hours.

441 Advanced Sculpture (3-6) Individual development of sculptural problems and techniques. Prereq: 6 hours of 300 level sculpture. May be repeated. Maximum 12 hours.

449 Special Topics in Sculpture (3) Student or instructor-initiated course offered at convenience of depart-ment. Prereq: Determined by department for individual topic. May be repeated. Maximum 12 hours.

451 Advanced Graphic Design (3) Advanced projects in conceptual and applied design for print media: publications, posters, advertisements. Prereq: 352.


453 Advertising Illustration (3) Concepts of advertis-ing illustration media and techniques as applied to project illustration. Prereq: 354.

454 Editorial Illustration (3) Concepts of editorial illus-tration media and techniques as applied to book, magazine, and newspaper illustration. Prereq: 453.

455 Professional Seminar (3) Political, social, econ-omic and ethical problems of the contemporary designer. Seminars with guest speakers. Senior port-folio reviews, resume' design. Prereq: 350.

456 Graphic Design/Illustration Practicum (1-12) Practical work experience in the design or illustration field. Only by rearrangement with the department. Prereq: Senior standing and consent of instructor. May be repeated. Maximum 12 hours.

459 Special Topics in Graphic Design/Illustration (3) Student or instructor-initiated course offered at dis-ccretion of department. Prereq: Determined by department for individual topic. May be repeated. Maximum 12 hours.

462 Intaglio III (3-6) Exploration of individual projects through advanced color etching methods and combi-nations with other print media. Prereq: 362. May be repeated. Maximum 12 hours.

463 Lithography III (3-6) Exploration of individual projects through advanced color etching methods from stones and aluminum plates. Prereq: 383. May be repeated. Maximum 12 hours.


469 Special Topics in Printmaking (3) Student or instructor-initiated course offered at convenience of depart-ment. Prereq: Determined by department for individual topic. May be repeated. Maximum 12 hours.

471 History of North American Art (3) Survey of land-mar党的建设, painting, architecture, and sculpture, and design from prehistory to 1900.

472 History of 20th Century American Art (3) Devel-opment in architecture, painting, and design from 1900.
473 19th Century American Painting (3) From West and Copley to emergence of “The Eight”.

474 History of Modern Architecture in Europe and America (3) Emphasis on France: Neoclassicism, Romanticism, Friederic, Constable, Turner, Cotot and Barbizon landscapes, Hudson River Group, Pre-Raphaelite Brotherhood, Manet, Courbet, Impressionism, Eakins, Homer, Seurat through Cezanne.

476 History of 20th-Century Painting in Europe and America (3) Fauvism, De Bruyke, Cubism, Der Blaue Reiter, Futurism, Dada and Surrealism, geometric abstraction, social commentary painting, Abstract Expressionism in the USA and parallels in Europe; Pop, Op, Minimal and Concept Art.

490 Special Topics (3) May be repeated. Maximum 6 hours.

493 Independent Study (3) May be repeated. Maximum 9 hours.

ASIAN STUDIES

101-102 Asian Civilization (3,3) Comparative study of development of religion, social institutions, and high culture in India, China, Japan, and the islamic world. 101 is one of two classifications. 102Traditional cultures and their modern developments.

121-122 Elementary Modern Standard Arabic I, II (5,5) Literary Arabic, language of the press, broadcasting, literature and formal situations. Must be taken in sequence.

131-132 Elementary Chinese I, II (5,5) Must be taken in sequence.

141-142 Elementary Modern Hebrew I, II (4,4) Taped language program. Must be taken in sequence.

151-152 Elementary Japanese I, II (5,5) Must be taken in sequence.

161-162 Elementary Persian (4,4) Taped language program. Must be taken in sequence.

221-222 Intermediate Modern Standard Arabic I, II (5,5) Literary Arabic, the language of the press, broadcasting, literature, and formal situations. Must be taken in sequence.

231-232 Intermediate Chinese I, II (5,5) Must be taken in sequence.

241-242 Intermediate Modern Hebrew I, II (4,4) Taped language program. Must be taken in sequence.

251-252 Intermediate Japanese I, II (5,5) Must be taken in sequence.

311-312 Chinese Literature in English Translation (3,3) 311-312 Classical literature. 312-Vernacular and modern literature.


315 The Literature of India in English Translation (3) Major genres and masterpieces of indian literatures—epic, poetry, drama, modern novel. Concentration on ancient and classical periods of Indian literary history.

319 Islamic Literature in English Translation (3) Selections from the Koran, classical Arabic and Persian poetry, and classical Arabic, Persian, and Turkis prose,
Astronomy

151-152 Introductory Astronomy (4,4) Survey of the composition, structure, and dynamics of the universe which introduces the basic vocabulary of astronomy and scientific method. Components of the solar system including results from interplanetary exploration; hypotheses and theories of the origin and evolution of our solar system in light of modern astrophysics and particle physics. A minimum of mathematical analysis. Must be taken in sequence. 4 hours lecture. Prerequisites: consent of instructor. May be repeated. Maximum 9 hours.

451 Readings in Chinese Literature (3) Prerequisite: Mastery of intermediate-level of Chinese or consent of instructor. May be repeated. Maximum 9 hours.

457 Readings in Japanese Literature (3) Prerequisite: Mastery of intermediate-level of Japanese or consent of instructor. May be repeated. Maximum 9 hours.

471 Selected Topics in Asian Studies (3) Content varies. May be repeated. Maximum 9 hours.

491 Foreign Study (1-15) See page 97.

492 Off-Campus Study (1-15) See page 98.

493 Independent Study (1-15) See page 98.

Audio and Speech Pathology

126 Speech for Foreign Students (3) Sounds and intonation patterns of American English and relation of language and speech disorders.

304 Introduction to Communication Disorders (3) Nature, etiology, and incidence of speech, hearing and language disorders.

305 Speech Science I: Phonetics and Acoustics of Speech (3) Basic phonetics including recognition and production of spoken English sounds with analysis of their formation. Discusses characteristics of speech and speech perception.

306 Speech Science II: Anatomy and Physiology (3) Anatomy, physiology and embryological development of the speech production mechanism. Prerequisite: 305.

320 Speech and Language Development (3) Speech and language development in the normal child.

331 Articulation Disorders (3) Etiology, diagnosis, and treatment of articulatory defects. Prerequisite: 304, 305, or consent of instructor. (Same as Speech Education 331.)

371 Audiology I (3) Basic acoustics. Fundamental aspects of auditory anatomy and physiology. Introduction to disorders of hearing. Basic Psychoacoustics. (Same as Speech Education 371.)

404 Appraisal of Speech and Language Disorders (3) Diagnostic procedures for children and adults with speech and language problems including observation and practice with diagnostic tests. Prerequisite: 304, 305, 433 or consent of instructor. (Same as Special Education 404.)

431 Stuttering (3) Nature, appraisal and treatment. Prerequisite: 304 or consent of instructor.

433 Clinical Practice in Speech-Language Pathology I (1-4) Prerequisite: 320, 351 or consent of instructor. Enrollment for fewer than 2 semester hours must have prior departmental approval. (Same as Special Education 433.)

434 Clinical Practice in Speech-Language Pathology II (1-4) Prerequisite: 433 and consent of instructor. Enrollment for fewer than 2 semester hours must have prior departmental approval. (Same as Special Education 434.)

440 Voice Disorders (3) Etiology, diagnosis, and treatment of organic and functional voice disorders. Prerequisite: 304, 305, or consent of instructor. (Same as Special Education 440.)

445 Clinical Practice in Audiology (1-4) Prerequisite: 473 and 494.

455 Problems in Speech Pathology (1-3) Prerequisite: Consent of instructor.

461 Introduction to Language Pathology in Children (3) Nature, etiology and treatment of language retardation in children: observations of language therapy required. Prerequisite: 320 or consent of instructor.

463 Practical Applications of Language Habilitation Techniques (3) Various methods and procedures used in treating delayed/disordered preschoolers. Alternatives/augmentative systems included. Prerequisite: 461 or consent of instructor.

465 Speech and Language of the Culturally Different Child (3) Speech and language differences of children of various minority groups. Recommended, but not required to be taken in sequence. Students who receive credit for 410-120 may not also receive credit for Biology 150, Botany 110-120, Honors Botany 118-128, or Honors Zoology 128.

Biology

110-120 General Biology (4,4) Biology 110 - Biology of cells; chemical basis of life; cell structure and function; energy metabolism; cell division; Mendelian and molecular genetics; kingdoms of monera, protista, and fungi. Biology 120 - Plant and animal anatomy (including microorganisms, tissues, and organ systems); physiology, growth, and reproduction; ecology; population genetics; behavior; and evolution. Recommended, but not required to be taken in sequence. Students who receive credit for 110-120 may not also receive credit for Biology 150, Botany 110-120, Honors Botany 118-128, or Honors Zoology 128.
150 Biology for Majors (5) General biology emphasizing biological principles. Open to students who have a year of high school biology and a score of 26 or better on the natural science section of the ACT. Students who receive credit for 150 may not also receive credit for Botany 110-120. Botany 110-120, Honors Botany 118-128, or Honors Zoology 117-118.

210 Cell Biology (3) Organization and function of the cell. Prereq: 110-120 or 150, or Botany 110-120 or 118-128. Honors Botany 117-118 or the equivalent of 2 years of high school biology and satisfactory ACT scores: Chemistry 120-130. 3 hours and 1 additional hour laboratory each week. May be taken in any sequence or combination with 210 and 220.

220 General Genetics (3) Classical and modern principles of heredity. Prereq: 110-120 or 150, or Botany 110-120, or 118-128, or Honors Zoology 117-118 or the equivalent of 2 years of high school biology and satisfactory ACT scores: Chemistry 120-130. 3 hours lecture, 1 hour discussion each week. May be taken in any sequence or combination with 210 and 220.

230 General Ecology (3) Relations between organisms and their environment, including human environmental problems. Prereq: 110-120 or 150, or Botany 110-120 or 118-128, or Honors Zoology 117-118 or the equivalent of 2 years of high school biology and satisfactory ACT scores: Chemistry 120-130. 3 hours lecture, 1 hour discussion each week. May be taken in any sequence or combination with 210 and 220.

305 Socio-Economic Impact of Plants (3) Significance of plants in society and in the development of human cultures, evolution of cultivated plants, and role of plants in present civilization. Occasional field trips. Sp, Su, Mini-Term

306 Genetics and Society (3) Introduction to genetics, anthropology and evolution with emphasis on their implications for human society. (Same as Anthropology 306.)

309 Biology of Human Affairs (3) Basic biological principles involved in deterioration and preservation of an environment in which humans and their cultures may survive.


313 Introductory Plant Pathology (3) (Same as Entomology 313)

321 Introductory Plant Physiology (4) Organismal physiology of plants: water relations, mineral nutrition, morphogenesis, elements of metabolic processes, energy, age, light, natural rhythms, temperature and other environmental factors. Lecture and lab. Prereq: One year general chemistry and one year biological science. F, Sp, Su.

330 Field Botany (4) Principles of taxonomy, basic ecological concepts and the identification, recognition, selection and preservation of local, native and naturalized plants. Prereq: 8 hours in biological sciences. 346 Introduction to Oceanography (4) (Same as Geology 346).

371 Undergraduate Seminar (1) At least one hour is required for a Botany major/minor. Junior or senior standing recommended. May be repeated. Maximum 2 hours.

400 Tutorial in Botany (1-2) Individual, independent study under guidance of selected staff. By application. May be repeated with consent of department. Maximum 4 hours.

401-402 Field Studies in Botany: (Specific Topic to be announced) (3,3) Field experience and taxonomy of special plant groups. Selected field topics will vary and may include: Bryology, Lichenology, Phenology, Agrostology, Mycology, Phycology, Aquatic Vascular Plants, Synanthropology, Woody Plants, and Botanical Photography. May be repeated. But no specific topic may be repeated for credit. Maximum 9 hours.


412 Plant Anatomy (3) Cells, tissues and organs: their development in vegetative and reproductive structures of vascular plants—emphasis on seed plants. Prereq: 110-120 or Biology 110-120.

426 Paleobotany and Palynology (3) (Same as Geology 426).

431 Plant Ecology (3) Interactions between individuals, species, communities and their environments. Circulation of energy and matter in ecosystems. Weekly field trips or laboratory periods, and at least two weekend field trips. Prereq: 300 or equivalent. Sp.

441-442 Undergraduate Research Participation (1-2) Experience in active research projects under supervision of staff members. Prereq: Junior or senior standing, minimum grade average 3.0, consent of instructor. May be repeated. Maximum 8 hours. E.

451 Plant Tissue Culture (3) Methods for the culture of plant cells, tissues and organs including media preparation and maintenance of cultures. Lecture and lab. Prereq: Botany 110-120 or Biology 110-120 or equivalent; and Chemistry 120-130 or equivalent. Recommended: Botany 310-320, 321, 412, Microbiology 310 or 319; Ornamental Horticulture and Landscape Design 330; and Plant and Soil Science 331.

475 Introduction to Radio and Television (3) History, economics, structure and regulation of broadcasting including radio, television, cable, satellites and related technologies. Includes role of broadcasting in society. Prereq: Communications 100.

310 Radio News (3) Writing, reporting, and performing news for radio. Lecture and lab course with experience in total news operation of WUTK-FM. Prereq: 275 and Communications 200.


330 Producing for Radio (3) Functions, theories, tools, and techniques of writing, producing, and broadcasting for radio. Students write, perform and produce on WUTK-FM. Overview of audio equipment and production techniques. Prereq: 275 and Communications 200.

410 Television News (3) Writing, reporting, performing and producing news for television. Lecture and lab course providing students with experience as report-er/producers for a television news program. Includes an overview of electronic news gathering equipment and techniques as well as video editing. Prereq: 310.

420 Radio and Television Sales and Promotion (3) Problems and practices of television, radio, and cable sales and promotion. Case studies in sales, sales management, pricing, rate cards, use of ratings and sales presentation. Includes an overview and analysis of effective station promotion techniques. Prereq: 320.


490 Radio and Television Management (3) Business policies and practices of broadcast operations, department functions, cost and income analysis, leadership styles and management techniques, relationship of technical development to management. Capstone course to be taken in student's last semester. Prereq: 275, 310, 320, 330.

492 Practicum (1) On or off-campus work and learning experience at radio, television, cable or non-broad-cast facility. 1 hour must be at WUTK-FM. 150 hours of work required for each hour of credit. Final written report required. May be repeated once. Prerequisite: 275, progression to a Broadcasting major and consent of department head.

493 Independent Study (3) Area of study in broadcasting to be determined by student in consultation with faculty advisor. Only the area of study not part of the departmental curriculum. Students must complete an application form available in the department. Prerequisites: Senior standing and consent of department head.

BUSINESS ADMINISTRATION

311 International Business (3) Survey of strategic implications of conducting business operations in an international context. Analysis of relevant cross-national environments, including cultural, political, economic and legal characteristics. Prereq: Economics 201.

320 Business Career Planning and Placement (1) Career opportunities in business. Making the career decision, preparing for and conducting a job cam-paign. Using the Placement Office. Satisfaction/No Credit only. Prereq: Satisfactory progression to upper-division level in Business or Liberal Arts Business Minor.

467 Honors: Corporate Executive in Residence Sem-inar (3) Interaction with top corporate executives from a wide spectrum of business disciplines. Domestic and international strategic planning as it is applied in major U.S. Corporations. Executive presentations and small group discussion on goods and services in con-sumption, industrial and institutional settings. Prereq: Senior standing, Finance 301, Management 301, Marketing 301 and consent of instructor.

491 Foreign Study (1-15) Prereq: Consent of instruc-tor. See page 58.

492 Off-Campus Study (1-15) Prereq: Consent of instructor. See page 57.

493 Independent Study (1-15) Prereq: Consent of instructor. See page 57.

BUSINESS LAW

301 The Legal Environment of Business (3) Intro-
dution to legal system including legal ethics (jurisprudence), sources of law, steps in lawsuits, courtroom procedures, administrative law, regulation, securities law, antitrust law, employer-employee relations, product liability, consumer protection. Fundamentals of business law required for professional examination preparation (e.g., CPA exam). Major writing requirement. Prereq: 301. F, Sp

**CHEMISTRY**

100 Principles of Chemistry (4) Bonding and molecular structure, gas laws, liquid and solid state, solutions, colloids, acids and bases, oxidation and reduction, kinetics and equilibria. 3 hours and 1 lab. E

110 Introduction to Organic and Biochemistry (4) Organic chemistry, analytical techniques and inorganic, organic, physical, and polymer chemistry. Students work with researchers to acquire expertise in planning experiments, understanding and analyzing data, and writing reports. Credits may not be applied toward a major or minor in chemistry. Not a substitute or prerequisite for 130. Prereq: 131 or 138. 4 hours and 1 lab. E

120 General Chemistry (4) Modern atomic theory, chemical bonding, stoichiometry, quantitative aspects of solution chemistry, kinetics, 130 - Chemical equilibria, thermodynamics, descriptive chemistry of non-metallic and metallic elements, electrodynamics, introduction to organic and biochemistry. Prereq: for 130: 120. 3 hours and 1 lab. E

121 General Chemistry (4) For chemistry majors. Subject matter similar to Chemistry 120-130. Prereq: for 130: 121. 3 hours and 1 lab. 121-F, 131-Sp

128-138 Honors: General Chemistry (4,4) 3 hours and 1 lab. 128-F, 138-Sp

140 Chemical Programming (2) Use of the computer in solving problems encountered in chemistry. Required of and limited to chemistry majors. Prereq: or Coreq: for 130: 130 or 131 or 138. 1 hour and 1 lab. Sp

200 Introduction to Chemical Research (1) Participates in research projects in analytical, inorganic, physical, polymer chemistry. Students work with researchers to acquire expertise in planning experiments, understanding and analyzing data, and writing reports. Credits may not be applied toward a major or minor in chemistry. Not a substitute or prerequisite for 400. Prereq: 121 or equivalent and 128 or 138. 1 lab. F, Sp

230 Inorganic Chemistry (3) Periodicity, valence, bonding, and the descriptive chemistry of the element; coordination compounds; nuclear chemistry; transition elements, inner transition elements. 2 hours and 1 lab. Prereq: 130 or 131 or 138. F

310 Analytical Chemistry (3) Principles and practices of quantitative measurements in chemical systems. Acid-base, complexometric, and redox equilibria, applications of titrmetric analysis; potentiometry; spectrophotometry; chemical separations including chromatography, ion exchange, and solvent extraction. Coreq: 319. Prereq: 130 or 131 or 138. E

319 Analytical Chemistry Laboratory (1) Experiments on topics covered in 310. Coreq: 310. E

320 Advanced Analytical Chemistry (3) Modern electroanalytical methods; mass spectrometry; optical spectroscopic techniques; magnetic resonance methods; advanced chromatographic theory. Coreq: 329. Prereq: 310 or 315. Sp

329 Advanced Analytical Chemistry Laboratory (2) Experiments on topics covered in 320. Coreq: 320. Sp

350-360 Organic Chemistry (3,3) Compounds of carbon and their reactions. Reaction mechanisms, synthesis, spectroscopic and other physical properties. Must be taken in sequence. Prereq: 130 or 131 or 138. Coreq: for 360: 369. E

369 Organic Chemistry Laboratory (2) Experiments on topics discussed in 350-360. Coreq: 360. One 5-hour lab. E

370-380 Biophysical Chemistry (3,3) Physicochemical principles with applications to biological systems. Must be taken in sequence. Not open to students having 371-379. 370-Gas Laws; first, second, and third laws of thermodynamics; chemical equilibrium; solution chemistry; electrochemistry. 380- Reaction kinetics; transport phenomena; elementary quantum chemistry; optical and magnetic spectroscopy; light scattering; macromolecular properties. Prereq: 369-360 and Mathematics 142 or 152 or equivalent. 370-F, 380-Sp

371-381 Physical Chemistry (3,3) Students may not receive credit for both 371 and 379 nor for both 381 and 381-Properties of gases; first, second, and third laws of thermodynamics; chemical equilibrium; simple phase equilibria; properties of solutions; introduction to statistical thermodynamics. 361-Kinetics of chemical reactions; introduction to quantum mechanics and applications to electronic structure of atoms and molecules; molecular spectroscopy; nuclear magnetic resonance. Prereq: 130 or 138, Physics 231 or 222, and Mathematics 241. F

379-389 Physical Chemistry Laboratory (2,2) Experiments on topics discussed in 379-380 or 371-381. Coreq: or Corresponding courses 370 or 379 and 380 or 381 for 389. 1 lab. E

400 Research in Chemistry (3) Open to seniors and 370 with consent of department head. Written reports are required. Prereq: for 400. Prereq: Senior standing or 370. 3 hours and 1 lab. Sp

420 Organic Chemistry (3) Principles and practices of quantitative measurements in chemical systems. Acid-base, complexometric, and redox equilibria, applications of titrmetric analysis; potentiometry; spectrophotometry; chemical separations including chromatography, ion exchange, and solvent extraction. Coreq: 319. Prereq: 130 or 131 or 138. E

410 Research and Thesis (1) Faculty and students discuss topics involving research topics. Oral and written reports required. All chemistry majors are encouraged to enroll. Prereq: Senior standing in chemistry and 400. Consent of instructor. F

409 Advanced Experimental Chemistry (3) Lab course in application of modern experimental techniques to solution of chemical problems. Synthesis and characterization of organic and inorganic compounds, with emphasis on independent study and use of chemical literature. Prereq: 230, 330, and 360. 3 labs. F

430 Advanced Inorganic Chemistry (3) Atomic and molecular structure, bonding theories, descriptive chemistry of the elements, kinetics and mechanism of inorganic reactions, applications of modern techniques for characterizing coordination and organometallic chemistry. Prereq: 230. Prereq: or Coreq: 380 or 381. Sp

431 Radioactivity and Its Application (2) Radioactive materials in tracer and therapeutic applications. Radioactive decay, detection apparatus and techniques, tracer procedures, safety precautions in agriculture, biology, medicine, nutrition, etc. Not for credit by chemistry or physical science majors. Prereq: Mathematics 122 or equivalent and two courses from the following: 100, 110, 120-130, 121-131, 128-138. Sp

450 Advanced Organic Chemistry (3) Modern organic reactions of mechanistic, synthetic, and theoretical interest. Content reflects current trends in the area. Prereq: 360. F

470 Advanced Physical Chemistry (3) Topics from chemical dynamics, statistical thermodynamics, quantum mechanics of atomic and molecular systems, crystal structure and solid state. Prereq: 380 or 381. Sp

490 Introductory Polymer Chemistry (3) Fundamental principles stressing the role of chemistry in the interdisciplinary field of polymers. Reaction of molecular structure to bulk properties of polymers. Prereq: 360. Prereq: or Coreq: 360 or 381. F

**CHILD AND FAMILY STUDIES**

110 Introduction to Early Childhood Education (3) History, philosophy, current trends, issues, programs, program models, includes observation. F

210 Human Development (3) Conception through adulthood in various social/ecological contexts; interrelationships among various aspects of development: physical, cognitive, emotional, social, normative, nonnormative development. F, Sp, Su

211 Development in Infancy (3) Normative, nonnormative aspects of development during first 24 months of life. Includes observation. F

212 Development in Childhood (3) Development from 2 to 10 years; interrelationships among cognitive, emotional, social, physical aspects of ontology; normative, nonnormative development. Includes observation. Sp

220 Marriage and Family: Roles and Relationships (3) Emerging, declining roles, changing relationships among family members across life cycle from various theoretical approaches; impact of gender roles on marital relationships, marital quality, power, decision-making, communications, conflict management, combining work-family roles. (Same as Women's Studies 200.) F, Sp

240 Human Sexuality (3) Sexuality through cultural, social, familial, and psychological factors. F, Sp, Su

311 Development in Adolescence (3) Physiological, personality, cognitive, social, familial development in adolescents. Includes observation. F

312 Adulthood and Aging (3) Adult life in society from youth through elderly; adjustment to internal, environmental changes through adulthood; interrelationships among various aspects of development: physical, cognitive, emotional, social. Includes observation. Sp

320 Parent-Child Relationships (3) Reciprocal influences of parents and children within family context; selected parent training programs. Prereq: 220 or consent of instructor. F

345 Family Resource Management (3) Theory and application of management of household income and expenditures; analysis of goals, resource use, information systems, constraints within families. Observation and analysis of diverse family practices. Prereq: 220 or consent of instructor. F

350 Early Childhood Education I: Environments for Children (3) Classroom management, behavior guidance, organization of day care environments, communication, intervention skills, interaction with children, child stress reduction and management in classroom. Includes participation. Prereq: 110 and 212 or consent of instructor. F

351 Early Childhood Education II: Curriculum and Program Development for Young Children (3) Planning effective early learning programs for young children relating knowledge of children's growth and development to appropriate design of settings; analysis of goals, resource use, information systems, constraints within families. Observation and analysis of diverse family practices. Prereq: 220 or consent of instructor. F

352 Family, School, and Community Relations (3) Techniques for developing community relationships and becoming advocate for children and families. Applications include handicapped children. Observation and program participation. Prereq: 351 or consent of instructor. F

360 Family Stress (3) Family's response to stressful circumstances; skills for intervention into family system; violence, abuse, divorce, illness, death. Prereq: 220 or consent of instructor. F

370 Interpersonal Skills in Professional Settings (3)
Organizational functions, structures, skills for managing communications, conflict, other interpersonal processes in professional settings. Prereq: Junior standing. F

380 Family Finance (3) Alternatives for meeting family financial needs across the life-cycle. Prereq: 220 for CFS majors. F

240 Families: Ethnicity, Race, Class and Culture (3) Cultural, socioeconomic, ethnic variations; emerging needs and programs. Prereq: 220, 320, Junior standing or consent of instructor. (Same as Afro-American Studies 420). A, F

440 Teaching in Community-Based Programs (3) (Same as Home Economics Education 440). A, Sp

450 Assessment in Early Childhood Programs (3) Physical, cognitive, social, language development in handicapped and nonhandicapped children birth to 5 years; early development, assessment. Includes supervised practicum in assessment. Prereq: 351 or consent of instructor. F

451 Early Childhood Education III: Mainstreaming Exceptional Children (3) Individualized curriculum planning based on knowledge of normative, nonnormative development, assessment, effective teaching strategies for facilitating development. Includes participation. Prereq: 450. F

460 Directed Study in Child and Family Studies (1-3) Individual learning experience arranged for students under supervision of faculty. May be repeated with different topics. Maximum 6 hours. Prereq: 3 hours. Child and Family Studies and consent of instructor. F, Sp

470 Student Teaching (15) Responsibility for planning and guiding groups of infants, toddlers, or preschoolers under supervision of head teacher. Includes weekly seminar. Prereq: 370. 450. Satisfactory/No Credit only. F, Sp, Su

475 Day Care Administration (3) Theories, methods, and materials for administrators of early childhood education programs; writing funding proposals, staff selection, financial management, recruiting and enrolling children, supervision, evaluation, public relations, communication, conflict resolution. Includes participation experience. Prereq: 351 or consent of instructor. Sp

480 Practicum in Child and Family Studies (3-15) Supervised experiences working with children or families, designed to meet special interests of the student. Prereq: 15 hours in Child and Family Studies and consent of instructor. May be repeated. Maximum 15 hours. Satisfactory/No Credit only. F, Sp, Su

485 Special Topics in Child and Family Studies (1-9) Personal or professional interest in human development or family studies. Prereq: 9 hours in Child and Family Studies, Junior or Senior standing, or consent of instructor. May be repeated. Maximum 9 hours. F, Sp, Su

497 Honors: Child and Family Studies (3-6) Issues or topics affecting children and/or families, designed to meet particular interests of the student. Prereq: 15 hours in Child and Family Studies, overall GPA of 3.25 or greater, Junior standing, or consent of instructor. May be repeated. Maximum of 6 hours.

221 Early Greek Mythology (3) Archaic Greek religion through comprehensive study of Greek myths with emphasis on how they reflect the early Greek vision of the universe and humanity’s place in it. Origins and development of Greek myths and the rise of organized religion. Age to about 450 B.C. Readings include Hesiod and Aesop. A

222 Classical Greek and Roman Mythology (3) Use of myth in literature, history, religion and philosophy of Greece and Rome from about 450 B.C. to about 330 B.C. Readings include Homer, the Iliad and the Odyssey, the Aeneid, the Iliad. B

223 Archaeology and Art of Ancient Greece (3) Survey of Greek archaeology from prehistoric times to the Roman period. For prehistoric Greece, emphasis on three times with an emphasis on architecture and artifacts used to recreate the culture of the Minoan and Mycenaean civilizations and that of the following Dark Ages. For Archaic. Classical, and Hellenistic periods emphasis on development of architecture, sculpture, and vase painting includes minor arts and the relationship between archaeology and art.

232 Classical Mythology and Art of Etruria and Rome (3) Survey of the archaeology of the Italian peninsula and the Roman World from prehistoric times to the fall of the Roman Empire (1000 B.C.-500 A.D.). Reconstruction of the Etruscan culture from tombs, paintings, and artifacts, development of Roman architecture, and urban planning in Rome and the provinces. Prereq: 232 or consent of instructor.

253-254 Greek and Roman Literature in English Translation (3,3) 253-Greek Literature. Major literature of ancient Greece from Homer to Manander, with emphasis on the sixth and fifth centuries B.C. 254-Roman Literature. Major literary works of the Romans from Plautus, Ovid, and Juvenal. Prereq: 253. May be repeated.

273 Medical and Scientific Terminology (3) Greek and Latin roots from which medical and scientific terminology is derived. Emphasis on use of etymology in understanding the meaning of words. Prereq: 200 or consent of instructor.

301 Archaeology of the Aegean Bronze Age and Early Greece (3) Includes Troy, the Cycladic islands, the Greek mainland, and the Greek islands of Crete and Cyprus ca. 3000-700 B.C. Rise and fall of the Minoan and Mycenaean civilizations and their effect on the Aegean World and Cyprus. Evidence for daily life, religion, trade, and foreign contacts. Architecture, wall paintings, and artifacts. Prereq: One of the following: 221, 232, 381, ancient history (Ancient Near East or Ancient Greece), or consent of instructor.

334 Cities and Sanctuaries of the Ancient Greek World (3) Archaeological survey of the development of the Greek city and sanctuary from prehistoric times through the Roman period (ca. 2000 B.C. - 200 A.D.). Includes topography and plans of major cities and sanctuaries, functions of buildings, development of city planning, quality of early and Hellenistic, with emphasis on the sixth and fifth centuries B.C.

381 Greek Civilization (3) Major aspects of ancient Greek civilization: religion, fine arts, political life, pan-Mediterranean relations, the prominence of Athens; the role of modern archaeology in interpretation; emphasis on the sixth and fifth centuries B.C.

382 Roman Civilization (3) Major aspects of ancient Roman civilization: political institutions, art and architecture, history, culture and daily life, emphasizing the late Republic and early Empire.

383 Women in the Greek and Roman World (3) The condition of women in the apparently male-dominated world of Classical Greece and Classical Rome. Evidence from literature, vase paintings, and other arts is examined from the age of Homer to the second century A.D. with emphasis on Athens in the fifth century B.C. and Roman Italy in the first and second centuries A.D. (Same as Women's Studies 383.)

422 Seminar in Classical Studies (3) Field of Classical studies today: recent achievements in the areas of both philology and archaeology; impact of the decipherment of Linear B: new understandings of the culture and politics of the "golden age" of Pericles and Augustus; Classical studies and the academic profession on both the high school and college levels. May be repeated. Maximum 6 hours.

441 Special Topics in Classical Civilization (1-3) Topics in art, literature, religion, and society of Greece and Rome. Required of majors up to three times with consent of department.

461 Studies in Classical Archaeology (3) Variable content course offering subject matter not taught in an existing course, or concentration on one aspect of the existing survey. May be repeated. Maximum 9 hours. Prerequisites according to topic.

462 Roman Law (2) Development of Roman law through examination of cases from the writing of the Roman jurists, the world's first legal professionals. Emphasis on understanding legal institutions in relationship to Roman society, as well as over aspects of Roman property and contract law.

491 Foreign Study (1-15) See page 97.

COLLEGE SCHOLAR HONORS

317-318 College Scholars Seminar (1,1) Sequence (in any order) limited to and required of all College Scholars each year. May be repeated. Maximum 8 hours. Satisfactory/No Credit grading only.

491 College Honors: Foreign Study (1-15) See page 97 and Director of Special Programs. Primarily for College Scholar students.

492 College Honors: Off-Campus Study (1-15) See page 96 and Director of Special Programs. Primarily for College Scholar students.

493 College Honors: Independent Study (1-15) See page 96 and Director of Special Programs. Primarily for College Scholar students.

498 Honors: College Scholars Studies (2-12) Designed for College Scholars working on their senior thesis, project, or performance. May be repeated. Maximum 16 hours.

COMMUNICATIONS

100 Introduction to Mass Communications (3) Overview of systems of mass communications, with emphasis on American media, their ownership, legal and social controls, role and effects. Advertising, broadcasting, journalism and publishing, and public relations are examined in the context of theories of mass communications. Potential majors in the College of Communications should take the course during their freshman year. E

200 Writing for Mass Communications (3) Information gathering and writing under deadline for print and broadcast media, including news and promotional copy. Preparation of news, advertising, and persuasive text. Comparison of styles and organization techniques. Grammar, usage, and style workshop. Prerequisites: 100, English 102, and college admissions tests (typing, spelling and grammar). E

300 Mass Communications Research Methods (3) Social science research methods, especially sample surveys, used by communications media. Applications to both internal decision-making and to external communication in media. Prereq: 200 or consent of instructor. E

400 Mass Communications Law and Ethics (3) Emphasis on legal issues directly affecting the mass media: libel, privacy, free press-fair trial, judicial controls, governmental regulations. Also includes ethical standards and practices of the mass media in America. Prereq: 200 or consent of instructor. E

COMPARATIVE LITERATURE

201 Introduction to Comparative Literature (3) Basic knowledge, techniques, and sources necessary to compare literatures of various cultures, ages, and nations.

202-203 Cross-Cultural Perspectives in World Literature (3,3) Literary perspectives and values in different time periods and cultures. Variable content.

301 Computer Techniques for Literary Study (3) Computer research in literary study including writing programs
100 Introduction to Computing (4) History of computers and computing, hardware, software, computing tools currently available. Organization and characteristics of modern digital computers. Introduction to programming, emphasis on developing good programming habits. Problem solving and algorithm development. Building abstractions with procedures and data. Prereq: 100 or 102. May not be taken for credit by Computer Science majors. 3 hour lab required.

360 Theory of Computation (3) Recursive functions, Turing machines, computability, halting problems, Godel theorem. Prereq: 111 and 311. (Required core course for the Theory of Computing Concentration.)


401 Applications of Computer Graphics (3) Commercial software, techniques, hardware. Prereq: 100 or 101 or 102. May not be taken for credit by Computer Science majors. 3 hour lab required.

402 Applications for Artificial Intelligence (3) Commercial software, techniques, hardware. Prereq: 100 or 101 or 102. May not be taken for credit by Computer Science majors. 3 hour lab required.

403 Applications of Microcomputers (3) Microcomputers, DOS, commercial software and hardware. Prereq: 100 or 102. May not be taken for credit by Computer Science majors. 3 hour lab required.

404 Applications of Database Systems (3) Commercial software, systems, techniques. Prereq: 100 or 101 or 102. May not be taken for credit by Computer Science majors. 3 hour lab required.


412 Senior Thesis II (3) Continuation of 411.

421 Introduction to Artificial Intelligence (3) Introduction to AI languages. Basic techniques of heuristic search, and theorem proving. Prereq: 320. 3 hour lab required.

422 Expert Systems (3) Production rule model and its extension into many-valued and fuzzy logics. Deriving explanations, experts of expert systems, and other methodologies. Frames, scripts, decision expressions. Prereq: 421. 3 hour lab required.

423 Natural Language Processing (3) Phrase-structured and slot grammars, error-correcting interfaces and semantics. Applications in database and expert systems. Prereq: 381 and 421.

424 Robotics Software (3) Software for robotic control. Prereq: 331 and Mathematics 142. 3 hour lab required.

425 Functional Languages (3) Functional, applicative and object-oriented languages such as LISP and SMALL-TALK used for research applications. Prereq: 111 and 112 and Mathematics 222. 3 hour lab required.

432 Computer Graphics (3) Interactive computer graphics. Transformations, perspectives, shading, vector generation, etc. Details of graphics hardware such as tablets and chips for understanding techniques to design computer systems for graphics capability. Prereq: 331. 3 hour lab required.

433 Computer Systems Architecture (3) Parallel processing, memory, I/O, pipelines, specialized architectures. Prereq: 331 and 360.

434 Networks and Communications (3) ISO open system interconnection model, protocols, study of several existing wide area networks, local area networks. Prereq: 331 and 360.

435 Microcomputer Systems (3) Disk operating systems, peripherals, local area networks and communication protocols. Design and implementation. Prereq: 331 and 360. 3 hour lab required.

436 Computer Systems Hardware Design (3) Investigation of computer systems hardware, including bus structures, memory, I/O interface, support hardware, direct memory access logic, timing budgets, and system considerations. Design and debugging of either or both of a prototypic subsystem; a system based on commercially available microcomputer component devices. Prereq: 435. Includes 3 hour lab.

439 Microprogramming (3) Microprogramming concepts and techniques for control systems of large and small machines, bit-slice architecture, sequencers, etc. Prereq: 331. 3 hour lab required.

441 Science Information Systems (3) Design of scientific data bases, document repositories, information retrieval and electronic dissemination services. Control and dissemination of scientific information at the national and international level. Prereq: 340.

442 Introduction to Database Management Systems (3) Designing and implementing database management systems, networks, and relational models; relational calculus and algebra, data definition and manipulation languages; implementation and security considerations, performance, integrity, and reliability metrics, intelligent database systems. Prereq: 340 and 311.

443 Introduction to Information Storage and Retrieval (3) Information storage and retrieval, statistical, syntactic, and logical analysis of information content, evaluation of retrieval effectiveness. Prereq: 340.


451 Pattern Recognition and Analysis (3) Elements of syntactic pattern recognition, learning algorithms, decision theory, classification rules. Prereq: 111 and 112 and 311. 3 hour lab required.

452 Image Processing and Analysis (3) Methods for digitizing, processing, and analyzing images, with emphasis on image enhancement, restoration. Prereq: 451. 3 hour lab required.

460 Human Factors in Software (3) Interface between people and machines and the ease of use of software for people's environment for which it is intended. Prereq: 111 and 112.


462 Software Engineering (3) Software design and application process from initial requirement and specification statements to coding, testing, implementation, and maintenance. Prereq: 111 and 112.

463 Programming Languages (3) Study and comparison of programming languages and their environments. Human interfaces, formalisms, domain of applicability, object manipulation, syntax, etc. Prereq: 111 and 112.


465 Parallel Computation I (3) Examination of non-numerical algorithms for parallel computation, operating systems, design and classification of parallel processors, compilers, concurrent computation. Prereq: 331.


469 Non-Numeric Algorithms (3) Design and analysis of effective and efficient computer algorithms. Trees, sorting, searching, graphs, pattern matching, etc. Prereq: 111, 112 and 311.

471 Numerical Analysis (3) (Same as Mathematics 381).

473 Numerical Analysis (3) (Same as Mathematics 473).

474 Computer Modeling and Simulation of Physical Systems (3) Interactive techniques for the simulation of various kinds of physical systems. Prereq: 111, 112 and 311; and Mathematics 371.

476 Management of Uncertainty in Computer Systems (3) Origins of uncertainty and methods for dealing with the various classes of uncertainty. Topics may include hazards in switching circuits, vagueness in natural language processing, approximate reasoning models. Prereq: 111, 112 and Mathematics 222.

482 Graph Theory and Applications (3) Planarity,
network flow, critical paths, etc. Prereq: 111, 112 and 311.

483 Information Theory (3) Theory of communica-
tion, efficient transmission and storage of informa-

493 Independent Study (1-15) Special project in area of
student's primary interest. Directed by Computer
Science faculty, perhaps jointly with student's faculty
advisor. Intended for students with a specific project
pursue in conjunction with a faculty member. Project
may be from a department other than Computer Sci-
one in which a faculty member from the
appropriate department will help oversee the project.
May be repeated. Maximum of 16 hours may be applied
to the major. Prereq: Consent of instructor.

494 Special Topics in Computer Science (1-3) May
be repeated. Maximum 9 hours.

DANCE

101 Practicum: Dance Production (1) Supervised tech-
nical and promotional production aspects of university
dance company. May be repeated. Maximum 2 hours.

201 Practicum: Dance Performance (2) Preparation
and presentation of university dance company per-
formances. Participation through audition only. May
be repeated. Maximum 16 hours.

210 Ballet: Level I (2) Instruction and practice in ele-
mentary classical ballet techniques. May be repeated.
Maximum 4 hours.

220 Jazz: Level I (2) Instruction and practice in ele-
mentary jazz dance styles and techniques. May be repeated.
Maximum 4 hours.

230 Modern: Level I (2) Instruction and practice in ele-
mentary modern dance techniques. May be repeat-
ed. Maximum 4 hours.

240 Tap: Level I (2) Instruction and practice in ele-
mentary tap dance techniques.

250 Composition I (3) Choreographic skills empha-
sizing form, content and music.

310 Ballet: Level II (2) Instruction and practice in inter-
mediate classical ballet techniques. Available to majors and minors or with consent of instructor. May
be repeated. Maximum 12 hours.

320 Jazz: Level II (2) Instruction and practice in inter-
mEDIATE jazz dance styles and techniques. Available to
dance majors and minors or with consent of instruc-
tor. May be repeated. Maximum 12 hours.

330 Modern: Level II (2) Instruction and practice in inter-
mediate modern dance techniques. Available to majors and minors or with consent of instructor. May
be repeated. Maximum 12 hours.

340 Tap: Level II (2) Instruction and practice in inter-
mediate tap dance techniques. Prereq: 240 or consent of instructor.

350 Composition II (3) Choreographic skills empha-
sizing design, use of costumes and props. Prereq: 250.

380 Special Topics (1-3) Selected disciplinary or pro-
essional areas of dance. May be repeated.

410 Ballet: Level III (2) Instruction and practice in ad-
vanced classical ballet techniques. Available to majors and minors or with consent of instructor. May be repeat-
ed. Maximum 16 hours.

415 The Teaching of Creative Dance (2) Theory,
methods, materials and practical experience in the pre-
sentation and integration of creative dance in grades
K-6.

420 Jazz: Level III (2) Instruction and practice in ad-
vanced jazz and musical theater dance styles and tech-
niques. Available to dance majors and minors
with consent of instructor. May be repeated. Maxi-
 mum 16 hours.

430 Modern: Level III (2) Instruction and practice in
advanced modern dance techniques. Available to majors and minors or with consent of instructor. May be repeat-
ed. Maximum 16 hours.

450 Composition III (3) Application of choreograp-
hic and production skills culminating in the presentation
of two works. Prereq: 350.

460 Rhythmic Analysis (3) Basic nature and princi-
pies of music, rhythm and rhythm notation with empha-
sis on their correlation with dance movement and
composition. Prereq: Consent of instructor. Senior
standing or graduate status required for graduate credit.
Different levels of performance is expected of those registered for graduate credit.

465 Dance Notation (3) Fundamentals of movement
notation with emphasis on notation and reading of
elementary movement studies. Senior standing or grad-
uate status required for graduate credit. Different level
of performance is expected of those registered for
graduate credit.

480 History of Dance I (3) Survey of the dance of
various societies and cultures from pre-history through
the nineteenth century. Senior standing or graduate
status required for graduate credit. Different level of
performance is expected of those registered for grad-
uate credit.

481 History of Dance II (3) Survey of the development
of dance in theater, recreation and education during the
20th century. Senior standing or graduate status
required for graduate credit. Different level of per-
formance is expected of those registered for graduate credit.

490 Philosophy of Dance and Related Arts (3) Aes-
estic principles and current trends in dance emphasizing
relationships with other art forms. Senior standing or
graduate status required for graduate credit. Different level of per-
formance is expected of those registered for graduate credit.

493 Directed Independent Studies (1-3) Indepen-
dent study in a specialized area with dance. May be
repeated. Maximum 6 hours. Prereq: Consent of instruc-
tor.

495 Dance Pedagogy (3) Principles and methods of
the teaching of dance with practical application in a
mini-teaching experience. Prereq: Upperclass or grad-
uate standing and approval of instructor. Senior standing
or graduate status required for graduate credit. Different
level of performance is expected of those registered for
graduate credit.

ECOLOGY

370 Environment and Conservation (2) Introduction
of natural and artificial environments and natural resource
conservation. Limited to students in the College of
Education.

ECONOMICS

100 Survey of Economic Ideas (3) Ideas of major
economists in context of socioeconomic conditions
of their times. Emphasis on nontechnical treatment.
May not be substituted for Economics 201.

201 Introductory Economics: A Survey course (4)
Theory of consumer behavior, theory of firms, supply
and demand, costs of production, market models, national income and employment theory, money and
banking, fiscal and monetary policy, debt, and inter-
national economics.

207 Honors: Introductory Economics (4) Honors course
for students of superior ability and interest. Students accepted on the basis of their records.

311 Intermediate Microeconomics (3) Theories of
consumer behavior, cost of production and costs, of price
and behavior of firms in perfectly competitive, monopo-
listic and imperfectly competitive markets, input prices,
income distribution, welfare and general equilibrium.
Prereq: 201.

313 Intermediate Macroeconomics (3) Measure-
ment of income and prices, aggregate demand, output,
employment, price determination, inflation, business
fluctuations, fiscal and monetary policies and growth.
Prereq: 201.

321 International Economics (3) Balance of pay-
ments, exchange rates, foreign exchange transactions,
monetary movements, international relations, commit-
tive advantage, tariff and non-tariff trade barriers, eco-
processions, foreign exchange policies and global
integration. Prereq: 201.

323 Economic Development (Third World) (3) Theo-
ries of economic development, policies and strategies
used to promote economic improvement in less devel-
oped countries. Prereq: 321.

324 Comparative Economic Systems (3) Economic
processes under alternative strategies and allocatio-
 mechanisms. Prereq: 201.

325 Economic History of the North Atlantic Com-
 munity (3) Origins of capitalism, mercantilism, Industrial Rev-
 olution, developments of factor systems, rise of organized
business and labor, integration of the Atlantic econo-
y. Prereq: 201.

331 Government and Business (3) Antitrust and
regulatory economics, problems in regulation and social
control of business organization, oligopoly models.
Prereq: 201.

341 Survey of Labor Economics (3) Extension of eco-
nomics to labor markets, public policy questions, demand and supply, theory of wage differentials, unem-
ployment, unions in the private sector, investment in individuals, education and training, mobility. Prereq:
201.

343 Labor Relations and Collective Bargaining (3)
See Management 311.

351 Monetary Economics (3) Role of money in the econ-
omic system, money and credit, international dollar
system, development of monetary policy, U.S. depository
institutions and money supply process. Prereq: 201.

361 Regional and Urban Economics (3) Overview of
regional differences. Theory of industrial and agricul-
tural location and human migration, economic basis
for land use patterns, central places, and urban form,
regional and urban structure, growth, and methods of
analysis, examination of urban problems. Prereq: 201.

381 Econometrics (3) Methods of specification, esti-
 mation, testing and forecasting of economic relationships.
Includes specification of models, estimation meth-
ods, statistical inferences of empirical results, forecasting
procedures and common econometric problems, such as
multi-collinearity, heteroscedasticity, and autocor-
relation. Prereq: 201, Statistics 201 Mathematics 121-
122, 311-312, 141-142.

400 Special Topics (3) Topics vary. Prerequisites deter-
dined by department each time course is offered.
Numerical grade is given to law students. Prereq: 201.

415 History of Economics (3) Methods of study of
dogmatic history. Origins and evolution of major doc-
tines. Classical and Neoclassical economics, economics of
Keynes and his followers, some principal develop-
ments of second half of twentieth century. Major writing
requirement. Prereq: 201 and consent of instructor.

424 Political Economy of World Development (3) Topics
vary. Latin America, Asia, Soviet Union and Eastern
Europe. Analysis of major economic strategies, poli-
cies, and problems. Major writing requirement. Prereq:
201.

435 Industrial Organization Analysis (3) Monopoly and
competition in United States economy, interrela-
tionship of market structure, business behavior, and
economic performance. Major writing requirement. Prereq:
201.

442 Analytical Labor Economics (3) Problems con-
 nected with labor market. Intensive treatment of a
small number of topics. Health economics, econom-
ics of education, economics of discrimination, natural
rate of unemployment, wage-price guidelines, or job

462 Economics of Resources and Environmental Policy
(3) Economic analysis of environmental policy and
allocation of resources. Benefits and costs of development of national resources and implications for the environment. Major writing requirement. Prereq: 201.

471 Public Finance: Optimal Government Functions and Expenditure Analysis (3) Problems of collective decision-making, external effects, public investment, social decision making. Prereq: 201.

472 Public Finance: Taxation and Intergovernmental Relations (3) Individual taxes and tax system, non-tax sources of revenue, fiscal federalism. Prereq: 201.

482 Introduction to Mathematical Economics (3) Application of algebra, matrix algebra, differential and integral calculus to micro and macroeconomics. Prereq: 201, Mathematics 121-122 or 141-142.

493 Independent Study (1-3) Opportunity for qualified students to pursue topics of special interest. Prereq: Senior standing, 3.0 GPA in economics courses, and consent of instructor. Maximum total credit 3 hours.

EDUCATION

302 School and American Society (3) (Same as Educational Curriculum and Instruction 302.)

303 Teacher Effectiveness and Curriculum Design (1) (Same as Educational Curriculum and Instruction.)

304 Microcomputers and Instructional Design (1) (Same as Educational Curriculum and Instruction 304.)

402 Social Theory and Educational Practice (1) (Same as Educational Curriculum and Instruction 402.)

315 Psychology of Learning and Classroom Management for Teachers (3) (Same as Educational and Counseling Psychology 315.)

325 Principles of Education Test Construction for Teachers (2) (Same as Educational and Counseling Psychology 325.)

370 Survey of Exceptional People (2) (Same as Special Education 370.)

EDUCATIONAL AND COUNSELING PSYCHOLOGY

210 Psychology of Human Development for Teachers (3) Understanding and application of the psychology of human development to teaching/learning process in educational settings. For students intending to enter the Teacher Education Program and Human Services students. Sp, Su

212 Career and Personal Development (3) Systematic approaches to facilitating career development and life planning. E

215 Learning Skills and Study Systems (3) Approaches to enhancing academic performance through study skills, efficient reading and understanding of personal factors. E

305 Laboratory in Educational and Counseling Psychology (1) Practice in acquiring knowledge and skill in areas such as interpersonal relations, career decision-making, communication and self-awareness. Individual and small-group format. May be repeated twice. Satisfactory/No Credit only. E

315 Psychology of Learning and Classroom Management for Teachers (3) Understanding and application of the psychology of learning and classroom management to the teaching/learning process in educational settings. Prereq: 210 or equivalent and admission to Teacher Education Program. (Same as Education 315.) Sp

325 Principles of Educational Test Construction for Teachers (2) constructing classroom tests for diagnosing student learning needs and for evaluating mastery of subject matter. Prereq: 315 and admission to Teacher Education Program. (Same as Education 325.) Sp

404 Special Topics (1-3) Instructor initiated course offered at completion of department on various topics of current interest. Contact department for listing of topics to be covered. May be repeated. Maximum 15 hours. E

410 Sex and Family Development: Implications for Education and Counseling (3) Theories and research concerning the development of sexual role and its relevance in educational and counseling settings. E

421 Personality and Mental Health (3) Perspectives of mental health with applications to education and other social situations. Prereq: 201.

432 The disadvantaged Student: Psychoeducational Perspectives (3) Theory and research regarding etiology, psychosocial behavior and appropriate interventions. E

460 Self-Management in the Helping Professions (3) Applications of self-management strategies to career, social, emotional and health domains for both helping professionals and their clientele. Prereq: Introductory course in psychology or permission of instructor. E

493 Independent Study (1-15) Independent investigation of problems in educational and counseling psychology. May be repeated. Maximum credit 15 hours. E

EDUCATIONAL CURRICULUM AND INSTRUCTION

141 Efficient Reading and Study Skills (2) Improvement of reading comprehension and rate, intensive vocabulary enrichment, study skills as they relate to content area subjects. Satisfactory/No Credit only. F, Sp

203 Field Study in Education (1-3) Problems of persons in active service in the field. Includes methods of teaching, curriculum materials, school-community relationships and school organizations. May be repeated. Maximum 6 hours. E

302 School and American Society (3) Historical, philosophical and social perspectives on contemporary educational issues. Prereq: Junior level standing. (Same as Education 302.) F, Su

303 Teacher Effectiveness and Curriculum Design (1) Literature and research on effective teaching. Relationship to basic concepts, principles and processes of curriculum designing. Prereq: Admission to Teacher Education Program. (Same as Education 303.) F, Sp, Su

304 Microcomputers and Instructional Design (1) Basic operations and application of microcomputer as related to curriculum development and instructional design. Prereq: Admission to Teacher Education Program. (Same as Education 304.) F, Sp

325 Teaching Science and Social Studies in Elementary and Middle Schools (3) Methods and materials for teaching science and social studies in elementary and middle schools. Teaching approaches common to both fields including inquiry, multi-sensory activities and group approaches. Prereq: Admission to Teacher Education Program. F, Sp

326 Teaching Language Arts/Reading in Elementary and Middle Schools (3) Language and language development as applied to teaching of oracy (listening-speaking) and aspects of literacy (reading process/readiness and writing). Includes methods and materials. Prereq: Admission to Teacher Education Program. F, Sp

329 Teaching Developmental Reading in the Elementary and Middle Schools (3) Methods and background on how to teach word recognition skills, comprehension, study skills and how to use materials. Includes units on phonics, evaluation and basal readers. Prereq: Admission to Teacher Education Program. F, Sp

335 Teaching Elementary and Middle School Mathematics (3) Specific procedures for helping children learn mathematics. Unit planning, daily planning, grouping, classroom management are included. Prereq: Admission to Teacher Education Program. F, Sp

351 Laboratory and Field Studies in Elementary Education (1-3) Simulated and actual experiences in which students apply concepts and skills from professional methods courses in a variety of school settings and levels. May be repeated. Maximum 3 hours. Prereq: Admission to Teacher Education Program. Satisfactory/No Credit only. E

352 Field Experiences in Teaching: Secondary I (1) Field experiences in tasks related to teaching and teacher roles. Prereq: 351 and admission to Teacher Education Program. Satisfactory/No Credit only. Sp

353 Field Experience in Teaching: Secondary II (1) Field experiences in tasks related to teaching and to teacher roles. Prereq: 352 and admission to Teacher Education Program. Satisfactory/No Credit only. Sp

355 Introduction to Secondary Schools (3) Aspects of teaching in grades 7-12, including curricular programs and roles and responsibilities of secondary school teachers and administrators. Prereq: Admission to Teacher Education Program. Sp, Su

402 Social Theory and Educational Practice (1) Concurrent with internship; designed to integrate student's own experience with foundational theory and policy. Prereq: Admission to Teacher Education Program. (Same as Education 402.) F, Sp

404 Problems in Improvement of Instruction (1-3) Special conferences, workshops or inservice programs designed for improvement of instruction. May be repeated. Maximum 6 hours. Satisfactory/No Credit. E

410 Pre-Internship Seminar (1) Objectives and policies of the internship program. Must be completed the term immediately preceding the internship. Prereq: Admission to Teacher Education Program. Satisfactory/No Credit only. Sp, Su

419 Teaching Laboratory (3) Learning and practicing research based effective teaching behaviors. Video taping in simulated school settings. Sp, Su

421 Elementary and Middle School Science and Social Studies Instruction (3) Methods and materials for teaching science and social studies. Development of functional relationships and individual entities of the two fields. Not open to students with recent course or background in The Teaching of Elementary School Science and/or Social Studies. Prereq: Admission to Teacher Education Program. F, Sp

424 Studies in Teaching Education (1-3) Variable topics on teaching in Early Elementary (K-3), Middle Elementary (4-8), and Skills (K-8). Prereq: Admission to Teacher Education Program and permission of instructor. May be repeated. Maximum 8 hours. E

429 Language Arts/Reading in Elementary and Middle Schools (3) Language and language development as applied to teaching of oracy (listening-speaking) and aspects of literacy (reading process, readiness and writing). Not open to students who have had recent course in language arts methods. Prereq: Admission to Teacher Education Program. F, Sp

430 Elementary and Middle School Developmental Reading Instruction (3) Word recognition (including phonics), comprehension, evaluation, and materials. Not open to students who have had recent course in reading methods. Prereq: Admission to Teacher Education Program. F, Sp

434 Topics in Reading Education (1-6) May be repeated. Maximum 6 hours. Prereq: Admission to Teacher Education Program and a course in Reading Education. E

443 Elementary and Middle School Mathematics Instruction (3) Procedures for helping children learn mathematics. Unit planning, daily planning, grouping, general factors related to classroom management, Not open to students with a recent course in teaching of elementary school mathematics. Prereq: Admission to Teacher Education Program. F, Sp

445 Early Childhood Education: Program Development and Teaching in Kindergarten (3) Curriculum plan-
493 Independent Study (1-3) Topics to be assigned. May be repeated. Maximum 12 hours. E
494 Supervised Readings (1-3) Topics to be assigned. May be repeated. Maximum 12 hours. E
495 Special Topics (1-3) Topics to be assigned. May be repeated. Maximum 12 hours. E
496 Teaching Science Grades 7-12 (3) Methods, materials, recent trends in science and environmental education programs for secondary schools. Prereq: Admission to Teacher Education Program. F, Sp
517 Seminar (1-3) Curriculum, instructional technology, elementary education, secondary education, or social foundations as they relate to goals of students' programs. May be repeated. Maximum 6 hours. E

ENGINEERING AEROSPACE

362 Dynamics/Vibrations (3) Central force motion, transfer functions, stability of systems, vibration transmission and multiple degree vibrating systems. Prereq: ES&M 231. F
401 Thesis (3) Problem investigation and report. Prereq: Senior standing. F, Sp
422 Aerodynamics (3) Theory and design of aerodynamic bodies for desired characteristics. Potential flow theory, viscous effects, compressibility effects. Subsonic, transonic, and supersonic airfoils. Prereq: 370. F
423 Viscous Flow (3) Boundary layer theory; laminar and turbulent flow; compressibility effects; numerical solution methods. Prereq: 381 and Mech. E. 341. Sp
424 Astronautics (3) Propulsion, trajectories, guidance, control, and atmospheric reentry of space vehicle systems. Prereq: 362, Mech. E. 332. F
425 Propulsion (3) Principles of propulsion devices: turbo-jet, ram jet and rocket engines. Prereq: 351. F
429 Aerospace Systems Design (4) Synthesis and design of a complete aerospace system including economic and technical aspects. Participation in team design effort including formal presentations and design report. Prereq: 425, 426. Sp
431 Mechanical Engineering/Aerospace Engineering Seminar (1) Topics related to engineering including ethics, formal oral presentations by students on engineering topics. Prereq: Senior standing. F
449 Aerospace Engineering Laboratory (3) Designing, conducting, and reporting results of experimental exercises. Test standards and specifications. Analysis of data and formation of conclusions. 3 hours lab per week. Prereq: 345, 351. F
494-495 Selected Topics in Aerospace Science (1-4) Current problems and topics in aerospace science; topics in science and engineering for the several areas of aerospace science. Prereq: Consent of instructor. F, Sp

ENGINEERING BASIC

100 Seminar (1) Overview of the College, engineering as a profession, engineering ethics. Consideration of each major and the various engineering disciplines. Satisfactory/No credit.
111 Fundamentals of Engineering Graphics (3) Technical drawing; geometric construction with emphasis on plane surface analysis; presentation of engineering data; graphical solution of three dimensional space problems; primary and secondary auxiliary views. Two three-hour periods or three two-hour periods, including one hour of lecture per week.
121 Statics (3) Vectors, forces and moments; equilibrium of force systems; free body diagrams, equilibrium, frames, trusses and friction. Coreq: Math 141.
131 Particle Dynamics (3) Kinematics, simple harmonic motion; vectors, Newton’s laws, work-energy, impulse-momentum, impact. Prereq: 121; Coreq Math 142.
201 Numerical Techniques (2) Use of FORTRAN in the development of algorithms for roots of equations; systems of linear equations; curve fitting; numerical integration, and solution of ordinary differential equations. Prereq: 101, 131 and Math 142.

ENGINEERING CHEMICAL

240 Fluid Flow and Heat Transfer (3) Force, energy and mechanical energy balances, flow in tubes, piping systems, preservation of energy, gravitational forces, and fluid motion; heat transfer and heat exchangers; radiation. Prereq: 200.
310 Chemical Engineering Laboratory (3) Thermodynamics, fluid flow and heat transfer in chemical engineering. Prereq: 240, 330.
330 Chemical Engineering Thermodynamics (3) Basic concepts and chemical engineering applications of thermodynamics; emphasis on flow processes, real gases, estimation of properties, phase equilibria and chemical equilibria. Prereq: 240.
340 Mass Transfer (3) Stagewise operation; application of analytical, graphical and computer methods to design of stagewise separatory operations. Differential operations-application of analytical and computer methods to the design of diffusive processes. Applications include gas absorption, distillation, extraction, humidification, ion exchange and membrane separations. Prereq: 330.
360 Process Dynamics and Control (4) Introduction to process modeling and industrial control system design. Mathematical tools for characterizing dynamic behavior of processes; theory and practice of operating and controlling such systems. Includes laboratory work. Lab. Prereq: 240.
380 Seminar (1) Presentation and discussion of topics in the practice of chemical engineering. Satisfactory/No credit.
401 Chemical Engineering Data Analysis (3) Analy-
sis of experimental data; identification of system
externalities; statistical properties of samples; empirical
modeling of processes; statistical process control;
opimization techniques.

403 Introduction to Optimization (3) Principles and
applications of optimization techniques to chemical
design, chemical reaction engineering, and other
fields. Optimization techniques for unconstrained

410 Chemical Engineering Laboratory II (3) Laboratory
investigations of mass transfer and chemical reaction
phenomena in chemical engineering. Preparq: 440, 450.

415 Computer Applications in Chemical Engineer-
ing (3) Introduction to computer solution of chemical
design problems. Focus on the application of

425 Introduction to Chemical Engineering Process
Economics (3) Concepts and methods of cost estimat-
ing, debt and equity financing, discounted cash flow
methods, and estimation of product manufacturing
costs. Includes case study and the use of computer

440 Transport Phenomena (3) Overview of moment-
um, mass, and energy balances; the analogies,
differential and macroscopic balances, applications
involving molecular diffusion, including simultaneous

450 Chemical Reactor Fundamentals (3) Homoge-
nous and heterogeneous reaction kinetics; idealized
homogeneous reactor models, both for closed and
flowing systems; corrections for non-ideal residence
time distributions; identification of scaling parameters; cat-
alyst effectiveness factors and conversion in fixed

461 Advanced Process Dynamics and Control (3)
Process dynamics and control. Process system simulation and advanced
industrial system design. Cascade, feedforward, mul-
tivariable, deadtime, adaptive, and nonlinear control
system design. Includes computer and laboratory work.
Lab. Preparq: 360.

469 Engineering Internship in Process Control (4)
Selected students work in small groups on industrial
problems in process dynamics and control. Directed
by faculty and monitored by host company. Preparq: 360
and consent of instructor.

475 Fundamentals of Bioreactor Design (3) Reactor
modeling, analysis and design for microbial fer-
tenations and cell culture, including batch, fed batch
and continuous operation; suspension cultures and immo-
lized systems; factors affecting productivity and control.

476 Principles of Biochemical Separations (3) Selec-
tion and design of separation and purification processes;
analysis of separation equipment and processes, including
centrifugation, density, and molecular sieving.

480 Equipment Design and Economic Methods (4)
Design, optimization and costing of chemical plant
equipment, introduction to economic evaluation meth-
ods, capital investment, discounted cash flows, net
present value. Coreq: 440.

485 Hydrocarbon Processing (3) Chemical and phys-
ical properties of petroleum and processes utilized in
conversion of raw material into various fuels and
chemical products. Includes crude oil; distillation:
refined products; catalytic cracking, and alkylation.
Preparq: 340.

486 Coal Processing to Liquid Fuels (3) Characteri-
sation of various coals with respect to current gasification
and liquefaction technologies; modeling of conver-
sion processes and estimation of product yield and
the associated water, oxygen, and energy require-
ments; catalytic hydrogenation and reactor design consi-
derations; economic assessments. Preparq: 485.

490 Process Design and Economic Analysis (3) Devel-
opment of process information into an integrated
chemical plant design. Process specifications, capital
investment, operating costs and economic feasibility.

494 Special Problems in Chemical Engineering (3)
Chemical engineering problems related to research and
applications in industrial practice or engineering research. Preparq: Consent of instructor. May be repeated. Max-
imum credit 6 hours.

ENGINEERING CIVIL

210 Engineering Surveys (3) Measurement through
application of surveying techniques; theory of errors
and their analysis; concepts of horizontal, vertical and
angular measurements and control; construction sur-
veys; and route surveys through vertical and horizontal
curves. Preparq: Sophomore standing.

251 Transportation Engineering I (3) Transportation
problems and perspectives, rural and urban; use of
a systematic planning process; analysis of existing
travel patterns, modeling and demand, development
of alternatives and the evaluation of civil engineering
projects. Civil engineering decision making and appli-
cations of economic analysis. Preparq: Sophomore standing.

261 Stresses in Framed Structures (3) Stress and
strain in two dimensions; Mohr's circle; area moments of inertia; reactions, moments, shears, and stresses in beams, columns, and torsional members. Preparq: Basic Engr. 121.

310 Route Surveying (3) Basic principles and practi-
cal applications of horizontal and vertical alignment
of transportation routes, including compound, reverse
and parabolic curves and spiral transitions. Includes
earthwork computations by micro-computer. Preparq: 211.

321 Materials of Construction (3) Physical and mechan-
ical properties of materials used in construction. Behavior of materials and structures under load. Testing stan-
dards, aggregates, cements, concretes, ferrous and nonferrous metals, and plastics. Two lectures and 1 lab. Preparq: 261.

330 Introduction to Soil Behavior (3) Physical and mechanical
properties of soils, theory of compaction, seepage, and sensitive stress. Consolidation theory, time rate and settlement, and shear strength of sands and clays. Two lectures and 1 lab. Preparq: 261.

335 Foundation Engineering (3) Fundamentals of geo-
technics applied to design and analysis of soil-
structure systems; subsurface investigation; design
of shallow and deep foundations, foundation on rock.
Lateral earth pressure and retaining structures. Anal-

340 Construction Methods and Equipment (3) Fundamentals of building construction; materials and equip-
ment selection; productivity, concrete and steel con-
struction, and construction contracts and econom-

352 Transportation Engineering II (3) Introduction to
design, construction, and evaluation of various
transportation modes, their guidelines and terminals. Two lectures and 1 lab. Preparq: Junior standing and 210.

361 Analysis of Framed Structures I (3) Forces in
trusses; influence lines; deflections and beams and
trusses; analysis of indeterminate structures; moment

380 Water and Waste Treatment (3) Principles of unit
operations employed in physical, chemical, and bio-
logical treatment of water, wastewater, and solid wastes.
Preparq: Junior standing and 390.

390 Hydraulics (3) Basic laws and properties of incom-
pressible fluids. Units and dimensional analysis; drag
forces; continuity, energy, and momentum equations;
pipe flow; flow measurement; open channel flow and
culverts; pump characteristics. Two lectures and 1 lab.

395 Hydrology (3) Concept of hydrologic cycle; weather
patterns; precipitation measurement and distribution;
abstractions, and runoff; storm hydrograph and peak
flows, including design floods; reservoir and channel routing; rainfall and streamflow frequency anal-
yses; groundwater flow. Preparq: 390.

400 Senior Design Project (3) Open-ended design
project including problem formulation, specifications,
feasibility and viabiility of proposed design. Project
depends upon various factors. Preparq: Consent of instructor. May be repeated. Maximum credit 6 hours.

401 Land Surveying (3) Procedures of locating prop-
erties; evaluating evidence; procedures to determine
property; to create legal descriptions; to prepare plats,

421 Portland Cement and Asphaltil Concrete (3) Aggre-
gates and properties and tests, tests of Portland cement
concrete. Mix design methods for concrete and asphalt
concrete admixtures, tests of asphalt and asphalt mixes,
and nondestructive testing. Two lectures and 1 lab.
Preparq: 261.

433 Earthquake-Resistant Structures (3) Same as Architecture 433.

434 Elementary Structural Matrix Methods (3) Same as Architecture 434.

440 Civil Engineering Systems Design and Manage-
ment (3) Methods of data analysis and modeling of
civil engineering systems to enhance resource allo-
cation for specific application to problems of transpor-
tation, environmental, water resources, struc-
tural analysis materials. Emphasis on micro-
computer applications. Preparq: Junior standing or con-
sent of instructor.

451 Highway Engineering (3) Design, construction,
operation, and maintenance of highway facilities; includes
application of various engineering principles and tech-
niques to the processes of planning, design and construc-
tion of highway facilities; covers both geometric and pave-
ment design. Preparq: 210, 251, 352.

452 Traffic Engineering (3) Characteristics of driver,
vehicle, and roadway and their interrelationship; traffic
studies; basic considerations of traffic circulation and
control, lighting, capacity analysis, roadway safety anal-
sis and design. Preparq: 210, 251, 352.

453 Airport/Railroad Planning and Design (3) Airport
master planning and railroad engineering. Runway
configuration, airfield capacity, geometrics and termi-

461 Analysis of Framed Structures II (3) Maximum
stresses due to moving loads; uses of influence lines;
seismic forces due to earthquake and wind; analysis of
building frame and members for axial tension and compres-
sion; reinforced concrete beams; use of standard specifi-

471 Introduction to Structural Design (3) Selection of
rolled structural steel beams, design of structural steel
members for axial tension and compression; use of rein-
forced concrete beams; use of standard specifications.
Preparq: 361.

472 Steel Design (3) Design of plate girders and compres-
sion beams; calculation of member strengths sub-
jected to combined stresses; design of a typical framed
building including connections. Preparq: 461.

474 Reinforced Concrete Design (3) Reinforced con-
crete elements subjected to combined loads; analysis of
aggregate contents and use of standard specifications.
Preparq: 361.
crete continuous beams and floor slabs, columns with combined axial loads and bending, footings and retain-

480 Water and Waste Transport (3) Theory and design of water distribution systems, wastewater collection systems and solid waste collection systems. Prereq: 390.

490 Water Resources Project Design (3) Development and management of water resources, with a focus on hydropower and dam projects, including data acquisition; split-way and outlet works design; earthworks and dam stability analyses; drainage and sediment transport; and operation and maintenance; and dam safety concepts, including dam break analyses. Prereq: 390, 395.

494 Urban Drainage Engineering (3) Design and management of stormwater conveyance and control structures. Application of hydrologic and hydraulic principles to design of drainage systems for urban, strip mining, and highway development; design of inlet structures, ditches, culverts, and detention/retention basins; application of commonly-used computer runoff models; evaluation of land-use for the purpose of storm event control. Prereq: 390, 395.

495 Water Resources Development and Management (3) Institutional framework including: water law, evaluation procedures for comparing and selecting among water resources development alternatives, alternative project development, project implementation, project evaluation, and project monitoring and control. Coreq: 390, 395.

ENGINEERING ELECTRICAL AND COMPUTER


202 Circuits II (3) Average complex, imaginary and active element - operational amplifier; measurement equipment - voltmeters, ammeters, and oscilloscopes; RLC transients; mutual inductance and transformers as circuit elements using two wattmeters. Complex frequency: real power; effective value of V and I. Three phase circuits. Coreq: Physics 231 and Mathematics 231.


202 Circuits II (3) Average complex, imaginary and active element - operational amplifier; measurement equipment - voltmeters, ammeters, and oscilloscopes; RLC transients; mutual inductance and transformers as circuit elements using two wattmeters. Complex frequency: real power; effective value of V and I. Three phase circuits. Coreq: Physics 231 and Mathematics 231.


301 Circuits and Electro-Mechanical Components (3) DC and AC Circuits, Transients, Transformers, Motors, Generators. For non-majors only. Prereq: Mathematics 231, Physics 231.


319 Systems Lab (1) Experiments and projects demonstrating systems discussed in 312.

321 Energy System Components (3) Iron core magnetic circuits, transformer principles, transformer characteristics and performance; core loss, core loss per unit notation; steady state behavior of induction motors; synchronous machines; dc machines; alternate energy systems; energy conversion and energy systems; direct-energy conversion. Prereq: 205.


329 Electrical Engineering Lab (1) Experiments and projects demonstrating electrical engineering discussed in 321 and 322.


332 Electronic Circuits (3) Multistage transistor amplifier biasing; wideband frequency response; output stages, frequency response, and transient response of open-loop linear amplifiers; fundamentals of integrated circuit operational amplifiers and application in feedback circuits; basic double-loop transistor switching circuits. Prereq: 331, Coreq: 339.

339 Electronics Lab (1) Experiments and projects demonstrating electronics discussed in 332.


342 Communication Theory (3) Propagation of waves on guiding systems, analysis and design of transmission line systems for communication; elements of amplitude and frequency modulation for analog signals, fundamentals of broadcast AM, broadcast FM, FM stereo, and television systems. Random processes. Prereq: 341, Coreq: 349.

349 Communications Lab (1) Experiments and projects demonstrating communications discussed in 341.

351 Introduction to Logic Design of Digital Systems (3) Binary algebra and logic design of combinational and sequential circuits. Principles of operation of d.c. machines; transfer functions for the common modes of operation of d.c. machines; response to different waveforms in supply; describing equations for a.c. machines and their numerical solutions. Prereq: 322. Coreq: 429.

359 Computers Lab (1) Experiments and projects demonstrating electronics discussed in 352.

369 Plasma Engineering Laboratory (1) Experiments and projects demonstrating plasma engineering concepts discussed in 361. Coreq: 361.


431 Digital and Analog Integrated Electronics (3) Basic processing and fabrication of active and passive components for monolithic integrated circuits; characteristics of bipolar, MOS and JFET transistors in both analog and digital integrated circuit designs; standard digital logic circuits including TTL, ECL, Schottky, CMOS, and GaAs gates and arrays; design concepts for op-amps, comparators, references, regulators, and other linear functions. Acceptable as a designated design course. Prereq: 332. Coreq: 435.

432 Analog Signal Processing Electronics (3) Transducer signal and interfacing characteristics; analog integrated circuits including operational, instrumentation, comparator, and sampling circuits; digital to analog and analog to digital converters. Acceptable as a designated design course. Prereq: 332. Coreq: 439.

433 Electronic Amplifiers (3) Feedforward amplifier principles; wideband linear amplifiers; feedback amplifiers; audio power amplifier design; linear regulated power supply design; oscillator principles. Acceptable as a designated design course. Prereq: 332. Coreq: 439.

435 Digital and Analog Integrated Electronics Lab (1) Experiments and projects demonstrating electronics discussed in 431.

436 Analog Signal Processing Electronics Lab (1) Experiments and projects demonstrating electronics discussed in 432.

439 Electronic Amplifiers Lab (1) Experiments and projects demonstrating electronic amplifiers discussed in 433.

or consent of instructor. (Same as Nuclear Engineer-

principles of fusion reactors, and engineering and

456 Digital System Design Laboratory (1) Experi-

453 Data Acquisition Systems (3) Digital-to-Analog

wave switching, filtering and multiplexing devices.

449 Microwave Circuits and Electronics Laboratory (1) Experiments and projects demonstrating micro-

wave circuit and electronics discussed in 443.

451 Microprocessors in Computer Engineering (3) Project oriented using a microcomputer kit having a

monitor program and development system with cross-

assembler and monitor. Includes ALU, CPU structures, control unit organization, storage

444 Radio-Acoustics (3) Wave equation for sound, radiation from pistons, impedance of a piston. Loud

speakers, horns, speaker systems, phonograph record-

ing and reproduction, tape recording and reproduction, noise reducing systems, digital recording. Accepta-

ble as a designated design course. Prereq: 312, 342.

449 Microwave Circuits and Electronics Laboratory (1) Experiments and projects demonstrating micro-

wave circuit and electronics discussed in 443.

451 Microprocessors in Computer Engineering (3) Project oriented using a microcomputer kit having a

monitor program and development system with cross-

assembler and monitor. Includes ALU, CPU structures, control unit organization, storage

444 Radio-Acoustics (3) Wave equation for sound, radiation from pistons, impedance of a piston. Loud

speakers, horns, speaker systems, phonograph record-

ing and reproduction, tape recording and reproduction, noise reducing systems, digital recording. Accepta-

ble as a designated design course. Prereq: 312, 342.

ENGINEERING INDUSTRIAL

200 Fundamental Computer Applications in Indus-

trial Engineering (3) Application of modern computer hardware and software to enhance professional pro-

ductivity. Includes spreadsheets, word processing, graphics

and libraries. IE applications applied to Industrial Engi-

neering. Includes FORTRAN programming and numerical

analysis. Prereq: Basic Eng. 201 or Statistics 251.

201 Quality Control (3) Application of statistical meth-

ods to quality of products and processes. Design and

use of sampling plans and control charts. Toleranc-


301 Operations Research (3) Introduction to math-

ematical programming includes classical optimization

theory, linear programming (simplex method, trans-

portation and assignment) and project network

programming. Prereq: Mathematics 231 and 200.

202 Work Methods and Measurement (4) Job analy-

sis, job evaluation, design of wage structures, design of

work measurement, flow charts, activity charts and

methods improvement. Work measurement tools such as

time study, predetermined time systems, work sam-

pling, data analysis, development of standard time,

data, learning curves and wage incentive systems. Prereq: Statistics 251.

432 Introduction to Human Factors Engineering (3) Human capabilities and limitations affecting work,

work places, and situations in industrial engineering. Focus on human factors methodology, human input require-

ments, human outputs, the design of human-machine interfaces, the analysis of stress on performance, the

environmental factors such as noise, lighting, and

atmospheric conditions. Focus on designing the task to

fit the person. Prereq: Junior standing.

305 Motion and Time Study (3) Design of work meth-

odologies, work measurement, and design of standard
time systems for work and determining standards. For non-industrial engineering students. Prereq: Junior standing.

200 Manufacturing Materials/Processes (3) Charac-

teristics of materials and processes used in modern


401 Integrated Manufacturing Systems (3) NC and

robotics. Modern manufacturing techniques for integrated

manufacturing systems, and the role of control systems. Prereq: 400.

402 Production System Planning and Control (3) Theory and application of forecasting systems including regres-

sion and time series models. Independent demand

inventory models, including development of safety

stock. All modules of Manufacturing Resource Plan-

ning (MRP) Systems; Master Production Scheduling, Resource Requirements Planning, Bill of Material and

Inventory File Structures. Material Requirements Plan-

ning, Capacity Planning, Shop Floor and purchase

Order Control. Overview of Just-in-Time Inventory Con-

trol. Prereq: Senior standing in Manufacturing Automation.

302 Production Facilities Design and Material Han-

dling (3) Design of production facilities including plant

layout for planning and analysis of material handling and

packaging of storage of materials. This includes

office layout and service areas. Principles applicable
to design facilities for such diverse groups as hospi-

tals, banking, and industry. Prereq: 302, 401.

404 Senior Seminar (1) Discussions, lectures and trips to

unify students educational experience. Prereq: Senior standing in Industrial Engineering.

405 Engineering Economy (2) Methods and prob-

lems in selection or replacement of equipment. Decisions among engineering alternatives involving capital recov-

ery, economic life of equipment, and rate of return on

investment.

406 Simulation (3) Simulation of complex industrial

processes using the available simulation languages.

Computer generation of random numbers and out-

comes of random process variables. Design of industrial

processes using simulation. Analysis of systems with

waiting lines using system simulation. Prereq: 200,

Statistics 251.

410 Predetermined Time Systems (2) Work design and

measurement using predetermined time system as a method to verify the correctness of


411 Planning and Scheduling (3) Forecasting tech-

niques and case studies. Concepts and measurements

Performance measures for job shop and flow shop

scheduling. Techniques for generating production sched-

ules and a comparison of different material. Requirements Planning and Just-in-Time philosophies. Prereq: 402.

412 Quantitative Methods in Project Management (3) Planning, scheduling, and control based on

networking and precedence diagramming meth-

ods. Includes resource allocation and time-cost trade-

off algorithms, multi-project control. computer appli-

cations, and PERT methods of handling uncertainty in

activity total times. Prereq: Junior standing in Industrial Engineering.

413 Research Methods in Industrial Engineering (3) Methods to collect and analyze data as related to

industrial engineering. Topics such as process con-

trol, statistical methods, experimental design, sampling, single subject experimental designs, clas-

sical experimental design methods, and time series

analysis experiments. Validity and reliability con-

cepts as related to measurement and collection of

data. Strategies to control internal and external.

research factors such as selection, maturation, and

building extraneous variables into an experiment. Sel-

ction of appropriate experimental designs for given

research situations, and experimental methods in the collection of data. Prereq: 300 and senior standing, Statistics 251.
ENGINEERING MECHANICAL

331 Thermodynamics I (3) Energy and laws governing energy transformations; thermodynamic properties; thermodynamic cycles; applications to engineering problems. Prereq: Chemistry 130, and Mathematics 231. F, Sp, Su

332 Thermodynamics II (3) Properties of gases and mixtures; chemical reactions; equilibrium; compressible flow; applications to engineering problems. Prereq: 331, F, Sp, Su

341 Fluid Flow (3) Development of mass, momentum, and energy principles for fluid systems; dimensional analysis, internal and external viscous flows. Prereq: ES&M 231, Mathematics 231. F, Sp, Su

344 Heat Transfer (3) Heat transfer by conduction, thermal radiation, free and forced convection. Prereq: 331, 341, 391. F, Sp, Su

345 Mechanical Engineering Instrumentation and Measurement (3) Fundamentals of measurement systems; standards; dynamic characteristics of instruments; statistical data treatment; transducers; signal conditioning; strain, pressure, temperature and flow measurements. Prereq: ES&M 231, Aerospace Engr. 362, 341, Electrical Engr. 301. F, Sp


366 Manufacturing Processes (2) Processes related to design of machine parts. Casting, hot and cold forming, metal removal and weldments. Manufacturing tolerances and surface finishes. Prereq: Materials Science 201, F, Sp


401 Thesis (3) Problem investigation and report. Prereq: Senior standing. F, Sp, Su

415 Energy Conversion Systems (3) Fossil fuel energy conversion systems with emphasis on coal technology. Coreq. 475.


422 Environmental Noise (3) Acoustics - measurements and control of noise in industrial and community environments. Prereq: Senior standing in engineering or consent of instructor.

431 Seminar (1) Topics related to engineering including ethics. Formal oral presentation by students on engineering topics. Prereq: Senior standing, F

445 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. Prereq: 344, Aerospace Engr. 351.

449 Mechanical Engineering Laboratory (3) Design, construction and reporting results of experimental exercises. Test standards and specifications. Analysis of data and formation of conclusions. 3 hours per week. Prereq: 332, 344, 345, Coreq: 475. Sp, Su

451 Systems and Controls (3) Analytical models of physical systems; comprised of combinations of mechanical, fluid, electrical, and thermal components; feedback control systems, transient and frequency response, stability analysis, non-linear control of linear systems, sampled data systems, digital filters. Prereq: 341, 353, Electrical Engr. 301-392. F, Sp

455 Introduction to Machine Design (2) Engineering materials, selection and testing, stress, strain, strength and properties of materials, design of mechanical engineering solid mechanics systems. Participation in team design effort; requires design report. Prereq: 363, 465. F

456 Introduction to Thermal Design (2) Engineering economy, optimization, design for automation, reliability, failures and the environment. Design of mechanical engineering thermal-fluid systems. Participation in team design effort; requires design report. Prereq: 332, 344. F


463 Control Systems I (3) Introduction to control of mechanical and electrical components. Analysis and implementation of control systems. Coreq: 475.


466 Elements of Machine Design II (3) Application of strength and properties of materials to machine design techniques to failure of design of machine elements. Mini design experiences. Prereq: Materials Science 201, ES&M 321, & F.


471 Refrigeration and Air Conditioning (3) Vapor compression and absorption cycles; heat pump systems; psychrometric processes; air washers; cooling towers; solar radiation; building heat transmission. Prereq: 332, 344.

474 Solar Energy Utilization (3) Nature and availability of solar radiation; review of heat transfer topics pertinent to solar energy collection and use; design analysis of solar energy collectors and method of storage; selected applications. Prereq: 332, 344 or consent of instructor.

475 Thermal Engineering (3) Thermal systems with emphasis on turbomachinery, heat exchangers, combustion and system analysis and design including second law and economic analysis. Prereq. 332, 344, F, Sp

479 Thermal Engineering Design (4) Design of a complete thermal-fluid system including economic, technical and optimization aspects. Participation in team design effort including term presentations and design report. Prereq: 456, 475. Sp

481 Internal Combustion Engines (3) Thermochemical phenomena in combustion and propulsion engines. Combustion, detonation; equilibrium; dissociation; Analysis of internal combustion engines using ideal and real fluids. Prereq. 332, 344.

494-495 Selected Topics in Mechanical Engineering (1-4) Topics and problems related to developments and practice in mechanical engineering. Prereq: Consent of instructor. F, Sp, Su

ENGINEERING METALLURGICAL

301 Physical Metallurgy (3) Phenomenology and mechanism of plastic deformation in single and polycrystalline materials. Applications of crystallography and x-ray diffraction. Diffusion in solids, solubility and solid solutions, point defects and atomic mechanisms of diffusion. Prereq: Mathematics Science 201. 3 hours or 2 hours and 1 hour lab. F

302 Physical Metallurgy II (3) Recovery and recrystallization processes of cold-worked structures in metals and alloys. Thermodynamics of phase equilibrium. Kinetics and morphology of phase transformations. Prereq. 301. 3 hours or 2 hours and 1 hour lab. Sp
302 Metallurgical Thermodynamics (2) First and second laws; free energy; activity; Racah's and Henry's laws of mixing; solid solutions; condensed phase equilibria; phase stability; phase rule; multiphase systems. Prereq: Chemistry 371 F.

371 Metallurgical Applications in Manufacturing and Processing (3) Fracture mechanics; standards and specifications; principles of thermomechanical processing for finished and semi-finished products; casting, forging, rolling, extrusion, machining; residual stress; corrosion control. Prereq: Materials Science 201. F.

401 Thesis (3) Investigation and report on a research problem in metallurgical engineering. May be repeated once. Prereq: Consent of instructor.

402 Special Project Laboratory (1-3) Group or individual investigation of problems related to metallurgical engineering or materials science. May be repeated to a maximum of 6 credits. Prereq: Materials Science 201, 202, 203 and consent of instructor.

411 Materials Process Design (3) Property control through composition, thermal and mechanical processing; material and property selection; steels and nonferrous alloys. Prereq: Materials Science 201. F.

412 Design and Analysis (3) Lecture and laboratory sessions on design and performance analysis; standardization and specifications, failure analysis, design projects. Prereq: Senior standing. Sp.

411 Fabrication (3) Principles and processes of welding, casting and powder metallurgy; solidification, segregation, shrinkage, residual stress, thermal treatments including sintering; non-destructive testing. Prereq: 301, 302, 3 hours or 2 hours and 1 lab. F.

422 Chemical Process Metallurgy (3) Application of chemical processes to metallurgical processing; Ferrous and nonferrous pyrometallurgical refining, slag-metal equilibria, solidification, gas-metal processing. Prereq: 303. Sp.

431 Mechanical Metallurgy I (3) Mechanical properties from tensile test; elastic behavior, description of stress, strain, and stress-strain relations; plane stress and plane strain loading; failure by yield; stress concentration; brittle fracture due to loading rate and to part and flaw geometry. Prereq: Materials Science 201, ES&M 321. Suggested for mechanical engineering and engineering science and mechanics majors. F.

432 Mechanical Metallurgy II (3) Brittle fracture due to metallurgical and environmental factors; stress-life and strain-life fatigue analysis; residual stresses; creep and stress rupture; finite plastic strain, ductile fracture; fabrication by forging, rolling, deep drawing, stretch forming; formability testing. Prereq: 431 or Mech. Engr. 466 or equivalent. Prereq: Materials Science 201. Suggested for mechanical engineering and engineering science and mechanics majors. Sp.

441 Seminar (1) Presentation and discussion of economic, political, social, ethical and other topics of significance to practicing materials engineers. Satisfactory/No credit.

451 Fracture-Safe Design (3) (Same as Engineering Science and Mechanics 423.)

ENGINEERING NUCLEAR

201-202 Seminar (1, 1) Topics related to nuclear engineering. Satisfactory/No credit.

203 Thermodynamics I (3) First law analysis of open and closed systems. Properties of ideal gases and real fluids. Prereq: Mathematics 142.

204 Thermodynamics II (3) Second law, development of entropy concept and availability. Various power plant cycles and systems. Prereq: 203.

301 Introduction to Nuclear Engineering (3) Nuclear systems, radioactive decay, cross sections, flux, heat physics, reactor theory. Prereq: Physics 232, Mathematics 231.

302 Introduction to Nuclear Reactor Theory (3) Fundamentals of nuclear phenomena; standards and specifications; reaction systems and nuclear data. Analytical and numerical methods applicable to general criticality problems, eigenvalue searches, perturbation theory, and the multigroup diffusion equations. Prereq: 301.

304 Nuclear Engineering Laboratory (3) Radiation detection and counting instrumentation, counting statistics, half life and decay schemes, gamma spectrometry, heat transfer experiments. Prereq: 305. Coreq: 302.

305 Energy Transport (3) Development of differential and integral energy conservation; conduction and convection in moderators, standard numerical methods, application to nuclear reactor fuel elements, reactors, and heat exchangers. Prereq: 204.

306 Designing for Energy Transport (3) Radiation heat transport; hydrodynamics and heat transport in boiling and condensing system; boiling crises; fuel element and heat exchanger thermal design; steam generator design. Prereq: 305.

310-311 Thermal Hydraulics (3, 3) Energies and the manner in which they are transferred and transported. First and second laws of thermodynamics with applications from power cycles; transfer of heat through conductive and radiative mechanisms and development of fluid flow principles for the transport of energy. Prereq: Mathematics 241.

342 Thermal Science (3) Fluid statistics; conservation of mass, momentum, and energy; applications to fluid flows; stress-strain relations, heat conduction, thermal radiation, free and forced convection. For non-departmental majors only.

401 Nuclear Reactor Theory (3) Thermal spectrum computer code calculations for various purposes; artificial and thermal spectra; considerations in reactor core design; equations that relate thermal and neutron variables; power distribution calculations and reactivity control methods. Prereq: 302.

402 Nuclear System Design (4) First order design and analysis of a nuclear system, interface with non-nuclear aspects of system design including system reliability and economics, class project. Prereq: 401.

403 Nuclear Engineering Laboratory (3) Cross-section measurement, diffusion process of neutrons, critical loading experiment, control rod calibration, statistical weight, shielding, xenon poisoning, dynamics and control experiments. Prereq: 304 or equivalent. Coreq: 401, 405.

404 Nuclear Fuel Management (3) Topics relative to nuclear fuel cycle including mining and milling; fuel fabrication, in-core management, reprocessing and waste disposal. Economic and regulatory issues. Prereq: 302.


463 Introduction to Fusion Energy I (3) (Same as Electrical and Computer Engineering 463.)

464 Introduction to Fusion Energy II (3) (Same as Electrical and Computer Engineering 464.)

ENGINEERING POLYMER

401 Thesis (3) Investigation and report on a research problem in polymer science and engineering. May be repeated to a maximum of 6 credits. Prereq: Consent of instructor.

402 Special Projects (1-3) Group or individual investigation of problems related to polymer science and engineering. May be repeated to a maximum of 6 hours. Prereq: Consent of instructor.

402 Introduction to Polymer Science and Engineering (3) Basic course on polymers. Methods of synthesis; molecular characterization; crystallization and glass transition; crystallization kinetics; introduction to mechanical properties, and rheology and processing. F.

455 Plastics Fabrication Operations (3) Lectures, laboratories and field trips; unit operations of plastics materials; classification; selection criteria; processing techniques; characterization laboratory. Sp.

456 Polymer Processing (3) Rheological measurements; development of test methods that relate test results and extrudate swell; selected applications, including screw extrusion, injection molding, synthetic fibers, including spinning methods, structure development, properties.

ENGINEERING SCIENCE AND MECHANICS

231 Dynamics (3) Kinematics of rigid bodies; center of mass; kinematics of systems of particles; mass moments of inertia; kinetics of rigid bodies; Newton's laws, work-energy, impulse-momentum. Prereq: Basic Engr. 131, Mathematics 142.

271 Introduction to Biomedical Engineering (3) Overview of biomedical engineering; anatomy, physiology, biochemistry, biophysics, bioinstrumentation, and biomechanics. Coreq: Mathematics 241 or consent of instructor.

301 Seminar (1) Engineering professionalism and career planning; seminars on current topics. Satisfactory/No credit. Prereq: Junior standing in ES&M.


322 Mechanics of Materials II (3) Analysis and design of beams, singularity functions, energy methods, thick-walled pressure vessels, inelastic bending and torsion, theories of failure and fatigue. Prereq: 321.

341 Fluid Mechanics I (3) Basic conservation laws of fluids; hydrostatics; integral forms, energy, work, similarity; viscous/turbulent flow through pipes, open channel flow; turbomachinery, performance/similarity, Dem'snestrates/labs. Prereq: 231, Mathematics 241.

351 Engineering Analysis (3) Integration of fundamental physical laws and mathematical methods of analysis with emphasis on numerical analysis and digital computer solutions of engineering problems. Prereq: 321, 341, and Basic Engr. 101.

421 Materials of Engineering (3) Mechanical properties of engineering materials; data collection and processing; time and cyclic dependent properties. 3 hours or 2 hours and laboratory. Prereq: 321, Materials Science 201.

423 Fracture-Safe Design (3) Critical view of variables controlling fracture toughness; part and flaw geometries; strain, stress-strain relations and flaw growth; cracking models; crack initiation, propagation, and arrest; residual stress; cyclic and dynamic loading; flaw detection and counting instrumentation, counting statistics; fatigue and fracture. Prereq: 304 hours or 2 hours and laboratory. Prereq: 321 and Materials Science 201. (Same as Metallurgical Engineering 451.)

425 Principles of Nondestructive Testing (3) Principles and theory of nondestructive testing methods; liquid penetrant, magnetic particle, eddy current, ultrasonic, acoustic emission, and radiographic methods. Laboratory. Prereq: 321, Materials Science 201. (Same as Physics 425.)

431 Fundamentals of Vibrations (3) Free and forced vibrations of single and multiple undamped lumped parameter systems; energy methods; free vibration of continuous bodies. Prereq: 231, Mathematics 231.

432 Fundamental Mechanics of Structures (3) Three dimensional dynamics of particles and rigid bodies; kinematics and dynamics of plane and space mechanisms; central force motion; Lagrange's equations; stability; transfer functions. Prereq: 431.

435 Engineering Acoustics (3) Concepts of acoustics,