DUAL J.D.-MBA DEGREE PROGRAM
The College of Business Administration and the College of Law offer a coordinated dual degree program leading to the conferment of both the Doctor of Jurisprudence and the Master of Business Administration degrees. A student pursuing the dual program is required to take fewer hours of course work than would normally be required, as two degrees were to be earned separately.

Admissions
Applicants for the J.D.-MBA program must make separate application to, and be competitively and independently accepted by, the College of Law for the J.D. degree and The Graduate School and College of Business Administration for the M.B.A. degree, and by the Dual Degree Committee. Students who have been accepted by both colleges may commence studies in the dual program at the beginning of any term subsequent to matriculation in both colleges provided, however, that dual program studies must be started prior to entry into the last 28 hours required for the J.D. degree and the last 16 hours required for the MBA degree.

Curriculum
A dual degree candidate must satisfy the graduation requirements of each college. Dual degree students withdrawing from the dual degree program before completion of both degrees will not receive credit toward graduation from either college for courses in the other college, except as such courses qualify for credit without regard to the dual degree program. For students continuing in the dual degree program, the J.D. and MBA degrees will be awarded upon completion of requirements of the dual degree program.

The College of Law will award credit toward the J.D. degree for acceptable performance in a maximum of 8 semester hours of approved graduate-level courses offered by the College of Business Administration. A student shall receive 2 semester hours of credit for each such course successfully completed in law, unless the college specifies otherwise. Two of the 8 semester hours must be earned in Accounting 501, 503, or a more advanced accounting course. If College of Law credit is given for such accounting course, the dual degree student may not receive College of Law credit for Legal Accounting (Law College Course 865).

The College of Business Administration will award credit toward the MBA for acceptable performance in a maximum of 8 semester hours of approved courses offered by the College of Law. Except while completing the first year course load in the College of Law, students are encouraged to maximize the integrative facets of the dual program by taking courses in both colleges each year.

Awarding of Grades
For grade recording purposes in the College of Law for graduate business courses and in the College of Business Administration for law school courses, grades awarded will be converted to either Satisfactory or No Credit and will not be included in the computation of the student’s grade average or class standing in the college where such grades are so converted. The College of Law will award a grade of Satisfactory for a graduate business course in which the student has earned a B grade or higher and a No Credit for any lower grade. The College of Business Administration will award a grade of Satisfactory for a College of Law course in which the student has earned a 2.3 grade or higher and a No Credit for any lower grade. Grades earned in courses of either college may be used if required by the college for any appropriate purpose in the college offering the course. The official academic record of the student maintained by the Registrar of the University shall show the actual grade assigned by the instructor without conversion.

Non-Law Elective Course Credit
Students enrolled in the J.D.-MBA degree program may receive credit toward the J.D. degree for courses taken in other departments of the University except for those taken in conjunction with the dual program. Students are advised to consult The Graduate School's degree requirements as stated in the front section of this catalog as well as the requirements for this college.

SATISFACTORY/NO CREDIT OPTION
A student may take a limited number of elective law courses on a Satisfactory/No Credit basis in the following circumstances:
1. The student has completed 34 semester hours of law work toward the Doctor of Jurisprudence degree;
2. The student is not on academic probation; and
3. The student electing an S/NC basis shall not be graded competitively and independently accepted by, the College of Law for the J.D. degree or the College of Business Administration for the MBA degree, and by the Dual Degree Committee. Students who have been accepted by both colleges may commence studies in the dual program at the beginning of any term subsequent to matriculation in both colleges provided, however, that dual program studies must be started prior to entry into the last 28 hours required for the J.D. degree and the last 16 hours required for the MBA degree.

Students must complete a degree program before dual degree students withdrawing from the dual degree program before completion of both degrees will not receive credit toward graduation from either college for courses in the other college, except as such courses qualify for credit without regard to the dual degree program. For students continuing in the dual degree program, the J.D. and MBA degrees will be awarded upon completion of requirements of the dual degree program.

The number of courses that may be taken on an S/NC basis depends upon whether any other elective law-related courses are taken in other parts of the University and applied toward the J.D. Degree. A total of two law courses are applied, then no law electives may be taken on an S/NC basis.

Dual degree students withdrawing from the dual degree program before completion of both degrees will not receive credit toward graduation from either college for courses in the other college, except as such courses qualify for credit without regard to the dual degree program. For students continuing in the dual degree program, the J.D. and MBA degrees will be awarded upon completion of requirements of the dual degree program.

The number of courses that may be taken on an S/NC basis depends upon whether any other elective law-related courses are taken in other parts of the University and applied toward the J.D. Degree. A total of two law courses are applied, then no law electives may be taken on an S/NC basis.

Grades earned in courses of either college may be used if required by the college for any appropriate purpose in the college offering the course. The official academic record of the student maintained by the Registrar of the University shall show the actual grade assigned by the instructor without conversion.

For purposes of S/NC grading, satisfactory shall mean a grade of at least 2.0. A student electing S/NC who makes 2.0 or above shall receive credit for the course, but the grade shall be recorded as S and will not be used in determining grade average. A student electing Satisfactory/No Credit who makes 2.0 or above shall receive credit for the course and the grade shall be recorded as S and will not be used in determining grade average. A student electing Satisfactory/No Credit who makes 2.0 or above shall receive credit for the course and the grade shall be recorded as S and will not be used in determining grade average. A student electing Satisfactory/No Credit who makes 2.0 or above shall receive credit for the course and the grade shall be recorded as S and will not be used in determining grade average. A student electing Satisfactory/No Credit who makes 2.0 or above shall receive credit for the course and the grade shall be recorded as S and will not be used in determining grade average.

A student may take a limited number of elective law courses on a Satisfactory/No Credit basis in the following circumstances:
1. The student has completed 34 semester hours of law work toward the Doctor of Jurisprudence degree;
2. The student is not on academic probation; and
3. The student electing an S/NC basis shall not be graded competitively and independently accepted by, the College of Law for the J.D. degree or the College of Business Administration for the MBA degree, and by the Dual Degree Committee. Students who have been accepted by both colleges may commence studies in the dual program at the beginning of any term subsequent to matriculation in both colleges provided, however, that dual program studies must be started prior to entry into the last 28 hours required for the J.D. degree and the last 16 hours required for the MBA degree.

Students must complete a degree program before dual degree students withdrawing from the dual degree program before completion of both degrees will not receive credit toward graduation from either college for courses in the other college, except as such courses qualify for credit without regard to the dual degree program. For students continuing in the dual degree program, the J.D. and MBA degrees will be awarded upon completion of requirements of the dual degree program.

The number of courses that may be taken on an S/NC basis depends upon whether any other elective law-related courses are taken in other parts of the University and applied toward the J.D. Degree. A total of two law courses are applied, then no law electives may be taken on an S/NC basis.

Dual degree students withdrawing from the dual degree program before completion of both degrees will not receive credit toward graduation from either college for courses in the other college, except as such courses qualify for credit without regard to the dual degree program. For students continuing in the dual degree program, the J.D. and MBA degrees will be awarded upon completion of requirements of the dual degree program.

The number of courses that may be taken on an S/NC basis depends upon whether any other elective law-related courses are taken in other parts of the University and applied toward the J.D. Degree. A total of two law courses are applied, then no law electives may be taken on an S/NC basis.

Grades earned in courses of either college may be used if required by the college for any appropriate purpose in the college offering the course. The official academic record of the student maintained by the Registrar of the University shall show the actual grade assigned by the instructor without conversion.
student may take, a non-law course for which credit is received is counted as two-thirds of a course. Thus, a student may take three non-law courses only if no Law College course has been taken on an S/NC basis but may take only one non-law course if one Law College course has been taken on an S/NC basis. A student should be aware that if two non-law courses are taken, no Law College courses may be taken on an S/NC basis.

ACADEMIC STANDARDS

No student will be excluded from the College of Law for academic reasons prior to the completion of two semesters of academic study. A full-time student who fails to achieve a grade-point average of 2.00 upon completion (receipt of a grade) of two semesters of academic study shall be excluded. Such exclusion shall occur regardless of whether the student has obtained prior permission to vary the first-year course load.

MAXIMUM COURSE LOAD PER SEMESTER

The maximum course load for a law student is 18 hours in any one semester. During the summer term the maximum course load is 7 hours.

POLICY FOR GRADUATE STUDENTS TAKING LAW COURSES

Law courses are not available for graduate credit; however, a graduate student may be allowed to take up to 6 semester hours of law courses and receive credit toward a degree upon approval of the College of Law and the major chairperson. The graduate student must register for the law course during regular registration at the College of Law requesting an S/NC grade only. If a 2.0 or above is earned in a law course, an S will be recorded on the transcript. If a 2.0 is earned below a 2.0, an NC will be recorded, and the course cannot be used toward meeting degree requirements. Grades for law courses will not be reflected in the cumulative average.

Different rules apply to the student enrolled in the Dual J.D.-MBA Program. Grades must be earned according to the grading system of the respective college. 9.9, grade points for law courses, letter grades for graduate courses. Refer to page 19 for the grading scale acceptable toward meeting degree requirements. Cumulative GPA for law courses only will be carried until graduation, at which time both the graduate and the law cumulatives will be shown on the permanent record.

PROGRAM OF INSTRUCTION

The J.D. program is designed to give the student an adequate preparation for the practice of law. From 12 to 15 hours of classroom work a week are required of all full-time students. The required courses will be taken as early in the law curriculum as possible or as scheduled by the law faculty. Required courses are numbered 801 through 819; elective courses are numbered 820 through 937; seminars are numbered 900 through 937.

WRITING REQUIREMENT

One upper-level course in which a substantial legal research paper is written under faculty supervision is required for graduation. This requirement may also be satisfied by a directed research project approved by the Academic Standards Committee, or by a faculty approved comment or perspective written for the Law Review.

LEGAL CLINIC COURSES

Students are eligible to enroll in clinical courses only after the successful completion of their fourth semester (56 semester hours) in addition to meeting other specified prerequisites. Students must enroll in only one clinical course per semester and are limited to a total of two courses. Clinical courses are numbered 850 through 895.

102 Civil Procedure I (3) Introductory course; broad subject matter, principles, policy, strategy, development of law. Prerequisites: completion of the Perspective Course Requirement and the Writing Requirement. This additional required courses may be taken at any time during the second or third year.

103 Civil Procedure II (3) Pleading, joinder of claims and parties; discovery, trials, verdicts, judgments and appeals; emphasis on Federal Rules of Civil Procedure.

104 Contracts I (3) Basic agreement process and legal protection afforded contracts. Problems of offer and acceptance, interpretation, legality, and statute of limitations.

105 Contracts II (3) Continuation of Contracts I. Remedies, conditions, impossibility and frustration. Third party beneficiaries, assignment and delegation, discharge.

106 Criminal Law (3) Substantive aspects of criminal law. Prerequisite: General principles applicable to all criminal conduct: specific analysis of particular crimes: substantive defenses to crimes, including insanity, intoxication, mistake, necessity, legal duty, self-defense, and duress.

107 Income Tax 1 (4) What is income; whose income is it; when is it income; how is it taxed (capital gains and losses, maximum and minimum tax); deductions and credits; ratios (corporate, estate, and trust).

108 Legal Process I (2) Court structure; case analysis, case synthesis, and use of cases to predict and influence judicial decisions; legislative process; statutory interpretation; influence of judge as policy-maker; adversary system and lawyer's role. Use of legal authority in periodic written exercises.

109 Legal Profession (2) Role of lawyer in society and ethical responsibilities implied in that role; admission to the bar, the organized profession, solicitation, advertising, unauthorized practice, conflicts of interest, decision to represent or withdraw as counsel; fiduciary relationship, advocacy and its limitations; fees, and disciplinary procedures.

110 Legal Bibliography and Research (1) Instruction in legal bibliography, citation form, and research methodology, including computerized research. Identification and location of authorities required to prepare a law office memo. Prerequisites: completion of an identifiable legal problem: S/NC only.

111 Legal Writing and Advocacy (2) Legal writing exercises, effective communication of ideas. Preparation of brief and oral argument.

113 Property I (3) Freehold estates, future interests, concurrent ownership, leases; real estate contract and deed; principles of personal property.

114 Property II (3) Recording system, title assurance, easements, nuisance, lateral support, water rights, zoning, and eminent domain.

118 Torts I (3) Intended interference with the person, assault and battery, false impersonation, negligence, affirmative duties, immunities, actual causation, and contributory causes.

119 Torts II (3) Negligence, result within the risk, or proximate causation. Assumption of risk and contributory fault; interference with property, trespass, conversion, possession; privileges; strict liability, liability of suppliers and contractors; misrepresentation; defamation; unjustifiable litigation; privacy; interference with contractual relations.

120 Administrative Law (3) Administrative agencies and process; delegation and interpretation of powers; investigatory and rule-making procedures and requirements; adjudicative procedures, evidence, findings, scope of review.

121 Admiralty (2) Admiralty courts and jurisdiction; death and injury to persons; special provisions concerning various maritime workers; carriage of goods by ships; principles governing collisions and liability.

122 American Legal History (3) Historical development of law, legal institutions, legal profession, and legal education from colonial times to present; historical relationship of legal system to society.

123 Antitrust (3) Federal antitrust laws; monopolization, price-fixing, group boycotts, and anticompetitive practices generally; government enforcement techniques and private treble-damage suits.

124 Bills and Notes (2) Negotiable instruments, negotiability, transfer, holders in due course; equity and defenses; liability of parties; discharge; letters of credit. Arts. 3, 4, and 5 of Uniform Commercial Code.

125 Business Associations (4) Legal forms of cooperative business enterprise: agency, partnership, limited partnership, corporation.

126 Advanced Business Associations (2) Selected topics. Prereq: 825.

130 Comparative Law (3) General introduction to civil law systems of France and Germany, focusing on legal institutions, methodology and aspects of law of obligations and commercial law.

131 Conflict of Laws (3) Jurisdiction, foreign judgments, choice of law, constitutional limitations, renvoi, and classification.

132 Constitutional Law I (3) Freedom of expression, association and religion; Fourteenth Amendment rights excluding rights of criminally accused, including discrimination, to race, sex, etc., right to franchise and apportionment; concept of state action in matters of civil rights.

133 Copyright, Patent and Trademark (3) Protection for intellectual property under federal and state law; patents, trademarks and trade names, trade secrets, copyright, tax considerations, international aspects.

134 Criminal Law Theory (3) Theoretical foundations of criminal law, including an examination of concepts of justice and morality and pertinent materials in physical and behavioral sciences.

135 Criminal Procedure I (3) Police practices and rights of persons charged with crimes: arrest, search and seizure, identification, interrogation, entrapment, electronic eavesdropping, right to counsel, and jury trial.

136 Criminal Procedure II (3) Pre- and post-trial procedures in a criminal case: bail, preliminary hearing, grand jury, prosecutorial discretion, discovery, speedy trial, plea bargaining, and post-conviction relief.

460 Debtor-Creditor Law (3) Enforcement of judgments; bankruptcy and its alternatives for the business and consumer; emphasis on federal bankruptcy statutes.
841 Decedents' Estates (3) Nature, creation, transfer, termination, and modification of trusts; fiduciary administra-
tion; intestate succession; validity, execution, mistake, revocation, probate and contest of wills; ademption,
advancements and contribution of wills.

842 Directed Research (1-2) Hours to be arranged. Independent study under direct supervision of instruc-
tor; maximum of once each year in last two years of study. Proposal must be approved in advance by Acad-
emy Standards Committee.

843 Discrimination and the Law (3) Comparison of race, sex and other invidious discriminatory practices as they affect political participation, education, employ-
ment, housing and other social and economic activities; em-phasis on Court decisions and United Nations Declaration of post-Civil War Amendments to the Constitution.

844 Environmental Law and Policy (3) Methods of public policy analysis, framework for understanding responses of legal system to environmental legislation; Clean Air Act, National Environmental Policy Act, and selected regulatory issues.

845 Evidence (4) Rules regulating introduction and exclusion of oral, written, and demonstrative evi-

dence; identification of dispute, competency, impeachment, hearsay, privilege, judicial notice, presumptions, burden of proof.

846 Family Law (3) Survey of laws affecting formal and informal family relationship: premarital disputes, antenu-
natal agreements, dissolution of common law and formal marriage, legal effects of marriage, support obligations within family, legal separation, annul-
ment, divorce, alimony, property settlements, child custody, child support, adoption, abortion, and illegit-
imate children.

847 Federal Courts (3) Jurisdiction of federal courts and conflicts between federal and state judicial sys-
tems including rules of judicial power, federal questions, diversity, removal, jurisdictional amount, choice of state or federal law, habeas corpus, absten-
tion, evidentiary objections, appellate jurisdiction, joinder of parties and claims.

848 Future Interests (3) Law of future interests, includ-
ing reversions, remainders, possibilities of reverter and reversion, remainders, formal marriage, legal effects of marriage, support

851 Government Contracts (2) Principles relating to government procurement, both federal and state; award, performance, and termination of contracts; administr-
ative law. Discretion, choice of adjudication or enforcement processes arising under government contracts. Prereq: 820.

852 Income Tax II (3) Partnership taxation; corporate reorganiza-
tions and distributions; transactions among corporations and shareholders. Prereq: 807.

853 Income Taxation of Entities (2) Federal income taxation of trusts and beneficiaries, partners and part-
nerships, subparagraph C corporations and shareholders, and related topics. Prereq: 807. Recommended: 852.

854 International Law and Policy (3) International agree-
ments, organizations, recognition of states, nationality, territory, jurisdiction and immunities, claims, expro-
piation, force and war.

855 International Business Transactions (3) Legal status of persons abroad, acquisition and use of prop-
erty within a foreign country, doing business abroad as a foreign corporation, engaging in business within a foreign country, expropriation or annulment of con-
tracts or concessions.

856 Jurisprudence (3) Legal theories: natural law, idealism, historical jurisprudence, utilitarianism, ana-
litical jurisprudence, sociological jurisprudence, legal realism, policy science approach.

860 Labor Law (4) Evolution of labor relations laws, rights of self-organization; employer and union unfair labor practices; strikes, boycotts and picketing, col-
collective bargaining, employee relations, internal union affairs; individual rights in labor relation-
s; employment testing and discrimination; federalism and preemption; unions and antitrust laws.

861 Land Finance Law (2) Financing devices: mort-
gages, deeds of trust and land contracts; problems involved in transfer of interests subject to these devices; problems incurred in event of default; contemporary

862 Law and Current Problems (2-3)

863 Law and Economics (3) Relationship between legal and economic thought, use of economics in legal decision making and legal criticism.

864 Law, Language, and Ethics (3) Intermediate level jurisprudence-type course; law as the mind's attempt to defend, direct, and enact social policy, e.g., ex-
clusionary legal ethics and the role of law in the ideological construction of racial or gender identity of actors in the law-making process, the role of political power in the formation of law.

865 Legal Accounting (2) Accounting problems and techniques, use and understanding of accounting infor-

866 Legal Imagination (3) Systematic study of literature and its application to accurate, fluent, and creative legal composition.

867 Legal Writing (1) By arrangement. Completion of a potentially publishable Casenote or Comment or Per-

868 Legislation (3) Interpretation and drafting of stat-
utes, legislative process, and legislative power; judicial views on legislative process subjected to critical compar-
ison with contentions of other legal processes and applicable constitutional principles.

869 Local Government (3) Distribution of power between state and local governmental units; sources of author-
ity for limitations on local government operations; creation of local governmental units and determination of their boundaries; home rule; problems represented by frag-
mentation of local government units; problems in financing of local services; influence of federal pro-
grams on local government finance and decision making.

872 Modern Land Use Law (2) Land use planning, nuisance, zoning, eminent domain.

873 Natural Resources Law (3) Selected materials on nature of interest, conveying, royalties, grants and reservations, leases, and taxation.

874 Products Liability (3) Negligence of manufactur-
er; strict liability of manufacturer; liability of retailer and other suppliers; defectiveness and causation; dis-
claimers and contributory fault.

875 Remedies (4) Judicial remedies: damages, restr

876 Selected Problems in Remedies (3) Course content varies. Topics may include: personal injury liabil-
ity, defective products, contracts, negligence in com-
plex litigation (class actions and/or derivative suits), problems in restitution. Prereq: 875 or consent of instruc-
tor.

880 Sales and Secured Transactions (4) Art. 2 (Sales) and Art. 9 (Documents of Title) of the Uniform Com-
mercial Code; brief survey of suretyship and guaranty; Art. 9 (Security Interests in Personal Property) of the Uniform Commercial Code.

881 Securities Regulation (3) Advanced problems of governmental regulation of issuance of securities.

882 Social Legislation (3) Schemes other than tradi-
tional tort law for compensating victims of accidents, dis-
ability and other malocclusions: Workers Com-
pensation and common law, state and federal schemes of Social Security disability benefits and administrative pro-
dure for resolving such claims. Brief survey of medical assistance, welfare, related matters.

883 Tax Theory (3) Comparative study of methods and purposes of governmental revenue collection through examination of economic theory and various actual proposed schemes of taxation. Prereq: 807.

884 Trial Practice (3) Criminal and civil litigation: trial problems. Topics: civil rights injunctions, reme-
dies in complex litigation (class actions and/or derivative suits), plea bargaining, argument, strategy, pre-vailing arguments. discovery and presentation of evidence, selection and instruction of juries, opening and clos-
ing arguments.

885 Wealth Transfer Taxation (3) Transfers of wealth at death (estate tax) and during life (gift tax); genera-
tion skipping transfers; deductions and credits; inter-
relationship of transfer taxation. Prereq: 807.

890-91 Introduction to Advocacy (4-8) Litigation, trial

892 Administrative Law Seminar (2) Principles of admin-
istrative law. Discretion, choice of adjudication or rulemaking to develop administrative policy, consist-
ency in administrative action.

901 Arbitration Seminar (2) Arbitration of labor disputes; judical and legislative developments, nature of process, relationships to collective bargaining, selected arbit-
tration problems on various topics under collective agreements, and role of lawyers and arbitrators in the

905 Business Planning Seminar (2) Selected prob-
lems on corporate and tax aspects of business planning and transac-
ctions. Prereq: 852, 825.

907 Commercial Law Seminar (2) Content varies. Prereq: 852. Recommended: 855. Selected problems in commercial transac-
tions; major research paper. Prereq: 880.

909 Constitutional Law Seminar (2) Current consti-
tutional law problems; original paper required. Prereq: 825.

911 Consumer Protection Seminar (2) Selected prob-
lems in consumer protection.

913 Criminal Law Seminar (2) Advanced problems in criminal law and administration of justice.
915 Environmental Protection Seminar (2) Problems of
protecting in defense of environment and mobilizing
public and private efforts in defense of environment.
Problems of proving environmental impact of selected
projects, interpretation and evaluation of scientific data,
use of expert witnesses. Special environmental con-
cerns of region, e.g., TVA operations, strip mining,
torest management, wildlife preserves. Team-teach-
ing and selected experts. Prereq: 844.

917 Estate Planning Seminar (2) Problems of estate
planning both inter vivos and testamentary; advan-
tages and disadvantages of various types of ownership;
law and practice of fiduciary administration, insur-
ance, wills, future interests, trusts, corporations,
partnerships, and gifts as related to estate planning;
research on assigned topics; drafting of estate plan
for hypothetical fact situations. Prereq: 841 and 885.

919 International Law Seminar (2) Current interna-
tional law problems; paper required. Prereq: 854.

921 Juvenile Law Seminar (2) Unique history and
philosophy of juvenile justice system; jurisdiction and
judicial law problems; paper required. Prereq: 854.

923 Labor Relations Law Seminar (2) Selected labor
relations law problems.

925 Land Acquisition & Development Seminar (2)
Alternative business forms and major documents (notes,
debt instruments); responsibilities necessary to accomplish
acqui-
sition or development of large pieces of raw land
prepared and presented for seminar discussion. Prereq:
881.

927 Law and Current Problems Seminar (2-3)

929 Law and Medicine Seminar (2) Medical profes-
sionals and involvement in judicial process: medical
malpractice and alternatives to fault-based liability;
responsibilities for disposition and care of dead bodies
and the role of the medical examiner; organ transplant;
expediatric proof and testimony; medicolegal
aspects of euthanasia; legal import of medical pro-
fession's various canons of ethics.

931 Law and Mental Health Seminar (2) Psychiatric
principles, roles of psychiatrist, and relationship to
role of legal counsel; assigned readings; field work in
mental health clinic; jointly taught by law professor and
psychiatrist.

932 Office Practice Seminar (2) Techniques of law
office management, methods and practice: tech-
niques in preparation of various legal instruments,
office management, interviewing and counseling, man-
agement of personnel.

935 Seminar in the Professional Competence of the
Lawyer (2) Typical situations in which malpractice
claims arise: third party claims, conflicts of interest,
breach of fiduciary duties; examination of difficult prob-
lems of proof including use of expert testimony.

937 Trade Regulation Seminar (2) Antitrust laws and
related topics, e.g., price fixing, territorial restric-
tions, and tying agreements, restraint of trade.

939 Seminar in Writing for Law School (2) Sections
on reading strategies and skills, memo writing, brief
writing, note-taking, legal research.

940 Seminar in Legal Research (2) Section on legal
research, sources, and methods; relationship of law
research to legal writing.

942 Seminar in Legal Writing (2) Section on legal
writing, sources, and methods; relationship of law
writing to legal research.

Professional Competence of the Lawyer (2) Sections
on legal research, sources, and methods; relationship of
law research to legal writing.

943 Seminar in Legal Practice (2) Sections on legal
practice, sources, and methods; relationship of law
practice to legal research.

945 Seminar in Legal Practice (2) Sections on legal
practice, sources, and methods; relationship of law
practice to legal research.

947 Seminar in Legal Practice (2) Sections on legal
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practice to legal research.

983 Seminar in Legal Practice (2) Sections on legal
practice, sources, and methods; relationship of law
practice to legal research.

985 Seminar in Legal Practice (2) Sections on legal
practice, sources, and methods; relationship of law
practice to legal research.
554 The Library in the Community (3) Application of marketing analysis for planning and policy formulation. Public library focus. Sp.

560 Development and Management of Collections (3) Philosophy and process of building and managing collections in libraries and information agencies: environment; community analysis; policy statements; collection evaluation; and preparation of buying lists. Prereq: 530. E.Su.A.

561 Contemporary Book Publishing (3) Creation, design, production, marketing, and distribution of materials acquired by libraries; various types of publishers. F.

562 Serials (3) Serials collections: selection, acquisition, bibliographic control, storage, maintenance, and public service. Prereq: 569 or consent of instructor. Sp.

563 Nonbook Materials (3) Selection, acquisition, media-graphic representation, storage, utilization, and programming: microforms, films, video, sound recordings, and video information media. F.

564 Records Management and Archives (3) Objectives and functional elements of records management and archives programs within various types of organizations; management of creation, distribution, retention, storage, retrieval, protection, and disposition of organizational records regardless of information medium. Sp.

569 Advanced Production of Audioserial Software (3) (Same as Curriculum and Instruction 569.)


572 Resources for Young Adults (3) Critical survey of books and materials for young adults; personal, vocational and recreational needs and interests. Evaluation, selection, and utilization for school and public libraries. Sp.

573 Services for Children and Young Adults (3) Philosophy and services of public and school library services for children and young adults. Reading, listening, and viewing guidance for individuals and groups. Program planning, implementation, and evaluation. Prereq: 571 or 572 or consent of instructor. Su.

574 Adult Materials and Services (3) Fiction and subject categories, popular and standard; reading, listening, and viewing guidance to meet adult interests; development of specialized collections; services for adults. F.

580 Foundations of Information Science (3) Identifies attributes of information; information theory; relevance, use and user studies, bibliometrics, and major components of information retrieval system design. Relates selected research findings to library and information system practice. F.Sp.

581 Information in Society (3) Characteristics of information society, knowledge and information, faced with technological innovation, use and effect of media. F.

582 Automation (3) Computer concepts and their applications to basic library and information center operations. E.Su.A.

583 Information Systems Analysis and Design (3) Tools and methodologies in library/information agency systems planning and implementation. Role and training of systems analyst, systems study from planning through implementation and evaluation, and related topics. Sp.


585 Information Technologies (3) Computer-based and non-computer related media and methods for information storage, retrieval, and transfer within and between external to library/information center environment, existing and prototype systems and interfacing of technologies. Prereq: 582 or consent or instructor. Sp.

590 Problems in Library and Information Science (3-6) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. F;

591 Supervised Readings in Library and Information Science (3-6) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. F.

592 Seminar in Library and Information Science (3) Prereq: Consent of instructor. May be repeated with consent of advisor. Maximum 6 hrs. F.

593 Independent Study (3) Prereq: Consent of advisor. Maximum 6 hrs. F.

599 Practicum (3) Opportunity to translate theory into practice under guidance of qualified information professionals. Prerequisite: Completion of courses relevant to student's practicum design. Written consent of advisor and approval of practicum coordinator. May be repeated with consent of advisor and practicum coordinator. F.

Life Sciences
(Office of the Provost)

MAJOR DEGREES

Life Sciences ......................................... M.S., Ph.D.

Coordinating Council:

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

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

The Life Sciences Council supports research and studies in the following concentrations: cellular and molecular biology (M.S. only); cellular, molecular and developmental biology; environmental toxicology; ethology; 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. Each program is overseen by a committee and may have unique admission and graduation requirements.

ADMISSION REQUIREMENTS

1. A Bachelor's degree with a major in a biological, behavioral, or physical science.
2. GRE (general) scores.
3. Three letters of recommendation.
4. Course work including a year of calculus (differential and integral), one year of chemistry, and a year of physics. Specific course deficiencies may be corrected during the first year.

DEGREE REQUIREMENTS

The Master's degree requires a minimum of 30 semester hours of study approved by the student's committee, a thesis, and an oral examination. Within the biotechnology program only, a non-thesis M.S. option is available. Students choosing this option are expected to complete: (1) two summers' co-op experience in an appropriate industry. An evaluation by supervisor and a written report are required (529, Biotechnology Practicum Cooperative Experience, maximum 4 hrs.); (2) A written report in the form of a scientific paper in an area of specialization chosen by the student and advisor. The minimum requirements for the doctoral degree include at least 6 hours above the 600 level, 24 semester hours of course 600, a pattern of courses approved by the student's committee, a comprehensive examination, a doctoral dissertation, and a defense of dissertation. Individual programs may have additional requirements.

CONCENTRATIONS

Biotechnology

The biotechnology program will prepare students to participate in the wide variety of opportunities presented by the use of living cells and their components for the production of useful materials. This will be achieved at the M.S. level by a prescribed course of study of the biology and biochemistry of cells and molecules in the first year; by further formal study in the second year of specific aspects of biotechnology and by the development of special expertise in areas such as animal embryo manipulation, automated chemical synthesis of macromolecules, bioprocess engineering, bioproducts and biotransformations, liposomes, microscopy and image processing, monoclonal antibodies and hybridoma technology, plant tissue culture, recombinant DNA technology and risk assessment, and modeling. The production of a research thesis or an industrial co-op experience plus an area of specialization will also be an important part of the training experience. Required courses are Life Sciences 509, 511, 512, 531, 532; Biochemistry 511; Microbiology 410; Botany 451; Chemical Engineering 475; and Zoology 507.

Cellular, Molecular and Developmental Biology

The interdepartmental program in cellular, molecular and developmental biology includes research in structural or functional aspects of cells or subcellular components, or the interactions between cells. Required courses are Life Sciences 511, 512, 531, and 532.
Environmental Toxicology
The toxicology program provides intensive training in basic toxicological principles and techniques. Courses and research expose trainees to mechanisms of intended and unintended interactions between living systems and potentially toxic agents from the point of view of biochemistry, physiology, ecology, public health, environmental law and regulation, pest management, pollution control and repair, and testing and residue analysis of toxicants.
Required courses are Biochemistry 551, 562, 604; and Life Sciences 510.

Ethology
Ethology is the naturalist study of normally occurring animal and human behavior. The program provides intensive training in basic ethology with specialized studies available in the development, evolution, and physiology of behavior; human ethology; and behavioral ecology and sociobiology.
Required courses for the Master's are Psychology/Zooology 450, 459; Zooology 524, 583; Statistics 531-32; and Zooology/Psychology 516.
The Ph.D. requirements are the same as for the Master's with the additional requirements of one additional statistics course and six semester hours of courses numbered above 600 approved by student's committee.

Physiology
The inter-departmental program in physiology includes research in the areas of cellular, comparative, developmental, exercise, muscle, neuro-physiology, regulatory, or reproductive.
Required courses are Zooology 520, 521, 240, 350, 420; Biochemistry 410; four 600 level seminars; and a statistics sequence.

Plant Physiology and Genetics
This program provides the opportunity for intensive training and research experience in areas transcending the usual boundaries of botany, biochemistry, and agricultural plant sciences. It devotes itself to seeking solutions to problems concerning the interactions of physiology and genetics in applied and fundamental aspects of plant science.
Required courses are Life Sciences 510; Botany 521, 522; Biochemistry 511, 512; Plant and Soil Science 551, 571; Microbiology 410.

512 Advanced Molecular Biology (3) (Same as Biochemistry 512.)

525 Research Practicum in Life Sciences (1-3) Individual sections for each of biotechnology: cellular, molecular and developmental biology; environmental toxicology; ethology; plant physiology and genetics; and physiology. May be repeated. Maximum 9 hrs.

529 Biotechnology Practicum Co-operative Experience (2) Work experience in commercial organization for students undertaking non-thesis option of biotechnology concentration. Evaluation by supervisor and written report by student. May be repeated. Maximum 4 hrs.

531 Biotechnology Laboratory (3) Growth of microorganisms, analysis of extracellular and intracellular components.

532 Biotechnology Laboratory (3) Pilot scale yeast cultivation, enzyme isolation, purification and characterization. Application of purified enzymes to food production fermentations and fermentation process control.

600 Doctoral Research and Dissertation (3-15) P/NP only. E

610 Advanced Topics in Life Sciences (1-3) Topics vary. May be repeated. Maximum 6 hrs.

Logistics
See Marketing, Logistics and Transportation

Management
(College of Business Administration)

MAJOR DEGREES

Business Administration.............MBA, Ph.D.

Ronald W. Boling, Acting Chair

Professors:
R. W. Boling, Ph.D. Stanford; H. D. Deward, Ph.D. Texas; M. E. Gordon (Alumni Distinguished Service Professor), Ph.D. California; A. H. Kealy (Emeritus), MBA Pennsylvania; J. M. Larsen, Jr., Ph.D. Purdue; C. L. Neel, Ph.D. Alabama; S. K. Reed, Ph.D. Edinburgh; D. Reese (Emeritus), Ph.D. Iowa; E. R. Smith, Ph.D. Ohio; S. C. Vance (Emeritus) (William B. Stokely Professor of Strategic Management), Ph.D. Pennsylvania; G. A. Wagener (Emeritus), M.S. Indiana; G. H. Whitlock (Emeritus) (Alumni Distinguished Service Professor), Ph.D. Tennessee; M. S. Womran, Jr., (William B. Stokely Professor of Strategic Management), Ph.D. Minnesota.

Associate Professors:
O. S. Fowler, Ph.D. Georgia; K. C. Gilbert, Ph.D. Tennessee; R. T. Ladd, Ph.D. Georgia; R. C. Maddox, Ph.D. Texas; M. C. Rush, Ph.D. Akron.

Assistant Professors:

BUSINESS ADMINISTRATION CONCENTRATIONS
For complete listing of MBA and Ph.D. program requirements, see Business Administration.

MBA Concentrations
Management
Forest Industries Management
Minimum Course Requirements for MBA
Concentrations: Management—Three courses from the following: 511, 513, 521, 541, 542, 551, 571, 593. Selection must be approved by the Management Department MBA advisor. Forest Industries Management — 511, 513, Forestry 560, 565.

Ph.D. in Business Administration
Concentration
Management (Operations Management and Strategic Management)
Minimum Course Requirements for Ph.D.
Concentration: Operations Management — 511 and 542; two semesters of 640 (may be repeated for credit); one additional semester of approved doctoral seminar work; Strategic Management — 513, 510, 511, 512.

500 Thesis (1-15) P/NP only. E

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

504 Management of Organizational Behavior (3) Integration of individual and group differences, organization theory and design, motivation, leadership, human resources planning, and career implications with strategy, planning, and decision making.

505 Operations and Logistics Management (3) Concepts and techniques for managing operations and distribution systems. (Same as Transportation 505.)

511 Organizational Theory: Integrated Structure and Behavior (3) Cases, group projects, discussion; organizational theories, organizational effectiveness; contextual factors of organizations; environment, size, technology; organizational structure configurations, organization design; social influences on organizational effectiveness; motivation, group behavior, intergroup relations, organization change and development.

513 Strategic Planning (3) Theoretical and applied literature, successful strategic positioning of business in a variety of environments. Analysis of industry notes and case histories. Coreq: Business Administration 509.

521 Personnel Administration (3) Personnel functions and human resources management. Community relations, recruiting, selection, training, performance evaluation, wage and salary administration, legal framework as it affects personnel.

522 Labor Relations and Collective Bargaining (3) American labor history, structure, philosophy of bargaining, dispute settlement, and contract administration. (Same as Economics 562.)

525-26 Industrial and Organizational Psychology (1-3, 1-3) Readings in industrial and organizational psychology. Available only by preregistration with supervising faculty member. May be repeated. Maximum 6 hrs. S/NC or letter grade.

531 Management of Technology-Based Organizations (3) Role of technology and innovation in formulation and implementation of strategy, Management of research and development function and coordination with other functions. Management of scientists and engineers.

541 Operations Management (3) Techniques applicable to design of systems in operations function.
Management Science

(College of Business Administration and Intercollegiate Program)

MAJORS

Management Science ........................... M.S., Ph.D.
Business Administration ........................ MBA

Kenneth C. Gilbert, Chair

Professor: J. K. Ho, Ph.D. Stanford.

Associate Professor: K.C. Gilbert, Ph.D. Tennessee.

Assistant Professor: D. R. Fox, Ph.D. Purdue University.

Master’s Committee:

Doctoral Committee:
J. Bradley, Mathematics; D. R. Fox, Management Science; K. C. Gilbert, Management; E. Glustoff, Economics; J. K. Ho, Management Science; M. G. Leitnaker, Statistics; B. Ralston, Geography; R. E. Shieries, Finance; W. Sullivan, Industrial Engineering; G. Thomason, Computer Science.

THE MASTER’S PROGRAM

The M.S. program in Management Science is an intercollegiate program and is designed as preparation for a career in the application of quantitative techniques to complex decision making. In addition to the theoretical development of quantitative techniques and their application to managerial decision making, the program requires concentrated study in a supporting area. Supporting areas are available in other departments of the College of Business Administration (excluding statistics) as well as in computer science, public administration, ecology, and other areas, subject to approval by the Management Science Committee.

Admissions Requirements

The M.S. program requires three Graduate School Rating Forms and the GRE or GMAT. Applications are encouraged from all majors, but mathematics background equivalent of the completion of at least two years of college calculus and proficiency in a computer language is required. The program is designed to be completed in three semesters by full-time students. However, students may start the program in any semester and may pursue an M.S. degree in Management Science on a part-time basis.

Course Requirements

Hours
Core Requirements ............................... 14
Management Science 531, 532, 533, 534 .......................... 534
Statistics 563 ....................................... 9
Applied specialization area .......................... 9
(approved by advisor) or
Statistics elective—500 level or above (approved by advisor) .......................... 6
Mathematics—400 level or above (approved by advisor)
Electives selected from mathematics, statistics, computer science, and/or management science area ................................................... 9

Total ............................... 38

A thesis option is available to qualified students which substitutes 6 hours of thesis credit for the following 8 hours of course work:
Management Science 534, 3 hours in the applied concentration area and 3 hours of electives in any area. The Management Science Committee will work closely with the student in tailoring a program to his/her needs. The committee must approve a tentative overall program during the student’s first semester and must approve all courses on a semester-by-semester basis.

Recognizing the diverse backgrounds and needs of Management Science M.S. students, the Management Science Committee is prepared to waive some of the above requirements on an individual basis. For example, an undergraduate mathematics major with a strong background may be allowed to take 6 additional hours of electives in place of the mathematics requirements. On the other hand, a student lacking experience in rigorous senior-level mathematics courses will be asked to take such courses to fulfill the 6-hour mathematics requirement. The total course load will remain 38 hours for all non-thesis students and 36 hours for all thesis students; however, the number of hours of electives can be reasonably expected to vary between 6 and 12 as a function of prior background.

THE DOCTORAL PROGRAM

The Ph.D. program in Management Science under the College of Business Administration is designed to prepare students for research related to the application of mathematical tools to complex decision making. Three primary objectives of the program are:
1. to provide, through management science coursework, a thorough knowledge of common Management Science/Operations Research mathematical models and their uses;
2. to provide sufficient advanced study in a supporting area to qualify the graduate for a joint faculty position in the supporting area and management science. The candidate may choose from the business functional areas (accounting, finance, marketing, management, and transportation and logistics) or other disciplines, (e.g., computer science, forestry, ecology, and public administration);
3. to develop in the student, through coursework in mathematics, statistics and

The Management Science Program is interdisciplinary and students in other degree programs are encouraged to enroll in management science courses. Course prerequisites are designed to indicate the level at which courses are taught. Interested students whose prior course work does not match the prerequisites are encouraged to seek the instructor’s guidance and consent to enroll.

B U S I N E S S  A D M I N I S T R A T I O N  C O N C E N T R A T I O N

For complete listing of MBA program requirements, see Business Administration.

MBA Concentration

For students whose MBA concentration area is Management Science, the MBA Core is revised as follows: substitute Management Science 531 for 501, Statistics 563 for 501, and with approval of student’s advisor, substitute Statistics 564 for 501. The concentration area must include Management Science 532 and 534.

500 Thesis (1-15) P/NP only. E
501 Quantitative Analysis for Management Decisions (3) Assignment, transportation and general linear programming problems; decision theory, Markov chains and queuing. Prereq or coreq: Statistics 501. Not available for students with credit for 531.
502 Registration for Use of Facilities (3-15) Required. S/NC only. E
503 Special Topics in Management Science (3) Prereq: Management Science 532 and 534.
505 Special Topics (3) Prereq: 531, 532 and consent of instructor. May be repeated. Maximum 9 hrs.
591-92 Management Science Seminar (1,1) Subjects selected from current literature.


(MBA Concentration)

M A J O R  D E G R E E S

Business Administration............ MBA, Ph.D.
David J. Barnaby, Chair

Marketing

Professors:
D. J. Barnaby, Ph.D. Purdue; E. R. Cadotte, Ph.D. Ohio State; R. L. Jenkins, Ph.D. Ohio State; W. B. Locander, Ph.D. Illinois; R. B. Woodruff, DBA Indiana.

Associate Professors:
J. R. McMillan, Ph.D. Ohio State; R. C. Reizenstein, Ph.D. Cornell; J. O. Rentz, Ph.D. Georgia.

Assistant Professors:
D. J. Faulds, Ph.D. Iowa; S. F. Garial, Ph.D. Houston; D. W. Schumann, Ph.D. Missouri (Columbia); P. S. Speck, Ph.D. Texas Tech.

B U S I N E S S  A D M I N I S T R A T I O N  C O N C E N T R A T I O N S

For complete listing of MBA and Ph.D. program requirements, see Business Administration.

MBA Concentration

Marketing

Minimum Course Requirements for MBA Concentration: Three courses from the following: 503, 504, 505, 506, 550, 593, 599, Transportation 507, Business Administration 590.
Materials Science and Engineering / Fields of Instruction

Materials Science and Engineering

Ph.D. in Business Administration

Concentration: 12 hours from among the following courses: 601, 602, 603, 604, 605, 606.

501 Marketing Management (3) Marketing viewed as total system designed to plan, promote, and distribute goods and services to household consumers and industrial users. Demand analysis as basis for marketing decisions.

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used to satisfy degree requirements. May be repeated. S/NC only. E

503 Buyer Behavior—Analysis for Marketing (3) Consumer behavior concepts and processes developed and applied to market analysis and design, and control of marketing programs. Social psychology and demographic factors that affect consumer purchase, brand and patronage decisions. Prereq: 501.

504 Analyzing Market Opportunity for Marketing Decisions (3) Major determinants of opportunity in markets, framework for finding markets and analyzing them for opportunity, application of market opportunity analysis to marketing strategy decisions. Prereq: 501.

505 Marketing Research and Information Planning (3) Design of a rigorous marketing study from inception to implementation of results by recognizing key decision points and critically evaluating merit of research project. Prereq: 501.

506 Marketing Strategy (3) Integration of concepts and analytical skills from each component area of marketing to formulate cohesive, well-organized marketing program. Prereq: 501.

550 Market Opportunity Analysis for New Ventures (3) Concepts for understanding coverage of new venture's MOA and various information sources and procedures; identify and analyze sales opportunities in markets for new product or service. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

593 Independent Study (3) Directed research and study. Prereq: MBA Core and consent of instructor. May be repeated. Maximum 6 hrs.

599 Special Topics Seminar (3) Topics vary; nonbusiness marketing applications, macroenvironmental issues, market segmentation, international marketing, marketing strategy, marketing channels, and related issues. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

601 Doctoral Research and Dissertation (3-15) P/NP only. E

605 Research Methods II (3) Analytical approach to marketing decisions and role of quantitative methods. Models and model building in marketing: consideration of decision theory, linear programming, simulation and other mathematical representations of marketing phenomena.

606 Special Topics (3) Topics vary: marketing strategies, advanced consumer behavior, influence and persuasion theory and strategy, pricing issues, international marketing issues, and nonprofit organization marketing issues.

Transportation and Logistics


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

BUSINESS ADMINISTRATION CONCENTRATIONS

For complete listing of MBA and Ph.D. program requirements, see Business Administration.

MBA Concentration

Transportation and Logistics

Minimum Course Requirements for MBA Concentration: 501, 508, and one course from the following: 563, 504, 506, 507, 593, and 599.

Ph.D. in Business Administration

Concentration: Transportation and Logistics

Minimum Course Requirements for Ph.D. Concentration: 12 hours to include 601, 602, 603.

501 Survey of Logistics and Transportation (3) U.S. logistics and transportation: physical, economic, social, and political environment; financing, managing, maintaining, and enhancing U.S. transport infrastructure.

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used to satisfy degree requirements. May be repeated. S/NC only. E

503 Logistics and Transportation Economics and Policy (3) Economics and legal principles which shape formation and administration of logistics and transportation policy in U.S.

504 Freight Carrier Systems and Management (3) Analysis of freight carrier management's efforts to provide services demanded by consumers in logistics and transportation marketplace.

505 Operations and Logistics Management (3) (Same as Management 505.)

506 Logistics Systems Management (3) Development of strategy for management of logistics systems. Executive level integration of logistics operations with marketing, production, and other decision areas. Practical applications through case approach and simulation game.

507 International Logistics and Transportation (3) Logistics strategy in the multi-national firm: materials management, international sources and distribution, and importing/exporting. Issues: international carrier management and operations and comparative national transport systems analysis.

508 Executive-In-Residence Seminar in Logistics and Transportation Strategies (3) Case studies of logistics, import/export

Materials Science and Engineering / Fields of Instruction

CONCENTRATIONS

BUSINESS ADMINISTRATION

J. H. Foggin, DBA Indiana.

Associate Professor:

F. P. Patton, Ph.D. North Carolina.

Professors:

C. J. Langley, Jr., Ph.D. Pennsylvania State; B. S. Borie, Ph.D. Massachusetts Institute of Technology; C. R. Brooks, Ph.D. Tennessee; R. A. Buchanan, Ph.D. Vanderbilt; E. S. Clark, Ph.D. California (Berkeley); D. A. Canonico, Ph.D. Lehigh; F. Fellers, Ph.D. Akron; J. S. Lin, Ph.D. Kansas; C. D. Lundin, Ph.D. Rensselaer Polytechnic Institute; C. J. McHargue, Ph.D. Kentucky; B. F. Oliver, Ph.D. Pennsylvania State; J. P. Phillips, Ph.D. Liverpool (England); J. E. Spruill, Ph.D. Tennessee; E. E. Stansbury (Emeritus), Ph.D. Cincinnati.

Associate Professors:

W. T. Becker, Ph.D. Illinois; J. Bentley, Ph.D. University of Salford (England); D. M. Kroger, Ph.D. Vanderbilt; C. T. Liu, Ph.D. Brown University; T. T. Meek, Ph.D. Ohio State; A. J. Pedraza, Ph.D. National University (Argentina); C. L. White, Ph.D. Michigan Tech. University.

Assistant Professor:

R. S. Benson, Ph.D. Florida State.

Lecturer:

George D. Wignall, Ph.D. Sheffield (England).

Graduate programs are offered leading to the degrees of Master of Science and Doctor of Philosophy in Metallurgical Engineering or Polymer Engineering. Both the metallurgical
and polymer programs are flexible and interdisciplinary in nature. Students may be admitted from a wide range of disciplines; those including physics, chemistry, chemical engineering, mechanical engineering, electrical engineering, materials engineering, and engineering science programs. Prospective students should consult materials science and engineering program faculty concerning development of individual concentrations or special programs compatible with their backgrounds and goals.

Areas of concentration within the metallurgical engineering program include physical metallurgy; materials processing; welding metallurgy and materials joining; corrosion behavior; failure analysis; and mechanical and physical behavior of materials. Specializations in electronic and ceramic materials are available.

Areas of concentration within the polymer engineering program include rheology and polymer processing; polymer morphology; mechanical, physical and chemical behavior of polymers; and composite materials.

THE MASTER’S PROGRAM

The requirements include the satisfactory completion of:

1. A major consisting of 12 to 18 semester hours of graduate courses in metallurgical engineering, polymer engineering, or chemical engineering. The Polymer Engineering major must include Polymer Engineering 511, 512, 541, 551-2. (Substitutions may be acceptable for students with significant experience in polymer research.)

2. One or two minors or cognate work, 6 to 12 hours total in engineering, chemistry, mathematics, physics, or other related fields.


4. Active participation in graduate seminars in the department. Resident students must register for the appropriate 501 every semester offered.

THE DOCTORAL PROGRAM

Students applying for entrance into the doctoral program must display concrete evidence of ability to perform and report independent research to the satisfaction of the department. The Master’s thesis may be offered as such evidence.

Departmental requirements consist of the satisfactory completion of:

1. Graduate courses in materials science and engineering, metallurgical engineering, or polymer engineering amounting to approximately 24 semester hours, at least 8 of which must be in 600 series courses.

2. Supporting courses in related scientific and engineering fields amounting to approximately 24 semester hours, subject to approval by the student's faculty committee. These related fields will normally include chemistry, mathematics, physics, and engineering.

3. The comprehensive examination, usually given in two parts, and covering such topics as materials science and engineering, metallurgical or polymer engineering operations and processes, thermodynamics, rheology, and other related fields.

4. Active participation in graduate seminars conducted by the department. Resident students must register for the appropriate 501 every semester offered.

Materials Science and Engineering

414 Corrosion Science and Engineering (3) Mechanisms and control of corrosion and degradation processes; thermodynamics and electrochemical kinetics of corrosion reactions; electrochemical measurement techniques; applications to design. Prereq: 201 or equivalent.

502 Registration for Use of Facilities (3-15) Required. The Doctoral Committee (3-15) Required. The Doctoral Committee

505 Engineering Analysis (3) (Same as Chemical Engineering 565.)

521 Chemical Thermodynamics (3) Enthalpy and entropy of mixing; Gibbs function and chemical potential methods of measuring activity; solution theories; phase rule; heat capacity of gases, liquids and solids; calculation of phase diagrams. Prereq: Metallurgical Engineering 303 or equivalent.

541 Electron Microscopy (3) Operation of electron microscope; kinematical and dynamical diffraction theories; structure determination; analysis of lattice defects. Prereq: Metallurgy 313, 351.

551 X-Ray Diffraction (3) Symmetry of crystals, space group theory, reciprocal lattice and application to definition of structures; powder and single crystal x-ray techniques; introduction to crystal structure determination; chemical characterization of orientation; application to inorganic, metallic and polymer structures.

562 Biomaterials Analysis and Development (3) Physical-chemical limitations of current surgical implant materials and methods of improvement; resistance to corrosion and wear; deformation and damage effects of specific metal ions; development of new biomaterials and new materials processing techniques. Prereq: 317, 414 or consent of instructor.

563 Metallography (3) Modeling and analysis of finite plastic strain with application to primary and secondary forming operations; crystalline and noncrystalline materials; flow localization, instability, predictive testing. Prereq: Consent of instructor.

571 Metalworking (3) Principles and applications of metal removal processes; selection of materials, cutting and noncutting techniques; applications of new materials and processing techniques to specific problems; applications to design. Prereq: Consent of instructor.

572 Metallurgy of Deformation and Fracture (3) Analysis of effect of stress state, strain rate, environment, temperature and flaw geometry. Prereq: Materials Science and Engineering 341 or consent of instructor.

Metallurgical Engineering

411 Materials Process Design (3) Property control through composition, thermal and mechanical processing of material; selection of fabrication methods and nonferrous alloys. Prereq: Materials Science and Engineering 201 or equivalent: F

421 Fabrication (3) Principles and processes of welding, casting and powder metallurgy; solidification, segregation, heat flow, microstructure, residual stresses, thermal treatments, sintering; non-destructive testing. Prereq: 301, 302. 3 hrs or 2 hrs and 1 lab. F

422 Chemical Process Metallurgy (3) Application of chemical thermodynamics to metallic processing; Ferrous and nonferrous pyrometallurgical refining, slags in equilibrium, solidification, gas-metal processing. Prereq: 303. Sp

431 Mechanical Metallurgy I (3) Mechanical properties from tensile to 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 Paris and flaw geometry. Prereq: Materials Science and Engineering 201, and Engineering Science and Mechanics 321. F

432 Mechanical Metallurgy II (3) Brittle fracture due to metastability or mechanical properties: stress-life and strain-life fatigue analysis; residual stresses; creep and stress-rupture, finite plastic strain, ductile fracture, fatigue, fracture by fatigue and creep, fracture by step forming, fracture by fatigue, and stress-rupture, Finite Plastic Strain, Ductile Fracture, Fatigue, Fracture by Fatigue and Creep, Fatigue, Fracture by Step Forming, Fracture by Fatigue. Prereq: 431; or Mechanical Engineering 469 and Materials Science and Engineering 201 or equivalent. Sp

451 Fracture-Safe Design (3) (Same as Engineering Science and Mechanics 423.)

500 Thesis (1-15) P/NP only. E

501 Graduate Seminar (1) Prereq: Admission to graduate program. May be repeated. S/NC only. E

511 Defects in Crystals (3) Analytical and experimental analysis of defect interactions in solids. Prereq: 431 or consent of instructor.

512 Plastic Deformation (3) Geometry and mechanisms of single crystal plastic deformation; slip, twinning, and cleavage, work hardening, effect of temperature, load rate effects; effect of ordering and solid solution alloying; polycrystalline behavior in terms of single crystal deformation mechanisms; texture formation. Prereq: 301, 302 or consent of instructor.

522 Metallurgical Thermodynamics (3) Applications of chemical thermodynamics to metallurgical problems; refining, oxidation, surface treatments, alloy systems. Prereq: Materials Science and Engineering 521 or equivalent.

531-32 Welding Metallurgy (3,3) Welding processes; physical metallurgy of welding; phase transformations; heat flow; residual stresses; theories of hot cracking, cold cracking and porosity formation; applications to process utilization.

541 Diffusion in Solids (3) Phenomenology and atomic mechanisms of diffusion in solid state. Solution and applications of diffusion equations; random walk problems and mechanisms of diffusion; diffusion in dilute and concentrated alloys; Kirkendoll effect; high diffusion paths.

542 Phase Transformations (3) Thermodynamics of phase equilibrium, theory of nucleation in solids; kinetics and morphology of diffusion controlled growth; kinetics of interface controlled phase transformations; crystallography and kinetics of martensitic transformations.

551 Advanced Corrosion (3) Analyses of corrosion processes in terms of polarization measurements and Pourbaix diagram. Influence of environmental and mechanical factors contributing to pitting, crevice, fretting, wear, fatigue and stress corrosion. Prereq: Materials Science and Engineering 414 or consent of instructor.

552 Metallurgy of Deformation and Fracture (3) Analysis of effects of stress state, strain rate, environment, temperature and flaw geometry. Prereq: Prior course in mechanical behavior.

591-92 Special Topics in Metallurgical Engineering (3,3) Recent advances in metallurgical engineering. Prereq: Consent of instructor. May be repeated.

600 Doctoral Research and Dissertation (3-15) P/NP only. E

611-12 Theoretical Metallurgy (3,3) Topics in solid state physics as applied to metallurgy; introduction to quantum theory, specific heats, electron theory of solids, electrical and thermal conductivity, magnetic properties, theories of alloy formation. Prereq: Consent of instructor.

621-22 Solidification and Crystal Growth (3,3) Theories of solidification, fluid flow effects, magneto-hydrodynamics of immiscible fluids, growth stability theory, thermodynamic applications, rapid solidification theory, metastability, 622-seminar format. Prereq: Consent of instructor.

631 Advanced X-Ray Diffraction (3) Kinematical and dynamical theory; crystal structure determination; thermal motion; lattice faults, diffuse scattering. Prereq: Materials Science and Engineering 551.

641 Seminar in Recent Advances in Metallurgical Engineering (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

Polymer Engineering

494 Introduction to Polymer Science and Engineering (3) Basic course on polymers, Methods of synthesis;
molecular characterization; crystalline and glass transitions; crystallization kinetics; introduction to mechanical properties; introduction to rheology and processing. F, P, F.

495 Plastics Fabrication Operations (3) Lectures, laboratories and field trips; unit operations of plastic fabrication; plastics classification; selection criteria; processing techniques; characterization laboratory. S.

496 Polymer Processing (3) Rheological measurements; flow through tubes and slits, and effects and extrudate swell; selected application, screw extrusion, injection molding, fibers, spinning methods, structure development, properties. 500 Thesis (1-15) P/NP only. E

501 Graduate Seminar (1) Prereq. Admission to graduate program. May be repeated. S/N/C only. E

511 Mechanical Properties of Solid Polymers (3) Types of mechanical behavior; Hookean and rubber elasticity; plastic deformation; fracture; linear viscoelasticity; dynamic mechanical behavior and testing; loss tangent; experimental methods. introduction to mechanical properties of polymeric composites.

512 Polymer Solution Thermodynamics and Characterization (3) Theories of solutions, statistical thermodynamics, characterization, transport properties, interaction parameters, viscosity, light scattering, and osmotic pressure. Prereq: Undergraduate physical chemistry.

513 Physical Characterization of Polymers (3) Birefringence theory; small angle x-ray and light scattering; spherical and fibrous structures; introduction to electron microscopy.

541 Fluid Mechanics and Polymer Processing (3) Navier-Stokes equations and illustrative problems; applications in chemical engineering and polymer engineering, packed and fluidized beds, multiphase systems. Basic concepts in rheology; applications in polymer processing: screw extrusion, fiber spinning, injection molding. (Same as Chemical Engineering 541.)

542 Further Topics in Polymer Processing (3) Descriptions and analyses of selected polymer processing operations. Prereq. 541.

551-52 Laboratory Methods in Polymer Engineering (1,1) Basic experimental techniques and instrumentation associated with characterization, x-ray and light scattering, rheometry, mechanical properties of solid polymers, polymer processing operations. Coreq: 494 or consent of instructor.

571 Phase Transformations in Polymers (3) Glass transition and glassy state; annealing of polymeric glasses; crystalization of polymers; nucleation, growth and morphology; secondary nucleation theory; solution of copolymers; crystallization under stress. Prereq: 494.

591-92 Special Topics in Polymer Science and Engineering (3,3) Prereq: Materials Science and Engineering 551, computer programming.

600 Doctoral Research and Dissertation (3-15) P/NP only. E

612 Advanced X-Ray Diffraction Methods for Characterization of Macromolecules (3) Classical methods; Patterson, Fourier and Bessel functions; levels of order, defects, order-disorder transitions. Prereq: Materials Science and Engineering 551, computer programming.

621 Advanced Rheology and Viscoelastic Theory (3) Continuum mechanics, formulation of viscoelastic theories for describing deformation and flow of polymeric materials. Application to polymer processing problems. Recommended for MS candidates working in rheological areas. Prereq: 541.

622 Advanced Topics in Polymer Processing (3) Application of theories of rheological behavior and of structure development to analysis of polymer processing. Prereq: 551. 641-42 Recent Advances in Polymer Science and Engineering (3,3) Treatment of latest developments in science and technology of polymers. Prereq: Consent of instructor. May be repeated.

Mathematics (College of Liberal Arts)

MAJOR DEGREES
Mathematics ..................... M.M., M.S., Ph.D.

John S. Bradley, Head

Professors:
G. E. Albert (Emeritus), Ph.D. Wisconsin; J. S. Bradley, Ph.D. Iowa; J. H. Carruth, Ph.D. Louisiana State; C. E. Clark, Ph.D. Michigan State; R. E. Cline, Ph.D. Purdue; R. D. Javerman, Ph.D. Wisconsin; D. J. Dessart, Ph.D. Maryland; D. E. Dobbs, Ph.D. Cornell; E. D. Eaves (Emeritus), Ph.D. Texas; H. Frandsen, Ph.D. Illinois; J. A. George (Distinguished Scientist), Ph.D. Stanford; T. G. Hallam, Ph.D Missouri; D. B. Hinton, Ph.D. Tennessee; A. S. Householder (Emeritus), Ph.D. Chicago; L. S. Husch, Ph.D. Florida State; G. S. Jordan, Ph.D. Wisconsin; R. M. McConnel, Ph.D. Duke; H. T. Mathews, Ph.D. Tulane; D. D. Miller (Emeritus), Ph.D. Michigan; B. S. Raquit, Ph.D. Illinois; K. C. Reddy (UTSI), Ph.D. Indian Institute of Technology; J. R. Schaffer, Ph.D. Maryland; S. Serbin, Ph.D. Cornell; K. Soni, Ph.D. Oregon State; F. W. Stallman (Emeritus), Ph.D. Giessen (Germany); 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:
J. Alexides, Ph.D. Delaware; N. Aliakkoza, Ph.D. Brown; D. F. Anderson, Ph.D. Chicago; J. Dydak, Ph.D. Warsaw; L. J. Gross, Ph.D. Cornell; O. Karakashian, Ph.D. Harvard; K. R. Kimble (UTSI), Ph.D. Ohio State; Y. Kuo, Ph.D. Cincinnati; B. A. Kuperschmidt (UTSI), Ph.D. Massachusetts Institute of Technology; S. Lenhart, Ph.D. Kentucky; J. Rosinski, Ph.D. Wroclan (Poland); W. H. Row, Jr., Ph.D. California; H. Simpson, Ph.D. California Institute of Technology; J. Smith, Ph.D. Indiana (Berkley); R. P. Soni, Ph.D. Oregon State; K. R. Stephenson, Ph.D. Wisconsin; C. Sundberg, Ph.D. Wisconsin.

Assistant Professors:
L. Bales, Ph.D. Cornell; J. Haefner, Ph.D. Wisconsin; S. Hariharan (UTSI), Ph.D. Carnegie Mellon; S. Mulay, Ph.D. Purdue; R. Svérska, Ph.D. Johns Hopkins.

The Mathematics Department has three graduate degrees: (1) The Master of Mathematics degree, intended primarily for teachers of high school mathematics, (2) The Master of science degree, designed to prepare students for industrial employment and for teaching at the high school and junior college level, and (3) The Doctor of Philosopy degree, designed to prepare students for industrial employment and for college and university teaching and research. Contact the department office for additional information.

THE MASTER'S PROGRAM
The Master of Mathematics is intended primarily for teachers of high school mathematics.

Before admission to this program, the applicant must have either (a) certification for teaching secondary mathematics in at least one state, or (b) three years of elementary or secondary school teaching experience. Applicants must have successfully completed one year of calculus (141-42 or equivalent) and a course in matrix algebra (251 or equivalent).

The following requirements must be met:
1. Complete 30 hours of course work of which 21 must be at the 500 level. The course work must include 504, 505, 506, 507; and 6 hours in 500. At most, 6 hours may be taken outside the Department of Mathematics (selected in consultation with the advisor).
2. Pass a final examination upon completion of all course work.

In exceptional circumstances, part of admission requirement (b) might be satisfied concurrently with course work. Normally Master of Mathematics degree students will start the program by taking 504 during the summer.

The Master of Science program is designed to prepare students for industrial employment and for teaching at the high school and junior college level.

The department offers two options for this degree. The first option requires a thesis for which 6 hours must be earned along with 24 additional hours of work in acceptable courses numbered above 400. Of the additional hours, 6 may be in an area outside the department and 15 must be in courses in mathematics numbered above 500.

After one semester of graduate study, a student whose supervisory committee gives its approval may choose the non-thesis option, for which 30 hours in courses numbered above 400 are required. Of these, 21 hours (at least 15 of which must be in mathematics) must be in courses numbered above 500. Of the 30 hours, 9 in courses approved by the supervisory committee may be taken in fields other than mathematics.

For this option it is also required that a written final examination be prepared and that credit be received for a reading course (598) in which a term paper or project is required.

A student offering mathematics as a minor for the Master's degree is required to obtain at least 6 hours of resident graduate credit in courses numbered above 400 and approved by both the major department and the Department of Mathematics.

THE DOCTORAL PROGRAM
For the Ph.D. in Mathematics, the student must meet the following four requirements:
1. Satisfy either of the following: A, the standard program or B, the mathematical ecology concentration. A student intending to work in mathematical ecology may complete either but she/she is encouraged to complete the mathematical ecology concentration. A student may elect to complete both, or any combination of the other provided that the constraints of the latter option have not been violated. A student's status after electing such a transfer is determined by the complete history of his/her earlier examinations from the standard program and part 1 of the interdisciplinary mathematical ecology concentration.

A. Standard program: Pass written exam-
Students may not count passes of examinations in both 4. and 5., in both 6. and 7., nor in both 9. and 10. toward the required three subjects in mathematics; one of these exams will be permitted to take another round of exams.

Variables: Poisson processes; discrete and continuous parameter Markov chains and their applications, Kolmogorov differential equations; Brownian motion process as limit of random walks. Prereq: 323.

425 Statistics (3) Derivation of standard statistical distributions: t, F and X²; independence of sample mean and variance; basic limit theorems; point and interval estimation, Bayesian estimates; statistical hypothesis tests, Neyman-Pearson theorem; likelihood ratio and other parametric and non-parametric tests; sufficient statistics. Prereq: 323.


444 Complex Variables II (3) Applications of complex variables to steady-state temperatures, electrostatics, and fluid flow. Prereq: 443.

445-46 Advanced Calculus I, II (3,3) Theory of sequences, series, differentiation, and Riemann integration of functions of one or more variables. Prereq: 341 or consent of instructor.


451 Topics in Algebra (3) Number theory and theory of polynomial equations such as quadratic reciprocity law and Sturm separation. Prereq: 351.


455-56 Abstract Algebra I, II (3,3) Algebraic structures: groups, rings, fields, vector spaces and linear transformations. Prereq: 351 or consent of instructor.

457-58 Honors: Abstract Algebra I, II (3,3) Honors version of 455-56. Prereq: 351 or consent of instructor.

460 Geometry (3) Axiomatic and historical development of neutral, Euclidean, and hyperbolic geometry stressing proof technique and critical reasoning. Models of Non-Euclidean geometries. Term paper. Prereq: 141-42, or consent of instructor.

461 Topology (3) Topology of line and plane, separation properties, compactness, connectedness, continuous functions, homeomorphisms, continua and topological invariants. Prereq: 341 or consent of instructor.

471 Numerical Analysis (3) Computation, instabilities, and rounding, interpolation and approximation by polynomials and piecewise polynomials. Quadrature and numerical solution of initial and boundary value problems of ordinary differential equations, stiff systems. Prereq: 371 (Same as Computer Science 471.)


490 Readings in Mathematics (1-3) Open to superior students with consent of department head. Independent study with faculty guidance. Prereq: Consent of faculty mentor to supervise independent work. May be repeated. Maximum 9 hrs.

499 Seminar in Mathematics (1-3) Students must register for number of credit hours announced for particular seminar. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

500 Thesis (1-6) P/NP only. E

502 Registration for Use of Facilities (3-15) Required

527 Stochastic Modeling (3) Models in probability applied to real situations: queueing theory branching processes; Monte Carlo simulation. Prereq: 445-46 or consent of instructor.


534 Calculus of Variations (3) Necessary conditions for extremum, Euler's equation, broken extremals, Weierstrass-Erdmann conditions. Prerequisites: Calculus, linear algebra. Maximum 12 hrs.

535-36 Partial Differential Equations (3,3) First order equations, classification of equations and properties of elliptic, hyperbolic, and parabolic equations in several variables. Prerequisites: 445-46 and 231 or consent of instructor.

539 Seminar in Differential Equations (1-3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.


547-48 Applied Linear Analysis (3,3) Banach and Hilbert spaces, linear operators and spectral theory with applications to integral and differential equations, optimization, and approximation theory. Prerequisites: Calculus, linear algebra. Maximum 12 hrs.

549 Seminar in Analysis (1-3) May be repeated. Maximum 12 hrs.

550 Matrix Algebra (3) Advanced topics in matrix theory. Prerequisites: Calculus, linear algebra. Maximum 12 hrs.

555-56 Number Theory (3,3) Introduction to algebraic number theory. Prerequisites: Calculus, linear algebra. Maximum 12 hrs.

559 Seminar in Algebra (1-3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

569 Seminar in Topology (1-3) May be repeated. Maximum 12 hrs.


581-82 Mathematical Ecology (3,3) Deterministic and stochastic models of populations, communities, and ecosystems. Prerequisites: Calculus, linear algebra. Maximum 12 hrs.

583 Mathematical Evolutionary Theory (3) Population genetics and evolutionary ecology. Prerequisites: Calculus, linear algebra. Maximum 12 hrs.

584 Mathematical Systems Theory (3) Analytic approach to discrete and continuous dynamical system optimal control. Prerequisites: Calculus, linear algebra. Maximum 12 hrs.

585 Optimal Control Theory (3) Deterministic optimal control. Prerequisites: Calculus, linear algebra. Maximum 12 hrs.

589 Seminar in Mathematical Ecology (1-3) May be repeated. Maximum 12 hrs.

593 Independent Study (1-15) See page 31.

598 Graduate Reading in Mathematics (1-3) Independent study with faculty guidance. Prerequisites: Consent of instructor. May be repeated. Maximum 6 hrs.

600 Doctoral Research and Dissertation (3-15) P/NP only.


619 Seminar in Applied Mathematics (1-3) May be repeated. Maximum 12 hrs.


Mechanical and Aerospace Engineering

(College of Engineering)

MAJORS

Aerospace Engineering

M.S., Ph.D.

Mechanical Engineering

M.S., Ph.D.

Don R. Pitts, Head

A. F. W. Johnson, Associate Head

Professors:

J. F. Bailey (Emeritus), Ph.D., Lehigh, P.E.

G. W. Braun* (Emeritus), Ph.D., Gottingen

F. G. Collins*, Ph.D., California (Berkeley)

P. E.; A. J. Edmondson, Ph.D., Texas A & M,

P. E.; B. H. Goethert* (Emeritus), Ph.D., California Institute of Technology, W. H. Heiser*, Ph.D., Massachusetts Institute of Technology;


J. W. White, Ph.D., Stanford; H. J. Wilkerson, Ph.D., Tennessee, P.E.; J. M. Wu* (B.H. Goethert Professor), Ph.D., California Institute of Technology; Y. L. C. Wu*, Ph.D., California Institute of Technology; R. L. Young*, Ph.D., Northwestern, P.E.

Associate Professors:


Assistant Professors:

M. Keyhani, Ph.D., Ohio State; K. Nguyen, Ph.D., Colorado (Boulder).

*Space Institute, Tullahoma.

Graduate programs in Mechanical Engineering or Aerospace Engineering are available that lead to the Master of Science and Doctor of Philosophy with concentrations in energy conversion and utilization, propulsion, heat transfer and fluid mechanics, and thermodynamics. In addition, Mechanical Engineering offers concentrations in gasdynamics, machine design and dynamics, power generation, and stress analysis; Aerospace Engineering offers structures and stress analysis, aerodynamics and gasdynamics, flight mechanics, and aeroacoustics. Each student must satisfactorily complete a program of study that has been approved by the student's committee. Specific program requirements are given below.

THE MASTER'S PROGRAM

Entrance into the Master of Science program is available to qualified graduates of recognized undergraduate curricula in mechanical or aerospace engineering and to qualified graduates of other curricula who satisfy the necessary prerequisites. Three program options are available.

Thesis Option

The requirements of this option are that the student must satisfactorily complete a program of study that includes:

1. A minimum of 24 semester hours of course work that includes at least 12 semester hours of graduate (500-level or above) courses in mechanical and/or aerospace engineering and normally 6 semester hours of course work (400-level or above) in mathematics. No more than 3 semester hours of course work for the degree may be below the Bachelor's degree, exclusive of credit for the M.S. thesis or problems, including:

2. A minimum of 6 semester hours of thesis.

3. Participation in the departmental seminar program.

4. Submission and defense of a written thesis that demonstrates the ability to conduct and report on an independent investigation.

5. Passing a final examination on all work submitted for the degree.

Course Option

This option is restricted to those students who have had the equivalent of a thesis experience. The evaluation of the work experience and the final selection of the student's program of study are left to the student's committee. The requirements of this option are that the student must satisfactorily complete a program of study that includes:

1. A minimum of 30 semester hours of course work that includes at least 18 semester hours of graduate (500-level or above) courses in mechanical and/or aerospace engineering and normally 6 semester hours of course work (400-level or above) in mathematics. No more than 3 semester hours of course work for the degree may be below the Bachelor's degree, exclusive of credit for the M.S. thesis or problems, including:

2. A minimum of 6 semester hours in 590 Selected Engineering Problems. A written report must be presented for each problem investigated.

3. Participation in the departmental seminar program.

4. Passing a comprehensive written final examination on all course work submitted for the degree and an oral examination on all work (including problems).

THE DOCTORAL PROGRAM

Admission into the doctoral program will be granted to those applicants who have demonstrated superior achievement in their engineering backgrounds. The student must satisfactorily complete an approved program of study that includes a minimum of 72 semester hours credit beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or problems, including:

1. A minimum of 24 semester hours in doctoral dissertation.

2. A minimum of 12 semester hours in engineering and normally 6 semester hours of course work (400-level or above) in mathematics.

114 Fields of Instruction/Mechanical and Aerospace Engineering
Mechanical Engineering


418 Turbo-Machinery (3) Basic principles of turbo-machinery; systematic methods of analysis, design, performance evaluation. Prereq: Aerospace Engineering 351.

422 Environmental Noise (3) Basic principles of acoustics: measurements and control of noise in industrial and community environments. Prereq: Senior standing in engineering or consent of instructor.

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 Engineering 351.


455 Introduction to Design (3) Engineering economy, optimization, design for automation, reliability, patents and product liability; design of mechanical engineering solid mechanics system. Participation in team design effort; design report. Prereq: 363 and 465. F

456 Introduction to Thermal Design (2) Engineering economy, optimization, design for automation, reliability, resources; specification of mechanical engineering thermal-fluid system. Participation in team design effort; design report. Prereq: 332, 344. F


462 Tool Design (3) Principles underlying tool and die design; design for high volume production; work holding fixtures; comparison of material removal methods; selection of tool material; plastics production. Prereq: 36 or Industrial Engineering 404, Engineering Science and Mechanics 321.


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 resource; heat transfer topics pertinent to solar energy collection and use; design analysis of solar energy collectors and method of storage; selected applications. Prereq: 392, 344, or consent of instructor.

475 Thermal Engineering System (4) Turbomachinery, heat exchangers, combustion and system analysis and design, second law and economic analysis. Prereq: 332, 344, F.

479 Thermal Engineering Design (4) Design of complete thermal-fluid system; economic; technical and optimization aspects. Participation in team design effort, formal presentations and design report. Prereq: 456, 475. F.


484-95 Selected Topics in Mechanical Engineering (1-4,1-4) Problems and topics related to development and practice in mechanical engineering. Prereq: Consent of instructor. E

500 Thesis (1-15) P/NP only. E

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N only. E


512 Convection Heat Transfer (3) Analysis of laminar and turbulent forced convection heat transfer in internal and external flows, effects of variable surface temperature or heat flux and variable fluid properties. Prereq: 351.


514 Phase Change Heat Transfer (3) Mechanisms and modeling of nucleate, transition and film boiling processes; critical heat flux; forced convection boiling and post dry-out heat transfer; condensation processes; Prereq: 332, Engineering Science and Mechanics 321. S.

521-22 Thermodynamics I and II (3,3) Macroscopic thermodynamics, including First and Second Law analyses, availability, phase and chemical equilibrium criteria, combustion, gas mixtures, and property relations, determination of thermodynamic properties from molecular structure, spectrophotometric data, kinetic theory, statistical mechanics, quantum physics, Schroedinger equation. Prereq: 332.

533 Special Topics in Thermodynamics (3) Application of thermodynamics to topics of current interest in mechanical engineering. Prereq: Consent of instructor.


541-42 Research in Mechanical Engineering I and II (3,3) Design of experiments; data analysis; experimental investigation. Prereq: Consent of instructor.

551-52 Mechanical Engineering Design (3,3) Design of mechanical and hydraulic devices and systems. Prereq: Consent of instructor.


560 Computer Aided Mechanical Design (3) Applications of matrices and computational techniques in static and dynamic analysis and re-design of complex, three-dimensional, statically indeterminate structures. Prereq: 569 and 494 or consent of instructor.

561 Experimental Stress Analysis (3) Experimental stress analysis, photoelasticiy, strain gauges. Prereq: Consent of instructor.

567-68 Dynamics of Machinery (3,3) Kinematics and kinetics; fixed, moving and rotating co-ordinate systems; linear and angular momentum; energy methods; computational techniques derived from Lagrangian mechanics; variable mass; rigid body dynamics. Prereq: 363, 391.

569 Vibrations (3) Free and forced vibration of single and multiple degree of freedom systems linear and nonlinear. Prereq: Undergraduate vibrations course.


581 Rocket Propulsion (3) Rocket propulsion fundamentals; thermodynamics of supersonic and subsonic reacting flows; chemistry; ideal rocket performance parameters; rocket heat transfer; chemistry of propellants; liquid rocket engine systems; ground testing; introduction to solid propellant rockets. Prereq: Consent of instructor.

582 Rocket Propulsion II (3) Solid propellant rocket performance, homogeneous and heterogeneous propellant chemistry and combustion system performance, thermal decomposition and gas phase reaction models; effect of chamber pressure and additives on solid propulsion; rocket nozzle design; ideal solid rocket performance parameters; rocket heat transfer; chemistry of propellants; liquid rocket engine systems; ground testing; introduction to solid propellant rockets. Prereq: Consent of instructor.


589 Measurement Science II (3) Same as Nuclear Engineering 589, Chemical Engineering 589, Civil Engineering 589, Electrical and Computer Engineering 589, Engineering Science and Mechanics 589, and Aerospace Engineering 589.

590 Selected Engineering Problems (2-6) Enrollment limited to students in problems program. Prereq: Consent of advisor. May be repeated. S/NC only.

595 Seminar (1) All phases of mechanical engineering, reports on current research at UT. May be repeated. S/NC only.

599 Special Topics in Mechanical Engineering (1-3) Prereq: Consent of instructor. May be repeated. Maximum 8 hrs.

600 Doctoral Research and Dissertation (3-15) P/NP only. E

610 Advanced Topics in Fluid Mechanics and Heat Transfer (3) Advanced theory and application of fluid mechanics and heat transfer; natural convection, multiphase flow, high speed reacting and nonreacting flows, advanced boundary layer techniques, combustion, turbulence and various methods of analysis, heat exchanger theory and design. May be repeated. Maximum 9 hrs. Prereq: Consent of instructor.

611 Advanced Convection Heat Transfer, Fluid Mechanics and Mass Transfer (3) Stagnation point and high speed convective boundary layer flows; problems in heat transfer at high supersonic and hypersonic speeds; laminar and turbulent boundary layer heat transfer with surface melting, ablation, sublimation; effects of gas species recombination; stagnation point heat transfer, Lee's integral solution for high speed boundary layers; heat flux scaling rules; mass transfer and radiation cooling techniques. Prereq: 512 and consent of instructor.


613 Advanced Radiation Heat Transfer (3) Radiation heat transfer in absorbing, emitting and scattering media; interaction of thermal radiation with convection and convection heat transfer. Prereq: 511, 512, 513.


624 Advanced Topics in Thermodynamics (3) Comparison of macroscopic and microscopic approach; equilibrium and non-equilibrium thermodynamics; non-equilibrium thermodynamics. Pre: Consent of instructor.


**Aerospace Engineering**

422 Aerodynamics (3) Theory and design of aerodynamic bodies for specified characteristics. Potential flow theory, inviscid and viscous flows, similarity considerations. Prereq: 516, Mechanical Engineering 491. Sp

423 Viscous Flow (3) Boundary layer theory; laminar and turbulent flow, compressibility effects; numerical solution methods. Prereq: 516, Mechanical Engineering 491. Sp

424 Aeronautics (3) Propulsion, trajectories, guidance, control, and atmospheric reentry of space vehicle systems. Prereq: 362, Mechanical Engineering 332. Sp

425 Propulsion (3) Principles of propulsion devices; turbojet, ram jet and rocket engines. Prereq: 516. F

426 Introduction to Aerospace Design (2) Design process, synthesis, safety, reliability, patents, product liability, economic analysis, optimization, design standards, design studies. Individual design reports. Prereq: 351, 370, 363. Coreq: Mechanical Engineering 344. F

429 Aerospace System Design (4) Synthesis and design of complete aerospace system. Economic and technical aspects. Participation in team design effort, formal presentations and design report. Prereq: 425, 426. Sp

499 Aerospace Engineering Laboratory (3) Designing, conducting, and reporting results of experimental exercises. Test standards and specifications. Analysis of data and determination of conclusions. Prereq: 345. 3 labs. F

494-95 Selected Topics in Aerospace Science (1-4) Current problems and topics in aerospace science. Prereq: Consent of instructor.

500 Thesis (1-15) P/NP only. E

502 Registration for Use of Facilities (3-15) Required. E

503 Selected Problems in Aerospace Engineering (1-3) May be repeated. Maximum 6 hrs.

505 Seminar (1) All phases of aerospace engineering, reports on current research at UT. May be repeated. S/NC only.

509 Special Topics in Aerospace Engineering (1-3) Participation in meetings at major aerospace conferences, and discussions of aerospace topics. May be repeated. Maximum 6 hrs.

554-55 Aerospace Vehicle Stability and Control (3,3) Static and dynamic longitudinal directional and lateral stability and control. Control and stability of three- and four-dimensional flight. Prereq: Consent of instructor.


559 Measurement Science II (3) Same as Nuclear Engineering 589, Chemical Engineering 589, Civil Engineering 589, Electrical and Computer Engineering 589, Engineering Science and Mechanics 589, and Aerospace Engineering 589.

560 Doctoral Research and Dissertation (3-15) P/NP only. E

562 Hypersonic Flow (3) slender body theory; similarity rules; method of characteristics. Prereq: 422 for 522. Maximum 3 hrs.

566 Vertical or Short Take Off and Landing Aircraft (3) Flight dynamics, stability, control, rotation of wing, tilt wing, vectored lift and jet vertical take off aircraft. Prereq: Consent of instructor.

567 Aircraft and Vehicle Flutter and Vibration (3) Elastic phenomena. Stability criteria for aeroelastic systems. Prereq: Consent of instructor.


569 Measurement Science II (3) Same as Nuclear Engineering 589, Chemical Engineering 589, Civil Engineering 589, Electrical and Computer Engineering 589, Engineering Science and Mechanics 589, and Mechanical Engineering 589.

570 Selected Engineering Problems (2-6) Enrollment limited to students in problems program. Prereq: Consent of advisor.

571 Seminar (1) All phases of aerospace engineering, reports on current research at UT. May be repeated. S/NC only.

591 Special Topics in Aerospace Engineering (1-3) May be repeated. Maximum 6 hrs.

600 Doctoral Research and Dissertation (3-15) P/NP only. E


612 Advanced Radiation Heat Transfer (3) Radiation heat transfer in absorbing, emitting and scattering media; interaction of thermal radiation with convection and convection heat transfer. Prereq: 511, 512, 513.


624 Advanced Topics in Thermodynamics (3) Comparison of macroscopic and microscopic approach; equilibrium and non-equilibrium thermodynamics; non-equilibrium thermodynamics. Pre: Consent of instructor.


670 Aerodynamics (3) Theory and design of aerodynamic bodies for specified characteristics. Potential flow theory, inviscid and viscous flows, similarity considerations. Prereq: 516, Mechanical Engineering 491. Sp

671 Viscous Flow (3) Boundary layer theory; laminar and turbulent flow, compressibility effects; numerical solution methods. Prereq: 516, Mechanical Engineering 491. Sp

672 Aeronautics (3) Propulsion, trajectories, guidance, control, and atmospheric reentry of space vehicle systems. Prereq: 362, Mechanical Engineering 332. Sp

673 Propulsion (3) Principles of propulsion devices; turbojet, ram jet and rocket engines. Prereq: 516. F

674 Introduction to Aerospace Design (2) Design process, synthesis, safety, reliability, patents, product liability, economic analysis, optimization, design standards, design studies. Individual design reports. Prereq: 351, 370, 363. Coreq: Mechanical Engineering 344. F

677 Aerospace System Design (4) Synthesis and design of complete aerospace system. Economic and technical aspects. Participation in team design effort, formal presentations and design report. Prereq: 425, 426. Sp

679 Aerospace Engineering Laboratory (3) Designing, conducting, and reporting results of experimental exercises. Test standards and specifications. Analysis of data and determination of conclusions. Prereq: 345. 3 labs. F


688 Measurement Science I (3) Same as Nuclear Engineering 589, Chemical Engineering 589, Civil Engineering 589, Electrical and Computer Engineering 589, Engineering Science and Mechanics 589, and Aerospace Engineering 589.

689 Measurement Science II (3) Same as Nuclear Engineering 589, Chemical Engineering 589, Civil Engineering 589, Electrical and Computer Engineering 589, Engineering Science and Mechanics 589, and Aerospace Engineering 589.

690 Selected Engineering Problems (2-6) Enrollment limited to students in problems program. Prereq: Consent of advisor.

695 Seminar (1) All phases of aerospace engineering, reports on current research at UT. May be repeated. S/NC only.

699 Special Topics in Aerospace Engineering (1-3) May be repeated. Maximum 6 hrs.

700 Doctoral Research and Dissertation (3-15) P/NP only. E

The faculty with the College of Veterinary Medicine participates in the graduate program leading to M.S. and Ph.D. 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.

500 Thesis (1-15) P/NP only. E

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

508 Graduate Research Participation (3) Advanced research techniques while conducting individual biomedical projects. Prereq: 500 or 501. Open to all graduate students. Prereq: Consent of instructor. May be repeated with consent of instructor. Maximum 9 hrs. S/NC only. E

521 Principles of Oncology (3) Lectures, classroom discussion, case reports surveying major topics of oncology. Prereq: Biology 220-30 or consent of instructor.

522 Special Topics in Cancer (1-3) Prereq: 521 and consent of instructor. May be repeated. Maximum 9 hrs. F,Sp

531 Principles of Hematology (3) Pathophysiology of blood and blood forming systems. Lectures, class discussions and demonstrations. Prereq: Upper division histology and/or cell biology. Zoology 410 and 420.

532 Special Topics in Hematology (1-3) Prereq: 531 and consent of instructor. May be repeated. Maximum 9 hrs. F,Sp


541 Molecular Basis for Metabolic Disease (4) Metabolic disorders of humans and animals. Molecular mechanisms in inborn errors of metabolism, toxic reactions and deficiency states. Clinical and pathological correlations. Prereq: Biochemistry 410-19 or equivalent. Sp,A

542 Special Topics in Metabolic Disease (1-3) Biochemical and physiological basis of selected diseases of humans and animals. Clinical-pathological correlations. Prereq: 541 and consent of instructor. May be repeated. Maximum 9 hrs. F,Sp

543 Metabolism of Drugs (1) Drug mechanisms of action: membrane transport, enzyme reactions, ionization, stereoisomerism. For students interested in biochemical pharmacology. Prereq: Biochemistry 310. Sp

545 Clinical Genetics (3) Human genetic disorders: new developments in cytogenetics, molecular genetics, clinical diagnoses and prevention. Prereq: Biology and genetics background or consent of instructor.

600 Doctoral Research and Dissertation (3-19) P/NP only. E

611 Advanced Topics in Medical Biology (1-3) New developments in biological research applicable to clinical medicine. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. F,Sp

652 Special Topics in Pathology (1-3) Pathologic anatomy, biochemical pathology, and related areas. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. F,Sp

Metallurgical Engineering
See Materials Science and Engineering

Microbiology
(College of Liberal Arts and College of Veterinary Medicine)

MAJOR DEGREES
Microbiology..................................M.S., Ph.D.
Veterinary Medicine.........................D.V.M.

Arthur Brown, Head

Professors:
R. W. Beck, Ph.D. Wisconsin; J. M. Becker, Ph.D. Cincinnati; A. Brown, Ph.D. Chicago; T. C. Montie, Ph.D. Maryland; W. S. Riggby, Ph.D. Yale; B. T. Pouse, Ph.D. Guelph (Canada); G. S. Sayler, Ph.D. Idaho; D. C. White (Distinguished Scientist), Ph.D. Riverside; J. M. Woodward (Emeritus), Ph.D. Kansas; C. J. Wust, Ph.D. Indiana.

Associate Professors:
A. B. Bemis, Ph.D. Cornell; D. A. Brain, Ph.D., D.V.M. Michigan State.

Assistant Professors:
R. N. Moore, Ph.D. Texas (Austin); K. M. Sirotkin, Ph.D. Michigan State; G. Stacey, Ph.D. Texas (Austin).

Microbiology
The Department of Microbiology offers both the M.S. and Ph.D. Students have the option of selecting from a variety of graduate research programs. For a departmental brochure, contact the department head.

ADMISSION REQUIREMENTS
Students are expected to have completed an undergraduate program with a 3.0 or better GPA on a 4.0 system. Included in the undergraduate course credits should be: (1) a full year of general biological science, (2) one year of calculus, (3) two years of chemistry, including one year of organic, (4) one year of physics, and (5) an introductory course in microbiology. In many cases, deficiencies in requirements may be removed by taking appropriate courses during the first year of graduate study. The department also requires the general portion of the Graduate Record Examination. A satisfactory score on each part is 550 or higher with rare exceptions. Three letters of recommendation should be submitted by current or former faculty members.

Each new graduate student meets with an advisory committee chaired by the departmental Director of Graduate Studies to plan a program of study for the first one or two semesters until a research advisor is selected. All first-year students participate in a laboratory rotation program during the first semester of study. This program allows the student to adjust smoothly to the research programs of the department, to develop a background of research procedures and
concepts, and to facilitate the selection of a research professor. Usually the student selects a research professor toward the end of the laboratory rotation period. The major professor assists in the selection of and carrying out of a suitable research program and in the naming of a thesis or dissertation committee.

THE MASTER’S PROGRAM

The program leading to the M.S. is designed to provide the student with broad basic knowledge and training in biology to permit the acquisition of technical competence in the fundamentals of research, and to encourage creative and independent thinking. Two to three calendar years are usually needed for the course of study that has the following requirements: (1) 30 hours including thesis credits; (2) a 3.0 GPA in all courses taken for graduate credit after 12 hours of credit have been earned in courses graded on the A-F system; (3) a 3.0 GPA in courses taken in the department; (4) a complete course sequence in biochemistry; (5) course work in at least five of the sub-disciplines recognized by the department: microbial physiology, pathogenic bacteriology, virology, mycology, immunology, microbial genetics, microbial ecology, molecular biology, and applied microbiology; and (6) presentation of a research proposal and its oral defense.

THE DOCTORAL PROGRAM

The program leading to the Ph.D. is designed to develop the student’s ability to pursue independent and original research in microbiology and allied fields, to teach both oral and written communication of the results of research to the scientific community, and to train effective teachers. Students may enter the program after receiving either a Bachelor’s or Master’s degree. Students who enter with a Bachelor’s degree usually receive the Ph.D. after four or five years; those with the Master’s degree usually take three or four years to complete the degree. Departmental requirements are: (1) a 3.0 GPA in all courses taken for graduate credit after 12 hours of credit have been earned in courses graded on the A-F scale; (2) a 3.0 GPA in courses taken in the department; (3) satisfactory performance in at least one semester as a teaching assistant; (4) one semester of physical chemistry; (5) one course in statistics; (6) courses in at least five of the sub-disciplines listed in the Master’s program; (7) satisfactory performance in a comprehensive examination that must be passed before admission to candidacy; and (8) the presentation of a written research proposal and its oral defense.

430 Immunology (2) Principles of inflammation and immunity: immunoglobulin structure and theory of formation and diversity; complement, hypersensitivities, cell cooperation and recognitions in immune mechanism, immune factors. Prereq: Biology 220. (Same as Zoology 430.)

439 Immunology Laboratory (1) Laboratory exercises designed to accompany 430. Coreq: 430. (Same as Zoology 439.)


480 Mycology (3) Morphology, physiology, genetics, and taxonomy of yeasts and molds; pathogenesis of disease causing fungi. Prereq: 310. Coreq: 489.

489 Mycology Laboratory (1) Laboratory exercises designed to accompany 480. Coreq: 480.

500 Thesis (1-15) P/NP only. E

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

510 Microbial Physiology (3) Topics in microbial physiology and metabolism. Prereq: 410, Biochemistry 410, or consent of instructor. May be repeated. Maximum 12 hrs.

520 Pathogenesis of Infectious Disease (3) Topics in pathogenesis: microbial factors and host responses. Prereq: 420, 430, or consent of instructor. May be repeated. Maximum 12 hrs.

530 Immunology and Immunochemistry (3) Topics in molecular and genetic aspects of immune response, immunobiology, and immunopathobiology. Prereq: 420, 430, or consent of instructor. May be repeated. Maximum 12 hrs.

540 Molecular Virology (3) Topics in replication, assembly, and expression of viruses. Prereq: 440 or consent of instructor. May be repeated. Maximum 12 hrs.

550 Microbial and Molecular Genetics (3) Topics in transmission and expression of genetic information at molecular level. Prereq: 410, Biochemistry 410, or consent of instructor. May be repeated. Maximum 12 hrs.

560 Recombinant DNA (3) Plasmid and bacteriophage molecular biology applied to development of recombinant DNA techniques. Prereq: 410 or consent of instructor.

569 Recombinant DNA Laboratory (3) Practical details and procedures applicable to recombinant DNA methodology and techniques. Prereq or coreq: 560 or consent of instructor.

570 Applied and Environmental Microbiology (3) Topics in applied and environmental microbiology that treat physiology, metabolism, and genetics of microorganisms: fermentations and natural and simulated ecosystems. Prereq: 470 or consent of instructor.

590 Laboratory Problems (2-6) Laboratory methods for development and interpretation of microbiological research. Prereq: Graduate standing. May be repeated. Maximum 6 hrs. S/NC only.

591 Foreign Study (1-15) See page 31.

592 Off-Campus Study (1-15) See page 31.

593 Independent Study (1-15) See page 31.

594 Selected Topics in Microbiological Research (2-4) Literature surveys and discussions of selected topics. Prereq: Graduate standing. May be repeated. Maximum 8 hrs. S/NC only.

595 General Seminar (1) Lectures and seminars by invited speakers, faculty, and graduate students. May be repeated. Maximum 16 hrs. S/NC only. E

596 Laboratory Rotation (1) Familiarization with research areas in department through series of rotations in laboratories of individual faculty members. May be repeated. Maximum 3 hrs. S/NC only.

600 Doctoral Research and Dissertation (3-15) P/NP only. E

601 Journal Club in Microbial Physiology (1) Readings and discussions based on current literature. May be repeated. Maximum 18 hrs. S/NC only. E

602 Journal Club in Microbial Pathogenesis (1) Readings and discussions based on current literature. May be repeated. Maximum 18 hrs. S/NC only. E

603 Journal Club in Immunology (1) Readings and discussions based on current literature. May be repeated. Maximum 18 hrs. S/NC only. E

604 Journal Club in Virology (1) Readings and discussions based on current literature. May be repeated. E

605 Journal Club in Microbial Genetics (1) Readings and discussions based on current literature. May be repeated. Maximum 18 hrs. S/NC only. E

606 Current Topics in Biological Membrane Research (1) (Same as Biochemistry 606.)

610 Advanced Topics in Microbial Physiology (3) Prereq: 510 or consent of instructor. May be repeated. Maximum 12 hrs.

620 Advanced Topics in Microbial Pathogenesis (3) Prereq: 520, 530 or consent of instructor. May be repeated. Maximum 12 hrs.

630 Advanced Topics in Immunology (3) Prereq: 530 or consent of instructor. May be repeated. Maximum 12 hrs.

640 Advanced Topics in Virology (3) Prereq: 440, 540, or consent of instructor. Maximum 12 hrs.

650 Advanced Topics in Microbial and Molecular Genetics (3) Prereq: 550 or consent of instructor. May be repeated. Maximum 12 hrs.

670 Advanced Topics in Environmental Microbiology (3) Prereq: 570 or consent of instructor. May be repeated. Maximum 12 hrs.

Microbiology - Veterinary Medicine

See Veterinary Medicine for program description.

PROFESSIONAL COURSES

811-12 Microbiology UJI (5.4) Pathogenesis of bacterial, fungal and viral diseases. Study relating microbial structure, metabolism and genetics to patterns of disease and mode of action of antimicrobials, antigens and antibodies. Immunobiology, study of mechanisms of immune reaction, diagnostic immunology, and role of immune response.

817 Special Problems in Microbiology (1-8) Extramural and specially designed study for students interested in select topics in bacteriology, mycology, virology and immunology.
THE MASTER OF MUSIC PROGRAM
A minimum of 30-33 semester hours of course work is required for the Master of Music. These hours are specifically distributed according to the area of concentration. All concentrations require course work in music history/literature and music theory and allow for elective courses. Specific curricula are available from the Department of Music. The graduate recital is given in lieu of thesis by Master of Music degree students with concentrations in performance, pedagogy, and accompanying. A performance project is given in lieu of thesis by students with concentrations in choral conducting, instrumental conducting, and sacred music. A thesis is required of students in composition and theory.

THE MASTER OF ARTS PROGRAM
A minimum of 33 semester hours, including 18 hours of course work above the 500 level and 6 hours of thesis, is required for the Master of Arts. Specific curricula are available from the Department of Music. A reading knowledge of French or German must be demonstrated by applicants before being admitted to candidacy.

Music General

Music History Genre (3) Topics vary. May be repeated. Maximum 6 hrs.
420 History of Opera (3) Dramatic, vocal, and orchestral elements in opera of Italian, French, and German schools, 1600-present.
430 Symphonic Literature (3) Literature for orchestra from Baroque to present, evolution of symphony.
440 Music of North America (3) Folk and art music of U.S. and Canada from colonial times to present.
450 Composer Seminar (3) Life and works of single composer. Subjects vary.
460 Music Aesthetics (3) Nature of music and musical experience, sense perception and emotions, music, and role of artist in society. Aesthetic viewpoint of individuals and historical eras through selected writings.
490 Church Music Methods and Administration (3)
510 Music Bibliography (2) Bibliographic methodology in music.
520 Music Research (1) Principles of research methodology applied to writing of research proposal and project.

Music Jazz

410 Advanced Improvisation (3) Further development of individual skills and solving individual problems in jazz improvisation. Prereq: 210 and 220.
420 Jazz Pedagogy (1) Methods and material relating to teaching of jazz, designing and administering jazz programs, and rehearsal techniques for jazz ensembles. Prereq: Studio music and jazz major or consent of instructor.

Music Keyboard

410 Early Keyboard Literature (2) Keyboard music through baroque period. Prerequisite: for harpsichord. Prereq: Music History 210-20.
420-30 Piano Literature I, II (2, 2) From 1750 to middle 19th century; 430—Middle 19th century to present.
460-70 The Organ and Its Literature I, II (3, 3) Development of organ and organ literature from Middle Ages to present; problems of style and interpretation;
pedagogical literature and methods: organ design. Prereq or coreq: History 220 and consent of instructor.

520 Piano Literature Seminar (2) Topics vary. May be repeated. Maximum 6 hrs.

531-41 Recital Project (2,2) Preparation and accomplishment of full recital for accompanying concentrations only. 531—Vocal recital, 541—Instrumental recital. Prereq: Consent of instructor.

540-50 Advanced Piano Pedagogy I II (2,2) 540—Evaluation and study of methods and materials for teaching piano at all levels. Supervised laboratory teaching. Prereq: 440, 450, or consent of instructor. 550—Introduction and principles of Kodaly, Orff, Suzuki, Dalcroze Eurhythmics, and class piano teaching. Prereq: 440, 450 or consent of instructor.

560 Organ Literature Seminar (3) Topics vary. May be repeated. Maximum 6 hrs.

Music Theory

430-40 Counterpoint I II (3,3) 430—Study of species counterpoint in modal and tonal styles, works of Palestrina and J.S. Bach. Prereq: 220, 440—Writing of contrapuntal forms of 18th century and fugue; analysis of works from 18th through 20th centuries. Prereq: 430.

510 Musical Styles (3) Elements of design and their role in definition of musical styles. Prereq: Consent of instructor.

520 Analytical Techniques (3) Analytical techniques, contemporary approaches. Tonal and neotonal music. Prereq: Consent of instructor.

530 Music Theory Pedagogy (3) Techniques, methods, and materials involved in college-level theory programs. Prereq: Consent of instructor.

540 Computer Projects (1-3) Programming languages, design and implementation of projects in computer-managed instruction. Prereq: Consent of instructor.

550 Music Theory Seminar (1-3) Topics vary.

593 Independent Study (1-15) See page 31. Prereq: Consent of department head.

Music Voice

430 Styles in Opera Acting (2) Study and practice of styles in opera acting based on historical and national characteristics. Prereq: 230.

440 Projects in Opera Theatre (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

510 Vocal Literature Seminar (3) Topics vary. May be repeated. Maximum 6 hrs.

520 Opera Performance (2) Prereq: Consent of instructor. May be repeated. Maximum 4 hrs.

540 Opera Production (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

550-60 Advanced Vocal Pedagogy I II (2,2) 550—Study of vocal production, examination of different methods. 560—Study of teaching materials, observation of studio teaching, analysis of vocal problems in selected students, and supervised teaching.

570 Vocal Chamber Music Performance (2) Prereq: Consent of instructor.

580-85 Choral Literature I II (2,2) Choral music from middle ages to present with consideration of historical development of major choral genres.

590 Advanced Choral Conducting (3) Expansions and continued refinement of conducting technique; development of choral rehearsal skills. Prereq: Consent of instructor.

594 Project in Choral Conducting Performance (1-3) Public performance, critical document, recording project. Prereq: Consent of instructor. May be repeated.

585 Choral Conducting Seminar (3) Score reading and preparation; problems of interpretation, performance practices, and conducting techniques. Prereq: 590 or consent of instructor. May be repeated.

Music Performance

All performance courses require an audition and consent of instructor. May be repeated. Maximum 8 hrs toward M.M. degree.

403 Flute (1-4)
405 Oboe (1-4)
410 Bassoon (1-4)
415 Clarinet (1-4)
420 Saxophone (1-4)
425 Horn (1-4)
430 Trumpet (1-4)
435 Trombone (1-4)
440 Baritone (1-4)
445 Tuba (1-4)
450 Percussion (1-4)
455 Voice (1-4)
460 Violin (1-4)
465 Viola (1-4)
470 Cello (1-4)
475 String Bass (1-4)
476 Electric Bass (1-4)
479 Guitar (1-4)
483 Piano (1-4)
485 Harpsichord (1-4)
490 Organ (1-4)
494 Composition (1-3)
495 Composition with Electronic Media (1-3)
496 Composition for Media (2)
498 Improvisation (1-2) May not be used toward applied music requirement.
501 Woodwind Choir (1) May be repeated.
503 Bassoon (1-4)
505 Oboe (1-4)
510 Horn (1-4)
514 Brass Choir (1) May be repeated.
515 Clarinet (1-4)
520 Saxophone (1-4)
525 Horn (1-4)
530 Trumpet (1-4)
535 Trombone (1-4)
540 Baritone (1-4)
545 Tuba (1-4)
550 Percussion (1-4)
555 Voice (1-4)
560 Violin (1-4)
565 Viola (1-4)
570 Cello (1-4)
575 String Bass (1-4)
576 Electric Bass (1-4)
579 Guitar (1-4)
580 Piano (1-4)
585 Harpsichord (1-4)
590 Organ (1-4)
594 Composition (1-3)
595 Composition with Electronic Media (1-3)

Music Ensemble

501 Woodwind Choir (1) May be repeated.
503 Small Jazz Ensemble (1) May be repeated. Maximum 12 hrs.
504 Jazz Ensemble (1) May be repeated.
505 Studio Orchestra (1) May be repeated. Maximum 12 hrs.
506 Trombone Choir (1) May be repeated.
509 Tuba Ensemble (1) May be repeated.
510 Percussion Ensemble (1) May be repeated.
511 Baritone Choir (1) May be repeated.
512 Baritone Choir (1) May be repeated.
513 Synthesizer Ensemble (1) May be repeated.
514 Brass Choir (1) May be repeated.
515 Concert Band (1) May be repeated. Maximum 12 hrs.
520 UT Singers (1) May be repeated.
530 Chamber Singers (1) May be repeated.
532 Collegium (1) May be repeated.
534 Saxophone Choir (1) May be repeated.
540 Opera Theatre (1) May be repeated.
542 Opera Workshop (1) May be repeated.
550 Concert Band (1) May be repeated.
552 Campus Band (1) May be repeated.
554 Varsity Band (1) May be repeated.
556 Labor Band (1) May be repeated.
559 Marching Band (1) May be repeated.
570 Symphony Orchestra (1) May be repeated.
580 Concert Choir (1) May be repeated.
582 University Chorus (1) May be repeated.
583 Men’s Chorus (1) May be repeated.
589 Women’s Choral (1) May be repeated.
599 Accompanying (1) May be repeated.

Nuclear Engineering

(College of Engineering)

MAJOR

Nuclear Engineering .................. M.S., Ph.D.

Professors:
H. L. Dodds, Ph.D. Tennessee, P.E.;
An alternate program is available that involves satisfying the research component through dissertation practice problems rather than a thesis. The engineering practice option provides the student with the opportunity to perform research in two, three, or four different areas as opposed to the traditional thesis, which involves in-depth research in one area. Engineering practice problems are usually smaller in scope than a thesis and must have prior approval of a member of the faculty. The student must complete a program of study that includes the following:

1. Twenty-four semester hours of course work similar to the requirements for the usual Master of Science program (see above).

2. Sixteen hours of NE 598 Nuclear Engineering Practice. Students register for NE 598 each semester. At the end of each semester, the student makes an oral presentation of the work. Upon completion of each credit hour, the student submits a formal written report of the work.

3. Final oral examination covering graduate course work and practice school problems.

THE DOCTORAL PROGRAM

Students in the field of nuclear engineering desiring to study for the Doctor of Philosophy must have a Bachelor of Science or Master of Science from a recognized university, with a major in engineering or physics, and present at least a B average. All candidates will be required to demonstrate general competence in a comprehensive examination in the areas of engineering science, mathematics, and physics. At the same time, all candidates will be required to demonstrate special competence in nuclear design.

Specific course requirements for the Ph.D. in Nuclear Engineering include:

1. A minimum of 48 semester hours beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or Nuclear Engineering Practice.

2. A minimum of 24 semester hours in doctoral research.

3. A minimum of 30 semester hours in nuclear engineering courses numbered 500 and above (or the equivalent), with at least 9 semester hours of 600-level courses. These are exclusive of thesis or dissertation credit.

4. A minimum of 12 semester hours in mathematics, computer science, or statistics courses beyond nuclear engineering graduate requirements numbered 400 or above.

5. A minimum of 8 semester hours in courses numbered 500 or above from a department other than nuclear engineering. The choice depends on the student's overall program and should expand his/her knowledge in a given field.

6. Reading knowledge of one foreign language may be specified by the student's doctoral committee.

A graduate program leading to the Master of Science is available to graduates of recognized undergraduate curricula in engineering and physics. Each applicant will be advised as to the necessary prerequisite courses before he/she enters the program.

1. A major consisting of a minimum of 12 semester hours of graduate courses in nuclear engineering.

2. A minor of 6 semester hours in mathematics, statistics or computer science.

3. Six semester hours in either nuclear engineering or a related field.

4. A six-hour thesis that demonstrates independent research or design capabilities. The student must pass a final oral examination covering the thesis and graduate course work. A student who fails the written part of the examination may take and pass the examination the next time it is offered during the academic year. Registration for NE 600 Dissertation is not permitted until the written examination is passed. The comprehensive examination is completed with a successful oral defense of the dissertation proposal. A candidate must successfully defend, in an oral examination, all work presented for the degree—all course work and dissertation.

GRADUATE CREDIT FOR UNDERGRADUATE COURSES

400-level courses in nuclear engineering may be used for graduate credit. However, students must recognize that at least two-thirds of the minimum required hours (30) in a Master's degree program must be taken in courses numbered 500 or above.

401 Nuclear Reactor Theory (3) Thermal and fast spectrum computational methods, homogeneous and heterogeneous methods. Equations that relate thermal and neutronic variables, power distribution calculations, and reactivity control methods.

403 Nuclear Engineering Laboratory (3) Cross-section measurement, diffusion properties of neutrons, critical loading experiment, control rod calibration, statistical weight, shielding, xenon poisoning, dynamics and controls experiments. Prereq: 304 or equivalent.


406 Radiation Shielding (3) Types of radiation sources, fundamentals of gamma ray and neutron attenuation, biological effects, approximate methods of shield design, discrete ordinates, and Monte Carlo. Prereq: Physics 232.

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.)

500 Thesis (1-15) P/N only. E

502 Registration for Use of Facilities (3-15) Required for the student not continuously enrolled during the summer semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

511-12 Transport Processes in Nuclear Engineering (3.3) Rheology of neutronic and non-neutronic fluids; integral and system conservation equations for single and multi-component fluids; in-depth development of differential conservation equations for mass, energy, momentum: exact and approximate solutions of equations of motion; boundary layer analysis; numerical analysis of fluid flow and heat transfer.

521 Nuclear Systems Dynamics and Control (3) Introduction to state variable methods for system dynamics and control analysis and application of these methods to nuclear plant dynamics, simulation and control problems.

531 Nuclear Systems Reliability (3) Qualitative and quantitative techniques for assessing and improving nuclear systems reliability and safety. Fault tree analysis and associated dependent failure analysis.

541 Reactor Fuel Management (3) Topics relative to in-core fuel management. Applicable topics in reactor physics, fuel depletion, isotope inventories, reactivity control and numerical methods. Prereq: 401.


561 Plasma Diagnostics I (3) (Same as Electrical and Computer Engineering 561.)

562 Plasma Diagnostics II (3) (Same as Electrical and Computer Engineering 562.)

563 Plasma Engineering (3) Integration of plasma physics models, fusion engineering design criteria, and fusion technology into design of future plasma experiments and reactors. Particle, momentum, and energy balance equations. Simulation of various fusion reactor plasma. Prereq: 401 or consent of instructor. (Same as Electrical and Computer Engineering 563.)

564 Fusion Technology (3) Engineering problems associated with fusion reactor design; vacuum and magnetic systems, materials and irradiation; plasma heating, fueling and impurity control; review of major design studies. Prereq: 563. (Same as Electrical and Computer Engineering 564.)


572 Reactor Theory and Design (3) Analytical and numerical techniques for neutronics modeling of nuclear systems. Multigroup cross section theory for homogeneous and heterogeneous systems. Selected topics from literature. Class project: solution of nuclear design problem. Prereq: 571 or equivalent.

581 Reactor Shielding (3) Application of analytic/deterministic solutions of Boltzmann transport equation to shield design problems. Spectral harmonics, moments method, discrete ordinates, adjoint calculations, coupled analysis, and fast reactor shield design. Prereq: 401 or equivalent.

582 Monte Carlo (3) Analysis of radiation transport problems in radiation shielding by Monte Carlo method, description of MORMC code, Random sampling, evaluation of integrals, analog particle transport, techniques of variance reduction, forward and adjoint modes of analysis, importance function biasing, splitting/weight window survival biasing and contribution theory. Prereq: 581.

586 Measurement Science I (3) Principles of measurement, introduction to measuring devices. Prereq: Consent of instructor. (Same as Chemical Engineering 586, Civil Engineering 588, Electrical and Computer Engineering 588, Engineering Science and Mechanics 589, Mechanical Engineering 589 and Aerospace Engineering 588.)

589 Measurement Science II (3) Modern industrial measurement systems, advanced topics in measurement. Prereq: 586. (Same as Chemical Engineering 589, Civil Engineering 589, Electrical and Computer Engineering 589, Engineering Science and Mechanics 589, Mechanical Engineering 589, and Aerospace Engineering 589.)

597 Special Topics in Nuclear Engineering (3) Lectures and recitation on recent advances in nuclear engineering. Prereq: Consent of instructor. May be repeated with consent of department.

598 Nuclear Engineering Practice (3-9) Experience in planning and reporting on engineering problems. Prereq: Approval of department. May be repeated. Enrollment limited to alternative plan students. S/NC only.

600 Doctoral Research and Dissertation (3-15) P/NP only. E

511-12 Selected Topics in Reactor Theory (3,3) Transport theory, control rod theory, stochastic methods. Selected topics from literature. Prereq: 572.

651 Plasma Engineering II (3) Detailed modeling of plasma breakdown, start up, burn dynamics. Prereq: 564.

652 Special Topics in Fusion Engineering (3) Selected advanced topics in plasma engineering and fusion reactor engineering and technology. Prereq: 651.

653 Theory of Information Processing (3) Modern system theoretical methods for evaluating system performance from dynamic measurements. Prereq: 522 or equivalent.

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### Nursing

**(College of Nursing)**

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<th>MAJOR</th>
<th>DEGREE</th>
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<tr>
<td>Nursing</td>
<td>M.S.N.</td>
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Sylvia E. Hart, Dean

**Professors:**
- D. H. Goodfellow, Ph.D. Peabody
- M. E. Groer, Ph.D. Illinois
- S. E. Hart, Ph.D. New York
- J. N. Mozino, Ph.D. Walden

**Associate Professors:**
- M. M. Davis, Ph.D. Tennessee
- P. G. Droppleman, Ph.D. Tennessee
- M. L. Jolly, Ed.D. Kentucky
- B. M. Reid, Ph.D. Texas
- T. G. Sharp, Ed.D. Tennessee

**Assistant Professors:**
- M. M. Fenske, Ph.D. Vanderbilt
- D. Shoffner M.S.N. Tennessee
- S. M. Thomas, Ph.D. Tennessee

The College of Nursing offers the Master of Science in Nursing with concentrations in adult health nursing, parent-child nursing, mental health nursing, and primary care nursing. See college description for additional information.

**ADMISSION REQUIREMENTS**

1. Meet requirements for admission to The Graduate School.
2. Hold a Bachelor’s degree in Nursing or complete the equivalent of an upper division undergraduate major in nursing in addition to meeting all MSN degree requirements.
3. Have an undergraduate GPA of 3.0 or higher or a GPA of 3.0 for courses in the undergraduate major.
4. Complete the General Aptitude portion of the Graduate Record Examination. NOTE: A strong performance on this examination may compensate for a GPA lower than 3.0.
5. Complete Graduate Program Data Form.
6. Submit three letters of reference or Graduate School Rating Forms from individuals familiar with the applicant’s work performance or academic aptitude.

**SPECIAL REQUIREMENTS**

1. Each student must hold professional personal liability insurance.
2. Registered nurses must be licensed to practice nursing in Tennessee.
3. Each student must present proof of a physical examination and rubella immunization or sufficient titer completed within six months of registering for clinical courses.
4. Non-nurses must have completed 8 semester hours of chemistry or biology, a nutrition and microbiology course, and 12 semester hours of behavioral science courses.

**THESIS AND NON-THESIS OPTIONS**

The thesis option is available for interested students and is especially encouraged for those who are considering pursuit of doctoral degrees sometime in the future. Students who choose the non-thesis option must complete a research-oriented project while registered for 580 Nursing Project. Specific guidelines for the project are available from the student’s major advisor.

**PROGRAM REQUIREMENTS**

All students must complete a minimum of 40 semester hours distributed as follows:

<table>
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<tr>
<th>DEGREE</th>
<th>CREDITS</th>
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**Core (12 credits)**
- 503-4 Holistic Nursing I,II 8
- 510 Theoretical Foundations of Nursing 2
- 520 Nursing Resource Management 2

**Research (9-12 credits)**
- Graduate level statistics course 3
- 501 Nursing Research: Methods, Design, and Analysis 3
- 500 Thesis 6
- 580 Nursing Project 3

**Clinical Concentration (11 credits)—choose one**
- 530-31 Adult Health Nursing I,II 11
- 540-41 Family Nurse Practitioner I,II 11
- 550-51 Parent-Child Nursing I,II 11
- 560-61 Mental Health Nursing I,II 11

**Role Preparation (5 credits)—choose one**
- 562 Specialty Field Work and Seminar 5
- 563 Teaching Strategies and Practicum (Not an option for non-nurse students) 5
- 564 Nursing Management: Strategies and Practicum (Not an option for non-nurse students) 5

**Elective (3 credits)—waived for those who choose thesis option**

Students who are not nurses must complete the following undergraduate nursing courses in addition to meeting the requirements listed above:

- 301 Pharmacology 3
- 302 Introduction to Professional Nursing 9
- 304 Nursing Assessment and Health Promotion 4
- 311 Acute Care Nursing 10
- 313 Nursing Research 3
- 401 Family Health Nursing 8
- 403 Community Health Nursing 4
- 406 Nursing Leadership 3
- 411 Psychosocial Long Term Nursing 6
Registered nurses whose undergraduate degrees are not in nursing must complete 304, 305, 313, 315 Clinical Nursing Practicum, and 403. They must also complete or successfully challenge the following:

301 Pharmacology 3
312 Acute Care Nursing Theory 6
402 Family Health Nursing Theory 3
412 Psychosocial Long Term Nursing Theory 3

Students whose science backgrounds are deficient may also need to take 214 Integrated Biomedical and Health Sciences and/or 450 Physiological Principles.

FINAL EXAMINATION REQUIREMENTS
All students must successfully complete a final examination as required by The Graduate School. For thesis students, the examination will consist of an oral defense of the thesis as well as written or oral questions designed to measure student mastery of the entire program of study. For nonthesis students, the written examination will cover the entire program of study and may, at the discretion of the student’s committee, be followed by an oral examination.

SPECIAL POLICIES
1. Students must maintain a 3.0 GPA throughout the program. If the GPA for all graduate level courses is less than 3.0 after 20 credit hours are completed, the student will be required to withdraw from the program.
2. If the clinical performance of any student for any course is found to be unsatisfactory, the student will receive a grade of "F" for the course.
3. If a student achieves a final grade of 'D' or 'F' for any required undergraduate nursing course, he or she will not be permitted to repeat the course and will be required to withdraw from the program.
4. If the clinical performance of any student is characterized by unethical, unprofessional or unsafe behavior, or behavior that places the client in jeopardy, the student will be required to withdraw from the program.

REQUIREMENTS FOR SECOND MASTER'S DEGREE
1. Students must complete 40 semester hours at the graduate level with a cumulative GPA of 3.0 unless they already have Master’s or doctoral degrees. Those who already hold a Master’s or doctoral degree may apply up to 9 semester hours from that degree to meeting MSN program requirements. In order to apply these hours to the MSN degree, the following criteria must be met:
   a. The courses utilized must be relevant to the MSN.
   b. The credits must have been earned within the time limits established for the MSN.
   c. The utilization of these courses must be approved by the student’s committee, by the Dean of the College, and by the Dean of The Graduate School.
2. Regardless of the specific courses transferred in order to reduce degree requirements, the following distribution of required nursing courses must be completed:
   Core 12
   Clinical Concentration 11
   Role Preparation 5
   Research 3

500 Thesis (1-15) F/P only E
501 Nursing Research: Methods, Design, and Analysis (3) Methods, data analysis, and their interrelationships in planning, implementation, and evaluation of nursing and health-related research. Investigation of computer applications to data analysis, Prereq: 313. Prereq or coreq: Graduate level statistics course. F
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. SYNC only. E
503 Holistic Nursing I (3) Examination of philosophy of holistic nursing and new paradigms for nursing assessment, diagnosis, and intervention. Exploration and application of principles of health promotion, education, and innovative strategies for achievement of wellness. Prereq: BSN degree, MSN student, or consent of instructor. F,Sp
504 Holistic Nursing II (3) Continuation of 503. Holistic nursing modalities utilized to provide nursing care to clients, families, and community groups. Clinical practice experience with clients experiencing deviations from wellness. Prereq: 503, 4 hrs and 1 lab. F,Sp
505 Advanced Pharmacology (3) Pharmacological agents utilized to treat common, recurrent health problems; indications, contraindications, side and interactive effects of commonly prescribed drugs. Prereq: 501 or equivalent or consent of instructor. F
509 Graduate Seminar in Public Health I (Same as Public Health 509, Social Work 509, Physical Education 509, Nutrition and Food Sciences 509.)
510 Theoretical Foundations of Nursing (2) Historical evolution of nursing science; examination and critical analysis of nursing's metaparadigm and selected conceptual models, philosophies, and theories; contemporary ethical theories and application to nursing practice dilemmas. Prereq: MSN student or consent of instructor. F,Sp
520 Nursing Resource Management (2) Selected organizational, conflict-management, decision-making, leadership, professional, technological, and other theories, principles, and concepts to advanced clinical nursing practice. Prereq or coreq: 504. F,Sp
530 Adult Health Nursing I (6) Exploration and application of advanced nursing, physiological, developmental, and psychosocial theories to nursing care and management of clients and their families who are experiencing episodes of acute and chronic illnesses and related crises; role of clinical nurse specialist in helping clients and families achieve optimal health. Prereq: 501, 504, 510. 2 hrs and 4 labs. F
531 Adult Health Nursing II (5) Continuation of 530. Role of clinical specialist in providing and managing nursing care for acutely and chronically ill adults across life span; analysis and utilization of nursing and health-related research in practice settings. Prereq: 530. 2 hrs and 3 labs. Sp
541 Family Nurse Practitioner II (5) Continuation of 540. Management of chronic health problems; clinical experiences in variety of settings. Prereq: 540. 2 hrs and 3 labs. Sp
550 Parent Child Nursing I (6) Exploration and application of selected advanced nursing, physiological, psychological, developmental, and other theories, principles, and concepts to child-bearing or child-rearing families in acute care or community settings; family health promotion and interventions designed to recognize and respond to threats to health of mothers and children. Prereq: 501, 504, 510. 2 hrs and 4 labs. F
560 Mental Health Nursing (6) Exploration and application of selected advanced theories of therapeutic intervention to clients experiencing mental health problems. Options for clinical practice with clients of various age groups in acute care or community facilities. Prereq: 501, 504, 510. 2 hrs and 4 labs. F
561 Mental Health Nursing II (5) Continuation of 560. Families and groups with mental health problems. Prereq: 560. 2 hrs and 3 labs. Sp
562 Specialty Field Work and Seminar (5) Seminar suitable for a clinical or practicum designed to facilitate further development of specialized knowledge and skills utilized for advanced clinical practice; required for all students who select role preparation in advanced clinical practice. Prereq: 530, 540, 550, or 560. Prereq or coreq: 531, 541, 551, or 561. 1 hr and 4 labs. Sp
563 Teaching Strategies and Practicum (5) Exploration, analysis, and application of selected educational, curriculum, teaching-learning, measurement, and evaluation principles and theories to instruction of undergraduate nursing students; teaching practicum in collegiate nursing classes. Prereq or coreq: 531, 541, 551, or 561. 3 hrs and 2 labs. Sp
564 Nursing Management: Strategies and Practicum (5) Exploration, analysis, and application of selected advanced management, supervisory, organizational, leadership, and other theories and concepts to administration of nursing services; management practicum in nursing service facility. Prereq or coreq: 531, 541, 551, 561. 3 hrs and 2 labs. Sp
577 Special Topics (3) Topic is determined by faculty and student interest. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. F,Sp
580 Nursing Project (Research) (3) Research-oriented, student-initiated endeavor that culminates in scholarly paper or project. Project plan, project proposal, project for all students who select role preparation in advanced practice as the thesis option. Prereq: 501, 504, 510. 2 hrs and 4 labs. F,Sp
593 Independent Study (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. F,Sp

Nutrition and Food Sciences
(Fields of Instruction 123)

Nutrition and Food Sciences/Fields of Instruction 123

MAJORS

DEGREES

Food Science ........................................... M.S.
Nutrition .............................................. M.S.
Food Science Laboratory .................................. M.S.
Human Ecology ........................................ Ph.D.

Betty Ruth Carruth, Head

Professors:
R. E. Beauchene, Ph.D. Kansas State;
B. R. Carruth, Ph.D. Missouri; H. W. Quinton;
E. D. Duke, J. T. Smith, Ph.D. Missouri;
M. A. Smith (Memphis), Ph.D. Tennessee.

Associate Professors:
W. C. Morris, Ph.D. Iowa; D. S. Sachan, Ph.D.
Completion of undergraduate courses that
grams in the department is dependent on
program, a student may choose a concentra-
tions in nutrition science or public health
nutrition.

ADMISSION REQUIREMENTS

Admission into any of the graduate pro-
gress is dependent on completion of under-
graduate courses that give the necessary

THE MASTER'S PROGRAM

Nutrition

In Nutrition, students may choose a thesis
thesis or non-thesis option. Food Science
Science and Food Systems Administration

Thesis Option: The program consists of a
thesis or non-thesis option. Food Science

The nutrition science concentration

Nutrition students who choose
thesis or non-thesis option. Food Science

Non-Thesis Option: The program consists
thesis or non-thesis option. Food Science

THE PH.D. CONCENTRATION

Students enrolled in the food science con-

Food Science

In Food Science, students may choose a
thesis or non-thesis option. Food Science

THEPh.D. CONCENTRATION

Students enrolled in the food science con-

Food Systems Administration

In Food Systems Administration, students
thesis or non-thesis option. Food Science

ADMISSION REQUIREMENTS

Admission into any of the graduate pro-
gress is dependent on completion of under-
graduate courses that give the necessary

THE MASTER'S PROGRAM

Nutrition

In Nutrition, students may choose a thesis
thesis or non-thesis option. Food Science

Thesis Option: The program consists of a
thesis or non-thesis option. Food Science

Non-Thesis Option: The program consists
thesis or non-thesis option. Food Science
513 Community Nutrition (3) Orientation to community assessment, needs, educational programs, functional roles of public health nutritionist. Concurrent field experiences. Prereq: 313 or consent of instructor. F

514 Community Nutrition (3) Planning, implementation, and evaluation of public health nutrition programs. Concurrent field experiences. Prereq: 513 or consent of instructor. Sp

515 Field Study in Community Nutrition (1-12) Personal participation in and analysis of state or regional community nutrition program. Location of in-depth study to be selected in consultation with instructor. Prereq: 514 and consent of instructor. Su, A

516 Maternal and Child Nutrition (3) Nutrition principles related to growth and development during pregnancy, infancy, and childhood to age 6, high risk conditions. Prereq: 313 or consent of instructor. F

517 Childhood and Adolescent Nutrition (3) Application of nutrition principles to school age children; effects of diseases on growth and health maintenance; nutritional assessment and counseling for nutrition. Prereq: 313 or consent of instructor. Sp

518 Nutrition and Aging (3) Nutritional problems of adults; nutritional requirements, dietary intakes; affects of nutrition on biological aging. Prereq: 313 or consent of instructor. Su

519 International Nutrition (3) World food supply, demographic, sociocultural, economic, and technological factors related to food and nutrition; international intervention and assistance programs. Prereq: Consent of instructor. F, A

520 Nutritional Ecology (2) Examination of issues in natural, political, physical, and social environments that impact availability of food and nutrients in U.S. food supply. F, A

521 Physiological Basis for Diet and Disease (2) Altered nutrient needs as result of metabolic changes that occur in selected disease states. Prereq: 411 or consent of instructor. F

522 Nutrition Counseling (2) Individual eating habits and disorders, evaluation strategies for effectiveness of helping process. Prereq: 313 or consent of instructor. F, A

523 Nutrition and Behavior (2) Influence of nutrients on intracerebral metabolic processes, electrophysiologlcal indicators of brain function and behavior of individuals: sensory, motor, intellectual, and personality aspects. Prereq: Consent of instructor. Su

524 Nutrition Education: Principles, Implementation, and Evaluation (3) Conceptual models, principles, application, and evaluation models in nutrition education research. Prereq: 508 or consent of instructor. Su, A

525 Nutritional Retardation or Other Developmental Disorders of Childhood (3) Multidisciplinary core course required of all full-time students in training at Child Development Center, UT, Memphis. Supervised project in related area. Prereq: Consent of department head. E

527 Nutrition in Mental Retardation and Developmental Disorders (3-9) Interdisciplinary diagnosis and treatment of developmentally-handicapped child; role of nutritionist; clinical experiences and lectures at Child Development Center, UT, Memphis. Prereq: Consent of department head. E

529 Management in Nutritional Care (2) Administrative roles and management functions of dietitians in clinical settings: program development, planning, and evaluation. Prereq: 220, 422, or consent of instructor. Su

530 Computer-Assisted Foodservice Systems Management (3) Application of computer technology to foodservice systems: administration, inventory, food cost accounting, production, and nutrient analysis. Prereq: 320 or consent of instructor. Su, A

531 Financial and Marketing Administration in Foodservice (3) Marketing and financial techniques used in foodservice operation, developing foodservice marketing plan, budgeting, foodservice accounting and information services. Prereq: 326 or consent of instructor. Sp

532 Human Resource Management in Foodservice (3) Identifying labor needs; development and maintenance of work force. Prereq: 422 or consent of instructor. F

533 Advanced Food Production and Delivery System Management (3) Analysis of production and delivery systems: application of quantitative methods and models to optimize decisions. Prereq: 320 or consent of instructor. F

534 Special Topics in Foodservice Systems Administration (1-3) Lecture/discussion format. Contemporary developments and trends in industry. Prereq: Consent of instructor. May be repeated. E

535 Directed Study in Foodservice Systems Administration (1-3) Problems selected for study by student with guidance of faculty member. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

536 Seminar in Foodservice Systems Administration (1) May be repeated. S/NC only. Sp

540 Seminar in Nutrition and Food Sciences (1) May be repeated. S/NC only. F

541 Research Methods (1) Basic principles of planning, conducting, and interpreting nutrition, food sciences, and foodservice systems administration research. Prereq: 6 graduate hours in nutrition and food sciences and statistics. Sp

542 Advanced Experimental Nutrition (2) Application of research principles to individual project using experimental animals. Prereq or coreq: 541. Sp

543 Human Metabolic Research Methods (2) Application of research principles to conducting and interpreting metabolic study. Prereq or coreq: 541. Sp

544 Food and Nutrition Survey (2) Project for assessment of food consumption, nutrient intake, nutritional status, and sociocultural economic parameters in populations. Prereq or coreq: 541. Sp

545 Advanced Experimental Food Science (2) Application of research principles to individual food science study. Prereq or coreq: 541. 2 labs. Sp

546 Foodservice Systems Administration Research Methods (2) Application of research methods to development of proposal for individual foodservice industry-related research project to be completed in 548. Prereq or coreq: 541. Sp

547 Field Experience (3-9) Experience in food-related industry or agency under supervision of faculty member. Prereq: Consent of instructor. S/NC only. E

548 Directed Study in Nutrition and Food Sciences (3-12) Advanced study in nutrition and food sciences. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

549 Special Topics (1-3) Recent advances in nutrition, food science, food systems administration and hospital industry; implications for professionals. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

600 Doctoral Research and Dissertation (3-15) P/NP only. E

601 Advanced Topics in Food Science (1-3) Comprehensive individual study and group discussion of topics related to current problems in food science. Prereq: 503 or 604, consent of instructor. May be repeated. F

602 Advanced Topics in Nutrition Science (1-3) Comprehensive individual study and group discussion of topics related to current problems in nutrition. Prereq: 512 or consent of instructor. May be repeated. F

603 Current Trends in Food and Sociocultural Change (2) Critical evaluation of research. Prereq: 508, 541, 544, graduate-level statistics. Su, A

Ornamental Horticulture and Landscape Design/Fields of Instruction

MAJOR

Ornamental Horticulture and Landscape Design

DEGREE

M.S.

G.Douglas Crater, Head

Professors:
L. M. Callahan, Ph.D. Rutgers; G. D. Crater, Ph.D. Ohio State; E. T. Graham, Ph.D. Pennsylvania State; G. L. McDaniel, Ph.D. Iowa State; H. v.d. Werken, GAUST.

Horticulture College, Frederiksdorp, (Holland); D. B. Williams, Ph.D. Pennsylvania State.

Associate Professor:
J. W. Day, Ph.D. Mississippi State.

Assistant Professors:
S. M. Rogers, M.A. Georgia; R. Trigiano, Ph.D. North Carolina State.

The Department of Ornamental Horticulture and Landscape Design offers the Master of Science with concentrations in floricultural science and technology, nursery science and technology, or turfgrass science and technology. Various science and technology interests such as micropropagation, innovative ornamental plant production systems, and computer aided maintenance and production management systems can be emphasized in any of the areas of concentration by judicious selection of courses and research objectives for the thesis.

For admission, the student must have a B.S. in ornamental horticulture, horticulture, plant science, or a closely related agricultural or basic science discipline and must have the undergraduate transcript evaluated by the department for prerequisite requirements. If any of the research assistantships are available on a competitive basis. For further information, contact the department head.

THE MASTER'S PROGRAM

Thesis Option

1. A thesis is required. A Master's committee of no fewer than 3 faculty members will be selected. Prior to research for the thesis, a proposal must be approved by the Master's committee. Registration for a minimum of 6 hours of Thesis 500 is required.

2. In addition to the thesis requirement, a minimum of 24 hours of graduate credit is required. Not more than 10 hours of the minimum 30 hours can be below the 600 level. The academic program must be approved by the Master's committee which may require additional course work if the student's progress or background indicates such need.

3. All students are required to include 2 hours of 590 Seminar in their program and are expected to attend this course and par-
ticipate in discussions each semester enrolled.

3. All students are required to include 2 hours of 590 Seminar in their program and are expected to attend this course and participate in discussions each semester enrolled.

4. Twelve hours of course work in the department must be at the 500 level or above exclusive of Thesis 500.

5. Final comprehensive written and oral examinations shall be taken upon completion of no fewer than 32 hours of approved graduate work.

410 Nursery Management and Production (3) Modern management methods as applied to retail and wholesale nurseries and landscape contracting firms. Methods of producing liners, container and field-grown woody ornamental plants. Prereq: 220, 330, and Plant and Soil Science 219, or consent of instructor. 2 hrs and 1 lab. Sp

440 Advanced Turfgrass Management (4) Principles and scientific basis of turfgrass culture: adaptation, ecology, physiology, soil fertility, and grass nutrition; climatic influences on grass culture; physiology of clipping and water management; design, construction, and management of golf courses; and physiological influences of pest insect and control measures. Prereq: 340 or consent of instructor. 3 hrs and 1 lab. Sp

460 Professional Practices in Landscape Construction and Management (2) Professionalism, salesmanship, proposals, bidding, estimating, specification, and contract management in landscape services industry. Interaction with industry representatives through special presentations. Prereq: 350 or consent of instructor. F

480 Advanced Landscape Design (4) Comprehensive application of landscape design skills. Design applied landscape composition; site planning; landscape grading; applied landscape construction, planting design, analysis, programming, design, detailing, estimating, and specifying applicable to variety of landscape projects. Prereq: 280, 350, and 380, or consent of instructor. 1 hr and 2-3 hrs. Sp

500 Thesis (1-15) P/NC only. E

501 Special Topics in Ornamental Horticulture and Landscape Design (1-3) Topics to be assigned. May be repeated. Maximum 6 hrs. Prereq: Consent of instructor. E

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Maximum 6 hrs. E

503 Comparative Pathology (3) Pathogenic mechanisms. Comparative aspects of protozoan, fungal, bacterial, viral and ultrastructural lesions. Prereq: Histology, 2 hrs and 1 lab. F,A

600 Doctoral Research and Dissertation (3-15) P/NC only. E

601 Advanced Topics in Pathobiology (1-3) Necropsy, histopathology, clinical pathology, clinical parasitology, clinical immunology, clinical bacteriology and mycology, and clinical virology. May be repeated. Maximum 12 hrs. E

602 Veterinary Biopsy (1-2) Examination of biopsy specimens and interpretation of observations. Preparation of specimens for sectioning. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

603 Correlative Post-Mortem Pathology (1-3) Gross and microscopic post-mortem examination of animals. Correlative interpretation of clinical diseases and lesions. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

604 Veterinary Pathology Seminar (1) Microscopic slides and transparencies of lesions from cases examined by pathologists, residents, and graduate students. Interpretation of observations. Prereq: Consent of instructor. May be repeated. Maximum 4 hrs. E

605 Pathology Seminar (1) Subjects of current interest in veterinary medicine and related sciences. Current topics. Prereq: Consent of instructor. May be repeated. Maximum 4 hrs. Class meets once monthly. E

606 Ultrastructural Pathology (1) Ultrastructural changes in diseased cells, interpretation of observations. Prereq: Professional medical degree or consent of instructor. Sp,A

607 Diagnosis and Pathogenesis of Virus Diseases of Domestic Animals (3) Advanced study of virus diseases important to domestic animals: virus biology, pathogenesis, pathology and diagnosis. Technical training in virus diseases diagnosis. Prereq: Cellular and Comparative Biochemistry, and Advanced Topics in Virobiology. Virology and Virology Lab, or Microbiology-Veterinary Medicine 811-912. 2 hrs and 1 lab. Sp,A

608 Techniques in Pathology (2) Fixation, processing and staining of tissue specimens; specialized gross dissection techniques; photography of gross specimens and photomicrography. Prereq: Consent of instructor.

609 Principles of Pathology (1) Advanced topics in pathology and mechanisms of disease: pathophysiology in cellular degeneration, inflammation, immunopathology, hemostasis. Prerequisite: Biochemical and morphologic responses of various cells, tissues, and organs to injury and other metabolic derange-
**Philosophy**  
(College of Liberal Arts)

**MAJOR**  
 philosophy .................................................. M.A., Ph.D.

**Associate Professors:**  

**Assistant Professors:**  
H. P. Hamlin, Ph.D. Georgia; E. R. Jones, Ph.D. Chicago; M. Lavin, Ph.D. Stanford.

The Department of Philosophy offers graduate study leading to the Master of Arts and Doctor of Philosophy. The M.A. program includes thesis and non-thesis options and offers concentrations in medical ethics and in religious studies. The Ph.D. program also has a concentration in medical ethics. Detailed information may be obtained from the Director of Graduate Studies in Philosophy.

**THE MASTER'S PROGRAM**

The department offers both a thesis and a non-thesis option. The course requirements for an M.A. with thesis are 30 hours, including a maximum of 6 hours in Philosophy 500. Of non-thesis hours, at least two-thirds must be in courses at or above the 500 level. No philosophy course numbered under 400 may be taken for graduate credit. There are no particular courses that M.A. students are required to take. The nature of the student's course work should be determined in consultation with the student's faculty committee. The non-thesis M.A. requires 30 hours of course work of which at least two-thirds must be in courses at or above the 500 level. Students seeking the non-thesis option must also pass a final written examination on all work offered for the degree. An additional oral examination may be required.

**THE DOCTORAL PROGRAM**

Specific requirements for doctoral students in Philosophy include a minimum of three academic years of graduate study involving at least 48 semester hours in course work (normally 16 semester courses or their equivalent, exclusive of credit for thesis and dissertation) of which no fewer than 30 hours shall be in courses numbered over 500 and no fewer than 6 hours shall be in courses numbered over 600. The specific number and distribution of courses will be determined by the student's faculty committee.

Doctoral students must demonstrate competency in one foreign language, normally French or German. This may be done by passing the doctoral language examination administered by the Romance Language or German Departments, or by passing French 302 or German 332 with a B or better. In special circumstances and upon petition by the student, the department's graduate committee may approve a substitute language for French or German.

### SPECIAL CONCENTRATIONS

#### Medical Ethics

The department has an M.A. and Ph.D. program of graduate study with a concentration in medical ethics. Detailed information concerning the program can be obtained from either the Director of Graduate Studies in Philosophy or the Director of the Medical Ethics Program.

#### Religious Studies

The department has an M.A. program of graduate study with a concentration in religious studies. Details concerning the program may be obtained from either the Director of Graduate Studies in Philosophy or the Department of Religious Studies.

#### Philosophy/Fields of Instruction 127

**400 Special Topics (3)** May be repeated when topic varies. Maximum 6 hrs.

**411 Modern Religious Philosophies (3)** (Same as Religious Studies 411.)

**412 Classical Indian Systems of Philosophy: The Moksha Tradition (3)** (Same as Religious Studies 412.)

**420 Topics in History of Philosophy (3)** Figures or movements in philosophical thought in various periods or eras. Prereq: 6 hrs of philosophy or consent of instructor. May be repeated when topic varies. Maximum 9 hrs.

**425 American Philosophy (3)** Colonial to early 20th Century. Prereq: 6 hrs of philosophy or consent of instructor.

**430 Topics in Logic (3)** Prereq: 6 hrs of logic or consent of instructor. May be repeated when topic varies. Maximum 6 hrs.

**440 Contemporary Ethical Theory (3)** Topics in metaethics or ethics. Prereq: 6 hrs of philosophy or consent of instructor.

**446 Theoretical Issues in Medical Ethics (3)** (Same as Religious Studies 446.)

**460 Philosophy of Science (3)** Methodological and conceptual issues in natural and social sciences: patterns of theory modification and replacement, nature of explanation and causation, status of theoretical entities. Prereq: 380 and 1 yr of natural or social science, or consent of instructor.

**465 Philosophy of History (3)** Speculative and critical aspects of philosophy of history. Prereq: 6 hrs of philosophy or consent of instructor.

**473 Philosophy of Mind (3)** Problems of mind and body in relation to consciousness and personal identity. Prereq: 6 hrs of philosophy or consent of instructor.

**475 Analytic Metaphysics and Epistemology (3)** Topics in metaphysics and epistemology in recent Anglo-American tradition. Prereq: 6 hrs of philosophy or consent of instructor.

**476 Philosophy of Language (3)** Survey of issues such as meaning, reference, and truth. Prereq: 6 hrs of philosophy or consent of instructor.

**479 Studies in Recent Continental Philosophy (3)** Selected thinkers or topics: existentialism, phenomenology, hermeneutics, structuralism, poststructuralism. Prereq: 6 hrs of philosophy or consent of instructor. May be repeated when topic varies. Maximum 6 hrs.

**500 Thesis (1-15)** P/NP only. E

**503 Registration for Use of Facilities (3-15)** Required of the student not otherwise registered during any semester when the student uses University facilities and/or of faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

**520 Topics in the History of Ancient and Medieval Philosophy (3)** Intensive critical work on major philosopher or school. May be repeated. Maximum 9 hrs.

**522 Topics in the History of Modern Philosophy (3)** Intensive critical work on major philosopher or school. May be repeated. Maximum 9 hrs.

**524 Topics in the History of Twentieth-Century European Philosophy (3)** Intensive critical work on major philosopher or school. May be repeated. Maximum 9 hrs.

**527 Topics in the History of American Philosophy (3)** Intensive critical work on major philosopher or school. May be repeated. Maximum 9 hrs.

**530 Topics in Logic and Philosophy of Mathematics (3)** May be repeated. Maximum 9 hrs.

**540 Topics in Value Theory (3)** May be repeated. Maximum 9 hrs.

**542 Ethics (3)** Dominant movements in history of ethics. May be repeated. Maximum 9 hrs.

**544 Applied Ethical Theory (3)** Single author, tradition, or topic in ethical theory, application to issues in health, business, technology, ecology, and other practical fields. May be repeated. Maximum 9 hrs. (Same as Religious Studies 544.)

**545 Orientation to Medical Ethics (3)** Survey of ethical theories in application to issues in medical ethics. Prereq: Consent of Medical Ethics Committee.

**547 Clinical Medical Ethics (2)** Medical terminology, history of medical ethics, case study discussion, clinical observation. Open only to students concentrating in medical ethics. May be repeated. Maximum 4 hrs.

**548 Clinical Residency in Medical Ethics (3-9)** Open only to students concentrating in medical ethics. Prereq: Consent of Medical Ethics Committee.

**553 Philosophical Topics in Literature and the Arts (3)** Aesthetics, criticism, art and society. May be repeated. Maximum 9 hrs.

**560 Philosophy of Natural Sciences (3)** Nature of subject matter and method of science. May be repeated. Maximum 9 hrs.

**562 Philosophy of Social Sciences (3)** Nature of subject matter and method of science. May be repeated. Maximum 9 hrs.

**570 Philosophy of Religion (3)** Examination of central problems. (Same as Religious Studies 570.)

**575 Topics in Metaphysics and Epistemology (3)** May be repeated. Maximum 9 hrs.

**577 Philosophy of Mind (3)** Relation of mental to physical and of role of words in discourse for mental activities, thinking and feeling. May be repeated. Maximum 9 hrs.

**590 Social and Political Philosophy (3)** Philosophical problems concerning social and political life: family, state, freedom, justice; major theoretical responses to anarchism, social contract, Marxism. May be repeated. Maximum 9 hrs.

**591 Foreign Study (1-15)** See page 31.

**592 Off-Campus Study (1-15)** See page 31.

**593 Independent Study (1-15)** See page 31.

**600 Doctoral Research and Dissertation (3-15)** P/NP only. E
620 Topics in the History of Ancient and Medieval European Philosophy (3) May be repeated. Maximum 3 hrs.
622 Topics in the History of Modern Philosophy (3) May be repeated. Maximum 3 hrs.
624 Topics in the History of 20th-Century Philosophy (3) May be repeated. Maximum 9 hrs.
620 Topics in the History of Ancient and Medieval European Philosophy (3) May be repeated. Maximum 9 hrs.
675 Topics in Metaphysics and Epistemology (3) May be repeated. Maximum 9 hrs.

Physical Education and Dance
(College of Education)

MAJORS DEGREES
Physical Education M.S., Ed.D. Education Ph.D.

Professors:

Associate Professors:

Assistant Professors:

THE MASTER'S PROGRAM
The Department of Physical Education and Dance offers the Master of Science with a major in Physical Education with the following concentrations:
Adapted Physical Education
Exercise Physiology and Fitness
Motor Behavior
Pedagogy in Physical Education
Philosophical and Sociological Foundations of Sport
Sport Administration/Management (an interdisciplinary concentration with Health, Leisure, and Safety)

The Master of Science program permits the student to select a thesis or non-thesis option. The thesis option requires a minimum of 30 hours. The non-thesis option requires 32 hours, including a project. All M.S. students must complete a course in research design or statistics and register for two credits of Physical Education 601.

THE DOCTORAL PROGRAM
The Doctor of Education with a major in Physical Education is available with concentrations in the following areas:
Adapted Physical Education
Exercise Physiology and Fitness
Motor Behavior
Philosophical and Sociological Foundations of Sport

The Doctor of Philosophy with a major in Education includes the concentrations and specializations listed under Education.

ADMISSION REQUIREMENTS
Applicants are required to complete the departmental application which will be sent to all persons upon their initial inquiry about the program. Specific questions about these programs should be directed to the head of the Department of Physical Education and Dance.

The following retention policy applies to all graduate students seeking a degree in the Department of Physical Education and Dance:
1. Graduate students are required to maintain an overall 3.0 GPA.
2. Any student who falls below this standard will be advised in writing by the department head of the need to discuss the matter with his/her advisor.
3. If a student's overall GPA remains below 3.0 for a second semester, the student will have his/her degree status revoked.

GRADUATE ASSISTANTSHIPS
A limited number of graduate assistantships are available for qualified women and men who are graduates of accredited colleges or universities. These assistantships are open to students in the Master's and doctoral programs. Students interested in these opportunities should file their applications before February. Letters should be addressed to:
Graduate Assistantships Coordinator
Department of Physical Education and Dance
The University of Tennessee
Knoxville, TN 37996-2700

Physical Education
401 Physical Activity and Fitness (2) Relationship of exercise to cardio-respiratory function, body composition, healthy low back, and stress. Prereq: 200, 262. (Same as Health 414.)
423 Readings in Physical Education (2) Review of current and classic literature in physical education.
500 Thesis (1-15) P/NP only. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May be used toward degree requirements. May be repeated. S/NC only. E
509 Graduate Seminar in Public Health (1) (Same as Public health 509, Nursing 509, Nutrition and Food Science 509 and Social Work 590.)
511 Administrative/Supervisory Processes in Physical Education (3) Organizational concepts, management strategies, and supervisory techniques related to physical education programs at all levels.
512 Application of Theory to Curricular/Methodological Decision in Physical Education (3) Application of curricular theories and methods to educational situations for development of curricula and lessons in physical education. Various methodological approaches.
514 Advanced Philosophy of Sport (3) Major philosophical theories of sport. Various conceptual, moral, aesthetic, and social-political issues.
515 Social Theories of Sport (3) Liberal, democratic and Marxist social theories of sport. (Same as Sociology 594.)
528 Motor Behavior: A Theoretical Perspective (3) Motor behavior from information processing perspective; overview of current research that supports theoretical bases. Prereq: Undergraduate course in general psychology or consent of instructor.
531 Biomechanics of Human Performance (3) Human movement and training in athletics and sports medicine. Prereq: 422 or equivalent.
532 Seminar in Research Techniques in Physical Education (3) Evaluate, compare, and contrast research techniques in physical education with consideration for and development of critical perspectives, design, and analysis procedures, and proposal development.
533 Psychology of Sport (3) Social psychological factors influencing human behavior in sport context; discussion of contemporary theory, research, and methodology. Prereq: General psychology course or consent of instructor.
534 Motor Behavior and Skill Acquisition (3) Topical explanation and application of principles of human movement behavior to acquisition and performance of skills; discussion of current research and methodology.
541 Special Topics (1-3) Advanced study in selected disciplinary or professional areas of physical education and/or sport. May be repeated.
542 Sociological Aspects of Sport and Physical Education (3) Social and cultural factors influencing sport and physical education. Pertinent issues and research applications. Prereq: Consent of instructor. (Same as Sociology 555.)
543 Human Motor Development (3) Changes in selected motor performance and related attributes areas critical developmental periods within context of perceptual-motor development and implications and explanations of factors affecting motor behavior.
544 Theories of Physical/Movement Education (3) Integration of various theoretical approaches to physical education/movement education within cultural context; research and field work.
553 Advanced Adapted Physical Education (2) Curriculum development and teaching methodologies in programming for children with special education needs. Prereq: 411 or consent of instructor. Coreq: 553.
554 Advanced Adapted Physical Education Practicum (1) Curriculum and methodologies experienced in lab in school for handicapped. Coreq: 553.
555 Motor Assessment and Programming for the Child with Special Education Needs (3) Criterion and norm-referenced tests used in development of individualized education programs for children with physical and/or motor development needs. Testing protocols which purport to get at basis of dysfunction; those which just measure symptoms of dysfunction; efficacy of remediation theories based or related to testing protocols. Evaluation of motor skill in exceptional children and development of remedial programs for children assessed appropriate for school/parent implementation.
560 Physiology of Fitness (3) Adaptations that take place with training and detraining, and influence of environmental and heredity factors. Prereq: Under...
graduate courses in human physiology of exercise. Coreq: 551.

561 Physical Fitness Testing and Evaluation (1) Laboratory; testing and evaluation of physical fitness factors in apparently normal population. Coreq: 559.

562 Advanced Physiology of Exercise (3) Laboratory; quantitative approach to scientific inquiry. Prereq: Undergraduate physiology of exercise.


569 Fitness Testing, Programming, and Leadership for Diverse Populations (1) Clinical experience in selecting, administering, and evaluating exercise tolerance tests on cycle ergometer and treadmill. Individual fitness programs for diverse populations. Practice in leading variety of activities aimed at improved fitness. Prereq: 560. Coreq: 568. (Same as Public Health 569.)

593 Directed Independent Studies (1-3) May be repeated. Prereq: 532 or consent of instructor.

600 Doctoral Research and Dissertation (1-15) P/NP only E.

601 Research Seminar in Physical Education (1) Research topics in different aspects of physical education, sport, and human movement. May be repeated. S/NC only.

622 Directed Independent Research (3-6) Prereq: Doctoral student or consent of instructor. May be repeated.

633 Advanced Motor Behavior (1-3) In-depth analysis, synthesis, and discussion of contemporary theory and topics; research development and production; motor control learning, sport psychology, motor development.

661 Seminar in Exercise and Applied Physiology (1) Prereq: 561. May be repeated with consent of instructor. S/NC only.

664 Research Participation in Applied Physiology (1-6) Participation in research with faculty member whose interests coincide with those of student. S/NC only.

681 Practicum (1-3) Intern experience in areas of major interest. May be repeated.

Physics and Astronomy

(Majors and minors in some courses may be taken with consent of instructor."

Dance

410 Ballet: Level III (2) Instruction and practice in advanced classical ballet technique. Prereq: Dance majors and minors or consent of instructor. May be repeated. Maximum 16 hrs.

415 The Teaching of Creative Dance (2) Theory, methods, materials, and practical experience in presentation and integration of creative dance in grades K-6.

420 Jazz: Level III (2) Instruction and practice in advanced jazz and musical theater dance styles and techniques. Prereq: Dance majors and minors and consent of instructor. May be repeated. Maximum 16 hrs.

430 Modern: Level III (2) Instruction and practice in advanced modern dance techniques. Prereq: Dance majors and minors or consent of instructor. May be repeated. Maximum 16 hrs.

450 Composition III (3) Application of choreographic and production skills culminating in presentation of two works. Prereq: 350.

460 Rhythmic Analysis (3) Basic nature and principles of music, rhythm, and rhythmic notation; correlation with dance movement and composition. Prereq: Consent of instructor.

465 Dance Notation (3) Fundamentals of movement notation; notation and reading of elementary movement studies.

480 History of Dance I (3) Dance of various societies and culture from pre-history through 19th century.

481 History of Dance II (3) Development of dance in theatre, recreation and education during 20th century.

490 Philosophy of Dance and Related Arts (3) Aesthetic principles and current trends in dance; relationship with other art forms.


495 Dance Pedagogy (3) Principles and methods of teaching of dance with practical application in in-service teaching experience. Prereq: Upperclass or graduate standing and consent of instructor.

Physics and Astronomy (College of Liberal Arts)

MAJOR

William M. Bug, Head

Professors:

- C. R. Bingham, Ph.D. Tennessee
- W. E. Blass, Ph.D. Michigan State
- M. A. Breazeale, Ph.D. Michigan State
- W. M. Bugg, Ph.D. Tennessee
- T. A. Calcott, Ph.D.
- L. G. Christophorou, Ph.D.
- University of Manchester (England)
- E. W. Coigazer, Ph.D. California Institute of Technology
- T. C. Collins, Ph.D.
- Florida
- G. T. condo, Ph.D.
- Illinois
- W. E. Deeds
- Ph.D. Ohio State
- J. B. Dicks (Alumni
- Distinguished Professor)
- Ph.D. Vanderbilt
- K. Fox, Ph.D. Michigan
- N. M. Gailar (Emeritus)
- Ph.D. Ohio State
- S. Georgiou, Ph.D.
- Ph.D. Manchester (England)
- M. W. Guidry
- Ph.D. Tennessee
- E. G. Harris (Alumni
- Distinguished Professor)
- Ph.D. Tennessee
- E. L. Hart, Ph.D. Cornell
- P. G. Huray, Ph.D.
- Tennessee
- H. C. Jacobson, Ph.D.
- D. Yale
- D. T. King, Ph.D. Bristol
- England
- R. J. Lovell, Ph.D. Vanderbilt
- G. D. Mahan (Distinguished Scientist)
- Ph.D. California
- Berkeley
- A. A. Mason, Ph.D.
- Tennessee
- A. H. Nielsen (Emeritus), Ph.D.
- Michigan
- F. E. Obenshain, Jr., Ph.D.
- Pittsburgh
- L. R. Painter, Ph.D. Tennessee
- D. J. Pegg
- Ph.D. New Hampshire
- L. L. Riedinger, Ph.D.
- Vanderbilt
- R. H. Ritchie, Ph.D.
- Tennessee
- H. C. Schweiner (Emeritus), Ph.D.
- Massachusetts Institute of Technology
- I. A. Selin (Chancellor's Research Scholar)
- Ph.D. Chicago
- C. C. Shih, Ph.D.
- Cornel1
- P. J. Siemens (Distinguished Scientist), Ph.D.
- Cornell
- W. F. Stelson, Ph.D.
- Massachusetts Institute of Technology
- J. Thompson, Ph.D.
- D. Duke
- J. O. Thomson, Ph.D.
- Illinois
- G. W. Wheeler, Ph.D.
- Yale
- J. W. White (Emeritus)
- Ph.D. North Carolina

482 Philosophy of Physics (3) Principles and methods of philosophy of physics; relationship with other art forms.

490 Philosophy of Science (3) Principles and methods of philosophy of science; relationship with other art forms.


495 Physics Pedagogy (3) Principles and methods of teaching of physics with practical application in in-service teaching experience. Prereq: Upperclass or graduate standing and consent of instructor.

Physics and Astronomy (College of Liberal Arts)

MAJOR

William M. Bug, Head

Professors:

- C. R. Bingham, Ph.D. Tennessee
- W. E. Blass, Ph.D. Michigan State
- M. A. Breazeale, Ph.D. Michigan State
- W. M. Bugg, Ph.D. Tennessee
- T. A. Calcott, Ph.D.
- L. G. Christophorou, Ph.D.
- University of Manchester (England)
- E. W. Coigazer, Ph.D. California Institute of Technology
- T. C. Collins, Ph.D.
- Florida
- G. T. condo, Ph.D.
- Illinois
- W. E. Deeds
- Ph.D. Ohio State
- J. B. Dicks (Alumni
- Distinguished Professor)
- Ph.D. Tennessee
- E. G. Harris (Alumni
- Distinguished Professor)
- Ph.D. Tennessee
- E. L. Hart, Ph.D. Cornell
- P. G. Huray, Ph.D.
- Tennessee
- H. C. Jacobson, Ph.D.
- D. Yale
- D. T. King, Ph.D. Bristol
- England
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- G. D. Mahan (Distinguished Scientist), Ph.D. California
- Berkeley
- A. A. Mason, Ph.D.
- Tennessee
- A. H. Nielsen (Emeritus), Ph.D.
- Michigan
- F. E. Obenshain, Jr., Ph.D.
- Pittsburgh
- L. R. Painter, Ph.D. Tennessee
- D. J. Pegg
- Ph.D. New Hampshire
- L. L. Riedinger, Ph.D.
- Vanderbilt
- R. H. Ritchie, Ph.D.
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- Massachusetts Institute of Technology
- J. Thompson, Ph.D.
- D. Duke
- J. O. Thomson, Ph.D.
- Illinois
- G. W. Wheeler, Ph.D.
- Yale
- J. W. White (Emeritus)
- Ph.D. North Carolina

Associate Professors:

- J. Grau, Ph.D. Massachusetts Institute of Technology
- M. Breinin, Ph.D. Oregon
- R. W. Childers, Ph.D. Vanderbilt
- J. Connel1
- Ph.D. Colorado State
- H. W. Crater, Ph.D.
- Yale
- K. E. Duckett, Ph.D.
- Tennessee
- W. A. Dunlin, Ph.D.
- Florida
- S. B. Elston
- Ph.D. Massachusetts
- T. Ferrell, Ph.D.
- T. H. Handler, Ph.D.
- R. H. Kohl, Ph.D.
- Ohio State
- J. W. Lewis,
Fields of Instruction/Physics and Astronomy

hours in a minor field; and 6 semester hours from other courses numbered above 400 (preferably of advanced laboratory nature.) At least 20 hours must be taken at the 500 level or above. In addition, the candidate must pass a written examination administered by the committee.

THE DOCTORAL PROGRAM

All students are expected to take Physics 521-22, 531, 541-42, 551, 561, 571-72, and 611. Physics 601-02 are normally required of students specializing in atomic physics. Physics 621-22 is required for nuclear physics; Physics 682-72 of students in elementary particle physics; Physics 683-84 of students in plasma physics; Physics 681-82 of students in health physics; Physics 671-72 of students in solid state physics; and Physics 681-82 of students specializing in molecular spectroscopy. Students specializing in chemical physics may substitute Chemistry 572 for Physics 551 and should complete at least 6 semester hours chosen from Chemistry 560, 570.

The recommended curriculum for Ph.D. candidates includes Physics 531, 571, and an elective in the first semester; Physics 521, 541, and 551 in the second semester; Physics 522, 542, and 561 in the third semester; Physics 551, 611, and an elective in the fourth semester. Electives are to be chosen in consultation with the student's advisory panel and/or dissertation committee from courses numbered above 500, and at least two from outside the student's area of concentration are recommended before graduation. The first three semesters of this curriculum constitute the core curriculum and are the basis for the departmental comprehensive examination, which is normally taken after two years of graduate study. A Master's degree is not to be awarded.

A reading knowledge of one foreign language in which there exists a significant body of literature is required. German 332 or French 302 with a grade of A or B may be substituted for the corresponding language examination.

The dissertation topic will be chosen with reference to one of the fields in which research facilities can be made available either at The University of Tennessee or at Oak Ridge National Laboratory in Knoxville; The University of Tennessee Space Institute at Tullahoma, Tennessee; the Oak Ridge National Laboratory, Oak Ridge, Tennessee; or at other research facilities used by the University faculty.

Astronomy

411 Astrophysics (3) Development of analytical physical models of galactic structure of universe, stellar and interstellar matter, and planetary systems. Topical and interdisciplinary, consideration of quasars, pulsars, black holes and current developments in field. Acceptable for major credit in physics. Prereq: Physics 232 and consent of instructor.

490 Special Topics in Astronomy (1-3) Topics of current interest in astronomy and astrophysics. Acceptable for major credit in physics with consent of department. May be repeated with consent of department. Maximum 9 hrs.

Physics

401 Background of Physics (2) Survey of historical development and philosophical foundations of natural science. Classical theories of gravitation, electromagnetism, thermodynamics, and quantum mechanics; unifying mathematical and physical principles underlying physical applications. Readings from important original papers, thought-provoking problems and order-of-magnitude calculations combining different fields of classical physics, and written report on independent study. Recommended for graduate students with plan of thesis research. Senior standing in physics or consent of instructor.

402 Forefront of Physics (2) Survey of modern developments in physics; various forms of quantum mechanics, quantum electrodynamics and recent theories of particle physics. Discussion of unsolved questions in physics, experiments of current interest, readings in recent literature, and applications to current research. Senior standing in physics or consent of instructor. Recommended for beginning graduate students. Prereq: 401 or consent of instructor.

411-12 Introduction to Quantum Mechanics (3.3) Fundamental principles of quantum mechanics and methods of calculation. Solution of Schrodinger equation for simple systems. Application to atomic, molecular, nuclear, and condensed matter physics. Must be taken in sequence. Prereq: 422 or equivalent. Mathematics 435.

421 Modern Optics (4) Transmission of light in uniform, isotropic media; reflection and refraction at interfaces; wave theory of light; wave motion and interference; interference and diffraction. Prereq: 411 or consent of instructor. 3 hrs and 3 labs.

425 Principles of Nondestructive Testing (3) (Same as Engineering Science and Mechanics 425.)

431-32 Electricity and Magnetism (3.3) Electrostatics; magnetostatics, coupled electric and magnetic fields, Maxwell's Equations, electromagnetic waves and radiation. Prereq: 232.


511-12 Theoretical Physics (3.3) Classical theoretical physics, with limited use of mathematics. Prereq: 512. Preparation of advanced calculus, differential equations, and vector analysis.


532 Advanced Classical Mechanics (3) Variational principles, canonical transformations, Hamilton-Jacobi theory, normal modes, mechanics, elasticity, fluid mechanics. Prereq: 531.


571-72 Mathematical Methods in Physics (3.3) Linear vector spaces, matrices, tensors, curvilinear coordinates, functions of a complex variable, partial differential equations and boundary value problems, Green's functions, integral transforms, integral equations, spherical harmonics, Bessel functions, calculus of variations. Prereq: Advanced calculus and differential equations. Must be taken in sequence. (Same as Mathematics 517-18.)

574-75 Group Theory for Physicists (3,3) Introduction to group theory, group theory, discrete and continuous groups, representation theory. Noether's theorem. Symmetries and degeneracies, application of group-theoretical methods to atomic physics, solid-state physics, and particle physics. Prereq: 571-72.

591 Foreign Study (1-15) See page 31.

592 Off-Campus Study (1-15) See page 31.

593 Independent Study (1-15) See page 31.

594 Special Problems (3) Especially assigned theoretical or experimental work on problems not covered in other courses. May be repeated. Maximum 9 hrs. E


600 Doctoral Research and Dissertation (3-15) P/NP only. E


605 Laser Spectroscopy (3) Application of lasers to spectroscopy of atomic and molecular systems; review of classical multi-pole radiation, atomic L-S and jj coupling, and Stark effects; spontaneous emission of atomic systems and oscillator strengths, selection rules of dipole and quadrupole transitions, radiative transfer and formation of spectral lines. Study of saturated absorption spectroscopy, resonance fluorescence and strong field effects, Hanle effect, optical double resonance, optical pumping and hyperfine spectroscopy. Prereq: 521, 541, 508.

606-07 Nonlinear Optics (3,3) Nonlinear optical susceptibilities, wave propagation in nonlinear media, frequency and difference frequency generation, harmonic generation, parametric amplification and oscillation, stimulated Raman processes, two- and multi-photon processes, four-wave mixing and phase conjugation, transient coherent optical effects and free induction decay, optical breakdown and nonlinear effects in plasmas. Prereq: 522.

608-09 Quantum Electronics and Electro-Optics (3,3) Electron spin resonance and antiferromagnetism in anisotropic and periodic media, linear and quadratic electro-optic effects and devices, acousto-optical effects and devices, guided wave phenomena, picosecond and femtosecond optical switching and electronics, and optical computers and processors. Prereq: 606.

610 Quantum Optics (3) Quantum theory of emission and absorption of radiation; frequency-dependent susceptibility; field quantization and coherent photon states; interaction of radiation with atoms; photon optics, counting and higher-order coherence; atomic scattering phenomena. Prereq: 521.

611 Advanced Quantum Mechanics & Field Theory (3) Second quantization, quantization of electromagnetic field, emission, absorption, and scattering of light, bremsstrahlung, pair creation and annihilation, quantum electrodynamics, field quantization and coherent photon states; interaction of radiation with atoms; photon optics, counting and higher-order coherence; atomic scattering phenomena. Prereq: 521.

612 Advanced Topics in Quantum Field Theory (3) Rarita-Schwinger, Lamb shift, anomalous magnetic moments, gauge theories, electroweak theory, quantum chromodynamics, grand unified theories, and advanced topics in field-theoretical methods. Topics vary according to interest of students, instructor and present state of physics. Prereq: 561 or consent of instructor.

617-18 Lie Algebras in Mechanics and Physics (3,3) (Same as Mathematics 617-18).

621-22 Nuclear Structure (3,3) General properties of nucleus; two-body scattering problems; saturation and scaling properties of nuclear response; theory of light nuclei; nuclear spectroscopy; special nuclear models; theory of nuclear reactions; theory of beta-decay. Prereq: 571.

626-27 Elementary Particle Physics (3,3) Survey in elementary particle physics covering experimental methods, conservation laws, invariance principles, and models of interactions. 627—Advanced topics: quark models, electroweak interactions and unification of elementary forces. Prereq: 522.

631 Advanced Topics in Relativity of Cosmology (3) Topics vary according to the interests of students, instructor and present state of physics. Cosmological solutions of Einsteins field equations, black holes, inflationary universe, unified field theories or interaction between cosmology and nuclear and elementary particle physics. Prereq: 531 and 561.

641 Advanced Topics in Classical Theory (3) To meet special needs of students. Advanced dynamics and hydrodynamics, electromagnetic theory, statistical mechanics, or theory of nonequilibrium processes. Prereq: 532, 542, 551. May be repeated with consent of department. Maximum 9 hrs.

642 Advanced Topics in Quantum Theory (3) To meet special needs of students. Quantum field theory, beta-ray theory, theory of atomic spectra, molecular structure and valence theory, theory of radiation, electric and magnetic susceptibilities, high energy processes, scattering and collision processes, or theory of fields. Prereq: 522. May be repeated with consent of department. Maximum 9 hrs.

643 Computational Physics (3) Developing computer algorithms for solving representative problems in various fields of physics, celestial dynamics in atmospheres, boundary value problems in electromagnetism, atomic and nuclear structures, band structure on solid state physics, transport problems in statistical mechanics. Monte Carlo simulation of liquids, fitting and interpolation of data, correlation analysis, or optimization strategy. Prereq: 522, 531, 542, and 572.

651-62 Collision Interactions (3,3) Interaction of electromagnetic radiation and charged particles with atoms and molecules or free particles, scattering, ionization, transport and capture, collective excitations, Cerenkov radiation, and stopping power. Prereq: 522.

663 Advanced Plasma Physics I (3) (Same as Electrical and Computer Engineering 663.)

664 Advanced Plasma Physics II (3) (Same as Electrical and Computer Engineering 664.)


681-82 Molecular Spectroscopy (3,3) Spectroscopic methods of determining molecular properties, theoretical and experimental aspects of infrared and Raman spectroscopy, and charge transfer, group theoret- ical methods and selection rules in gases and condensed phases, normal coordinates and potential functions, frequency-rotation interaction theory, intensities, frequencies and transition probabilities. Prereq: 532 and 542 or consent of instructor.

Planning
(Office of the Provost)

MAJOR

Planning

DEGREE

M.S.P.

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 studies leading to the professional degree of Master of Science in Planning. The degree is the normal route for entry into professional positions in urban and regional planning or related positions. Graduates are candidates for positions in regional, city, county, and metropolitan planning agencies; in local, state, and federal agencies concerned with physical, economic, and administrative planning; in private business and organizations dealing with development problems; and in private consulting.

The Master of Science in Planning program is accredited by the Planning Accreditation Board, a joint undertaking of the American Planning Association, the Allied Planners and the Association of Collegiate Schools of Planning.

ADMISSION REQUIREMENTS

Applicants are to submit an application for admission to The Graduate School, two letters of reference from faculty familiar with their prior academic work, and a statement describing personal career objectives. If the applicant has prior work experience in planning, a reference letter should also be provided by the work supervisor. Graduate Planning Examination scores are not required, but applicants are encouraged to submit them.

The M.S.P. is approved for SREB Academic Common Market participation in Arkansas, Kentucky, South Carolina, and West Virginia.

DEGREE REQUIREMENTS

The M.S.P. requires completion of at least 48 hours of graduate credit, at least 30 of which must be in planning. The following courses are the core curriculum required of all students: 510, 511, 515, 520, 521, 523, 530, 531, 532, 540, and 545.

Students should plan to enter the program in the fall term to take the core courses in the proper sequence. Each student is required to develop an area of concentrated competence beyond the core curriculum. After selecting the area of concentration, usually by the end of the second semester, the student takes a prescribed set of courses in the subject area. Further enhancement of the concentration is gained by taking additional elective courses in the subject and by focusing the thesis or major paper on the subject. Concentration courses are drawn from the planning curriculum and from other departments in the University. Concentrations are available in land use planning, analytical methods in planning, economic development planning, and real estate development planning.

Students have the latitude to propose an alternate specialization consisting of at least 9 hours of course work, subject to approval of a faculty committee. Courses are available

Planning/Fields of Instruction 131
in transportation, health, education, environmental, and social planning.

Each student is required to demonstrate competence in individual research. This may be done in one of two ways:

**Thesis Option** — Complete a thesis for 6 hours credit;

**Non-Thesis Option** — Complete a major study with acceptable documentation. In order to be eligible for the major study option, the student must have completed at least 12 hours of graduate course work in planning with at least a 3.5 cumulative grade point average. The student meeting these criteria may present a proposal to his/her committee for a major study that will include at least 6 hours of subsequent course work. The proposal shall justify the selection of the topic, describe the approach to the study, and describe the nature of the final product.

The topic will normally be expected to reinforce or complement the student's concentration.

Student academic progress is monitored by the faculty. A student failing to maintain an acceptable grade point average may be placed on probation or dismissed from the program.

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**Plant and Soil Science**

(College of Agriculture)

### MAJOR DEGREES

**Plant and Soil Science**

**M.S., Ph.D.**

John E. Foss, Head

Professors:

- F. F. Bell (Emeritus), Ph.D. Iowa State
- D. L. Coffey, Ph.D. Purdue; B. V. Conger, Ph.D. Washington State; J. E. Foss, Ph.D. Minnesota; H. A. Fribourg (Emeritus), Ph.D. North Carolina State; L. M. Josephson (Emeritus), Ph.D. Wisconsin; W. L. Parks, Ph.D. Purdue; B. S. Pickett (Emeritus), Ph.D. Michigan State; J. H. Reynolds, Ph.D. Wisconsin; L. F. Seatz (Emeritus), Ph.D. North Carolina State; L. N. Skold (Emeritus), M.S. Kansas State; M. E. Springer (Emeritus), Ph.D. California (Berkeley); H. D. Swingle (Emeritus), Ph.D. Louisiana State; E. Winters (Emeritus), Ph.D. Illinois.

Associate Professors:

- F. L. Allen, Ph.D. Minnesota; J. T. Ammons, Ph.D. Wisconsin; D. E. Deyton, Ph.D. New Mexico State; D. R. West, Ph.D. Nebraska; J. D. Wolt, Ph.D. Auburn.

Assistant Professors:

- J. G. Gravelle, Ph.D. Purdue
- G. N. Rhodes, Jr., Ph.D. North Carolina State

The Department of Plant and Soil Science offers graduate programs leading to the Master of Science and the Doctor of Philosophy. Concentrations for the graduate programs are offered in soil science, plant breeding and genetics, and crop physiology and ecology.

For further information, contact the department head.
414 Soil, Land Use, and the Environment (3) Soil as a tor. 2 hrs and 1 lab. Sp

431 Crop Physiology and Ecology (3) Principles of uptake, translocation, mode of action and uses of herbicides and plant growth regulators and their effects on plant morphology, metabolic systems and enzymatic activities. Practical aspects and current commercial uses of plant growth regulators. Prereq: Botany 521 and 522 or equivalent. F,A

571 Advanced Research Planning (3) Development of agricultural research proposals utilizing prescribed resources and emphasizing experimental design and statistical techniques. Prereq: 571, Animal Science 572, Statistics 461, or equivalent. (Same as Animal Science 571). F,A

Political Science

(College of Liberal Arts)

MAJORS

Public Administration

DEGREES

Political Science ................................. M.A., Ph.D.
Public Administration ........................... M.P.A.

Professors:

R. S. Avery (Emeritus), Ph.D. Northwestern; D. H. Carlisle (Emeritus), Ph.D. North Carolina; A. H. Hooton (Emeritus), Ph.D. Tulane; V. R. Iredell, Ph.D. Chicago; W. Lyons, Ph.D. Oklahoma; H. Plaas, Ph.D. Utah; N. M. Robinson (Emeritus), Ph.D. Syracuse; T. A. Smith, Ph.D. Ohio State; O. H. Stephens (Alumni Distinguished Service Professor), Ph.D. Johns Hopkins; T. D. Unger, Ph.D. Iowa; D. M. Welborn, Ph.D. Texas.

Associate Professors:

R. B. Cunningham, Ph.D. Indiana; J. Dodd, Ph.D. Tufts; G. Evans, Ph.D. Columbia; W. Fierman, Ph.D. Harvard; M. R. Fitzgerald, Ph.D. Oklahoma; P. K. Freeman, Ph.D. Wisconsin (Milwaukee); M. M. Gant, Ph.D. Michigan State; R. A. Gorman, Ph.D. New York; A. L. Peterson, Ph.D. Yale; T. McN. Simpson, Ph.D. Johns Hopkins.

Assistant Professors:


The Department of Political Science offers the M.A., M.P.A., and Ph.D. degrees in political science. The M.A. degree is awarded to students who have completed a program of study in political science. The M.P.A. degree is awarded to students who have completed a program of study in public administration. The Ph.D. degree is awarded to students who have completed a program of study in political science or public administration.

The Ph.D. degree program requires the successful completion of at least 60 hours of graduate work, including a dissertation. The dissertation must be a substantial piece of original research that makes a significant contribution to the field of political science.

The M.A. degree program requires the successful completion of at least 36 hours of graduate work, including a thesis. The thesis must be a substantial piece of original research that makes a significant contribution to the field of political science.

The M.P.A. degree program requires the successful completion of at least 48 hours of graduate work, including a practical internship. The internship must be a substantial piece of original research that makes a significant contribution to the field of public administration.
ADMISSION REQUIREMENTS
Three departmental recommendation forms must be submitted to The Graduate School, a copy of which must be completed by instructors at the institution most recently attended. In addition, scores on the general portion of the Graduate Record Examination must be submitted.

THE MASTER OF ARTS PROGRAM
A Bachelor's degree or its equivalent is required for admission. Normally an overall average of 3.0, is also required together with an average of 3.2 in the last two years of political science or social science. In addition, a composite score of at least 1100 on the verbal and quantitative parts of the GRE is normally required.

Each candidate must earn 6 semester hours by writing a thesis and at least 24 additional hours by taking regular course work. A total of 36 hours is required. At least 12 of these hours must be in political science, 6 in the field of methodology (Political Science 510 and 512). Finally, an oral examination on the course work and thesis is required.

THE MASTER OF PUBLIC ADMINISTRATION PROGRAM
The M.P.A. Program is intended to prepare students for public service careers by acquainting them with management principles, analytical tools, and the ethical dilemmas they will face as public administrators. It consists of a total of 36 semester hours, including a core program, an elective specialization, and a recommended internship.

Applicants for admission to the program must have a Bachelor's degree or its equivalent. Normally, an overall average of 3.0, and an average of 3.2 in the last two years of political science or social science courses is required. In addition, a composite score of at least 1100 on the verbal and quantitative parts of the GRE is normally required. The M.P.A. is a non-thesis program.

Specific requirements include the following:
1. Core - 30 hours
   b. General perspectives - elective courses (3 hours). 556 Policy Analysis; 558 The Politics of Administration.
   c. Analytical skills (6 hours). 512 Quantitative Political Analysis; 514 Research and Methodology in Public Administration.
   d. Management skills (6 hours). 560 Public Budgeting and Finance; 564 Human Resources Management in Public Organizations.
2. Specialization - 9 hours
   A specialization is designed by the student in consultation with the coordinator of the M.P.A. program. Possible specializations include specializations in general government, public health, budgeting and finance, planning, natural resources, program evaluation, criminal justice, public relations, personnel, and others.
3. Recommended internship with a public agency - 6 hours
   Internships are arranged in consultation with the coordinator of the M.P.A. program.
4. A written final examination, which may be followed by an oral examination, is required.

THE DOCTORAL PROGRAM
The Ph.D. program prepares students for careers in college teaching, as well as careers in other occupations related to services in the public or private sector.

Applicants for admission to the program normally should have completed a Master's degree in political science or a related field with a 3.5 grade point average and have earned a composite score of at least 1100 on the verbal and quantitative parts of the Graduate Record Examination.

Students admitted to the program must complete 72 hours of course work beyond the Master's degree, must successfully pass written and oral comprehensive examinations in three broad subfields of political science, and must pass a final oral examination on the dissertation. In addition, an examination must be passed in one foreign language.

In addition to the total hours required for the degree, the following requirements must also be met:
1. At least 63 hours must be in political science courses.
2. At least 48 hours in political science courses must be in courses numbered above 500.
3. At least 9 hours must be earned in political science courses numbered above 600.
4. A total of 24 hours must be earned by writing the dissertation.

410 Special Topics in United States Government and Politics (3) May be repeated with consent of department. Maximum 6 hrs.
420 Political Attitudes and Opinions (3) Nature, formation, development, and dissemination of politically relevant attitudes and opinions in American political system.
421 Political Parties and Interest Groups (3) Examination of role of political parties and organized groups in American politics and government.
422 Political Campaigns and Elections (3) Analysis of nature of campaigns and elections in American political process.
430 United States Constitutional Law: Sources of Power and Restraint (3) Analysis of judicial review, constitutional powers of President and Congress, federalism, sources of regulatory authority, and constitutional protection of political and economic rights.
431 U.S. Constitutional Law: Civil Rights and Liberties (3) Analysis of current issues in civil rights and liberties including: first amendment freedoms, equal protection, privacy and rights of accused.
440 Public Management and Human Resources (3) Mobilization and management of technical and human resources in pursuit of public sector organization goals.
441 Budgetary Process and Financial Management (3) Fiscal planning, budget and expenditure processes in government, their policy and administrative implications.
442 Administrative Law (3) Legal dimensions of administrative power and procedures, and constitutional controls over administrators.
452 Black African Politics (3) Recent evolution and current political environment of Black African nations. (Same as Afro-American Studies 452.)
540 Public Law (3) Selective examination of published research and current approaches in subfields of constitutional law, administrative law, and judiciary. May be repeated with consent of department. Maximum 9 hrs.

542 The Politics of Criminal Justice (3) Selective examination of contemporary problems of research and public policy formulation: criminal process; law enforcement administration; criminal court administration; and prison administration. May be repeated with consent of department. Maximum 9 hrs.

546 Law and the Administrative Process (3) Constitutional position; decisional processes, regulation and management; limitations on governmental action; questions of structure, role, and administrative choice. May be repeated with consent of department. Maximum 9 hrs.

550 Public Administration (3) Overview of public administration theory and function.

552 Organization Theory (3) Appraisal of major theories of organization and their applicability to public sector.

554 Contemporary Public Policies (3) Problems in one or more public policy areas from political and administrative perspectives. Topics selected by instructor. May be repeated with consent of department. Maximum 9 hrs.

556 Policy Analysis (3) Role of administrators in policy analysis and decision making. May be repeated with consent of department. Maximum 9 hrs.

558 The Politics of Administration (3) Examination of public administration in context of American political system, policy making and political roles of public administrators and agencies. May be repeated with consent of department. Maximum 9 hrs.

560 Public Budgeting and Finance (3) Technical and political aspects of planning, preparing and adopting government budgets. Management implications of revenue collection, debt management, treasury function, accounting, internal auditing, purchasing risk management, post-auditing.

562 Public Management (3) Interpersonal and leadership skills, techniques and methods for planning, decision making, and implementation of management strategies in public sector. May be repeated with consent of department. Maximum 9 hrs.

564 Human Resource Management in Public Organizations (3) Intensive analysis of contemporary challenges, methods and strategies related to effective management of human resources in public sector.

566 Ethics, Values, and Morality in Public Administration (3) Moral-ethical-value dilemmas confronting administrators in American political system.

567 Comparative Public Administration (3) Comparison of policy-making structures and public policies in selected countries. May be repeated with consent of department. Maximum 9 hrs.

568 Special Topics in Public Administration (3) Analysis of selected issues and problems in public administration. May be repeated. Maximum 9 hrs.

569 Internship in Public Administration (3-9) Open to students participating in approved internship programs. May be repeated with consent of department. Maximum 9 hrs. S/NC only.

570 Comparative Government and Politics (3) Selected topics in modern governments. May be repeated with consent of department. Maximum 9 hrs.

572 The Politics of Development (3) Selected topics dealing with problems of less developed countries. May be repeated with consent of department. Maximum 9 hrs.

574 Area Seminar in Comparative Government and Politics (3) Selected topics in area studies: African, Asian, Latin America, Middle East, Soviet Union and Eastern Europe or Western Europe. May be repeated with consent of department. Maximum 9 hrs.

580 International Politics (3) Survey of literature and major aspects of international politics. May be repeated with consent of department. Maximum 9 hrs.

582 Theory and Analysis of U.S. Foreign Policy Processes (3) Theoretical approaches to decision making in foreign policy area and analysis of policy-making process. May be repeated with consent of department. Maximum 9 hrs.

591 Foreign Study (1-15) See page 31.

592 Off-Campus Study (1-15) See page 31.

593 Independent Study (1-15) See page 31.

600 Doctoral Research and Dissertation (3-15) P/NP only. E

610 Research Seminar in Empirical Theory and Methodology (3) Advanced methods and procedures of analysis in political science. May be repeated with consent of department. Maximum 9 hrs.

620 Research Seminar in Political Theory (3) Research into selected topics. May be repeated with consent of department. Maximum 8 hrs.

630 Research Seminar in the American Political Process (3) Research into selected topics. May be repeated with consent of department. Maximum 9 hrs.

640 Research Seminar in U.S. Constitutional Law (3) Systematic analysis of published research and judicial decision: development of constitutional law as major component of public policy. May be repeated with consent of department. Maximum 9 hrs.

652 Research Seminar in Public Administration (3) Research into selected topics. May be repeated with consent of department. Maximum 9 hrs.

670 Research Seminar in Comparative Government and Politics (3) Research into selected topics. May be repeated with consent of department. Maximum 9 hrs.

680 Research Seminar in International Politics (3) Research into selected topics. May be repeated with consent of department. Maximum 9 hrs.

Polymer Engineering
See Materials Science and Engineering

Psychology
(College of Liberal Arts)

MAJOR

Psychology

DEGREES

Psychology

M.A., Ph.D.

Raymond R. Shrader, Acting Head

Professors:


Associate Professors:


Assistant Professors:

L. Beevers-Laurence,* Ph.D. Tennessee; W. Berez,* Ph.D. Tennessee; L. Coleman, Ph.D. Harvard; J. Erickson,* Ph.D. Tennessee; L. T. Lawrence,* Ph.D. Tennessee; R. Levey,* Ph.D. California School of Professional Psychology; J. Murray,* Ph.D. Case Western Reserve; M. Nash, Ph.D. Ohio; E. O'Conor, Ph.D. Massachusetts; M. Smith, Ph.D. Tennessee; P. Watrous,* Ph.D. Tennessee; M. Waugh,* Ph.D. Florida.

*Part-time.

THE MASTER'S PROGRAM

Graduate study leading to the Master of Arts in General psychology is normally available only to students in the doctoral program in psychology. Requirements are (1) a score of at least 630 on the GRE in psychology; (2) at least 30 hours of graduate-level courses in psychology; and (3) a Master's thesis based on at least 6 hours of Thesis 500. A non-thesis Master's degree is available with the approval of the student's supervisory committee upon successful completion of a total of at least 36 hours in graduate-level courses in psychology and a final written examination.

THE DOCTORAL PROGRAM

A student with a B.A. or B.S. may apply to the Department of Psychology for admission to the doctoral program with a concentration in general psychology or clinical psychology. The doctoral program with a concentration in ethnology or physiology is offered through the Life Sciences Program. Doctoral study in industrial and organizational psychology is offered through the Interdepartmental Program in Industrial and Organizational Psychology, to which application is made through the Department of Management.

Departmental Requirements

All students in the doctoral program in psychology must obtain a score of at least 630 on the GRE in psychology by the end of the first year, and all students must pass the departmental general psychology examination (a comprehensive, two-day exam offered twice each year) by the end of the second year. In addition, each student must pass the doctoral comprehensive examination, complete an acceptable doctoral dissertation, and conduct a satisfactory oral defense of the dissertation. All doctoral students must complete a minimum of 78 hours of graduate-level courses, including courses required by their program; at least 6 hours in courses outside of psychology; and at least 24 hours of dissertation research (Psychology 600).

General Psychology

This program allows students to select from a variety of specializations oriented...
toward careers in research and teaching in psychology in academic, institutional, or industrial settings. The program is highly flexible and individualized and seeks to provide professional apprenticeship. Specializations include behavioral medicine and health psychology, child and adolescent development, cognitive and symbolic processes, conditioning and learning, ethology, existential phenomenology, psychometrics, psychophysiology, social psychology, and others. Requirements of the program are as follows:

1. Statistics 537-38, or equivalent, and two additional courses numbered above 500 in research methodology, quantitative methods, statistics, or psychometrics.

2. Competence in general psychology, demonstrated by completing Psychology 513 (Foundations of Psychology) or Psychology 420 (History and Systems of Psychology) or equivalent, plus at least one course or sequence or equivalent from each of four categories in the following list. (This requirement may be met by passing approved written examinations.)
   d. Developmental psychology: 511 Developmental Psychology; 512 Life-Span Development; 574 Child Psychopathology.
   e. Individual differences and personality: 445 Theories of Personality and Testing; 470 Theories of Personality.

3. Research Practicum (509) - research apprenticeship involving participation in the ongoing research of two different members of the faculty during the first two semesters in the program.

4. Pre-dissertation research project completed during the second year, involving the collection of original data or original analysis of existing data, reported in publishable form and acceptable to the doctoral supervisory committee.

5. At least 4 graduate seminars in psychology numbered above 600.

6. Clinical Psychology
   a. This program is designed to lay the groundwork for a professional career as a licensed clinical psychologist capable of working in both academic and applied settings. The program emphasizes the theoretical foundations of psychology as well as supervised experience oriented toward the development of practical skills. The program uses the scientist-practitioner model of clinical psychology. Requirements are as follows:
      i. Apprenticeship with one faculty member during the first year, one day each week.
      ii. Pre-dissertation research project completed before forming a doctoral supervisory committee, reported in written form acceptable to the student's faculty advisor and the director of clinical training.
      iii. Supervised clinical experience two days (16 hours) each week during the second, third, and fourth years.
      iv. Satisfactory completion of listed courses (or equivalents) in the following nine categories:
         a. Foundations of Psychology (513);
         b. Measurement and Testing (445);
         c. Personality Theory and Research (570-71);
         d. Lifespan Development (512);
         e. Statistics and research methods (504 Empirical Methods in Psychology plus either 505 Research Design or 557 Applied Psychological Measurement);
         f. Psychopathology (572, 573, 574);
         g. Psychological Assessment (594-595, 596);
         h. Psychotherapy (670, 671, 673, 675);
         i. Ethical, Legal, and Professional Issues (635).
      v. Satisfactory completion of at least 3 additional graduate-level courses in non-clinical topics in psychology.
      vi. Satisfactory completion of a one-year clinical internship at a site approved by the program.

6. 489 Laboratory in Physiological Psychology (3) Laboratory studies of nervous system and physiological correlates of behavior.

470 Theories of Personality (3) Survey of major theories of human personality and their development.

470 Theories of Learning (3) Classical and current approaches to learning and cognition. Prerequisite: 310.

482 Topics in Psychology (3) Intensive analysis of special topics. Afro-American psychology or evaluation of programs in community. Prerequisite: 310 or equivalent. Recommended prerequisite: 210, 220, 385, 396. May be repeated. Maximum 9 hrs.

489 Supervised Research (1-9) Prerequisite: Consent of instructor. May be repeated. Maximum 12 hrs in 399. 409, 419, 492, and 493 combined may apply toward undergraduate major.

500 Thesis (1-15) Prerequisite: Currently enrolled as a graduate student and consent of advisor. E 1-15 only. E 1-15 only. E 1-15 only.

4. 502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

504 Empirical Methods in Psychology (3) Data-management, Techniques for generating and analyzing data: charts and tables. Basic descriptive statistics. Prerequisite: Consent of instructor.

505 Research Design (3) Techniques for planning and conducting research, and to enable students to use non-experimental settings: experiments, quasi-experiments, observational studies, surveys, and program-evaluations. Development of questions and hypotheses for study. Design of studies to maximize validity. Prerequisite: Consent of instructor.

508 Readings and Special Problems in Psychology (1-3) Prerequisite: Consent of instructor. May be repeated. Maximum 9 hrs.

509 Research Practicum (2) Required of first-year graduate students in psychology. May be repeated. Maximum 9 hrs.

510 Topics in Psychology (3) Intensive examination of selected problem(s) in psychology. Prerequisite: Consent of instructor. May be repeated. Maximum 9 hrs.

511 Developmental Psychology (3) Normal processes of human socialization; physical, cognitive, and emotional development from conception through infancy, childhood, and adolescence. Prerequisite: Consent of instructor. May be repeated. Maximum 6 hrs.

512 Life-Span Development (3) Theories and research concerning normal human development throughout life, adulthood and old age. Prerequisite: Consent of instructor.

513 Foundations of Psychology: Biological factors, Perception, Learning, Thinking, Motivation (4) Intensive survey. Prerequisite: Consent of instructor.

516 Colloquium in Ethology (1) Current research and theory. May be repeated. Maximum 9 hrs. (Same as Zoology 516.) S/NC only.

517-18 Proseminar in Industrial and Organizational Psychology (3,3) (Same as Management 567-568.)

520 Interventions for Behavioral Change (3) Principles and techniques for planning, implementing, and evaluating interventions derived from social learning theory. Interventions by people in community: teachers or supervisors. Token economies and strategies for self-control. Prerequisite: Consent of instructor.

525 Laboratory Techniques and Instrumentation (3) Procedures for laboratory research involving humans and nonhuman animals; techniques for collecting, transforming, storing, and retrieving data using microcomputers. Prerequisite: Consent of instructor. May be repeated. Maximum 9 hrs.

526 General Vertebrate Neuroanatomy (3) Lecture and laboratory. Structure and functioning of central and peripheral nervous system. Prerequisite: 461, 462, or equivalent and consent of instructor. (Same as Zoology 526.)
527 Behavioral Neurology (3) Disorders of nervous system and organic brain dysfunctions. Diagnosis and treatment. Prereq: Consent of instructor.

528 College Teaching in Psychology (3) Concepts, techniques, and materials for teaching psychology at college and/or university level. Supervised practice. Prereq: Consent of instructor. S/NC only.


546 Ethological Psychology (3) Basic ethology and comparative psychology. Implications for human behavior. Prereq: Consent of instructor.

549 Internship in School Psychology (1-6) (Same as Educational and Counseling Psychology 546.)

550 Social Psychology (3) Survey of theory and research concerning interpersonal interaction and individual behavior in social context. Prereq: Consent of instructor.

555 Psychometrics (3) Basic concepts: factor analysis, scaling, test theories, probability models and their applications, computerized adaptive testing and other topics. Prereq: Statistics 537-538 or equivalent. May be repeated. Maximum 6 hrs.


557 Applied Psychological Measurement (3) Issues and techniques in applying psychological measurement in organizational, clinical, and community research. Prereq: Statistics 537-538 or equivalent or consent of instructor. May be repeated. Maximum 6 hrs.

560 Psychology of Learning (3) Review of current evidence from research involving human and/or non-human animals. Prereq: 400 and consent of instructor. May be repeated. Maximum 6 hrs.

570 Personality: Theory and Research I (3) Advanced survey of psychodynamic and neo-Freudian approaches to personality, related research. Prereq: 470 or equivalent.

571 Personality: Theory and Research II (3) Advanced survey of behavioral and humanistic approaches to personality, related research. Prereq: 470 or equivalent.

572 Descriptive Psychopathology (2) Diagnostic criteria of the DSM-III. Examples from written case-histories and recorded interviews. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

573 Dynamics of Psychopathology (3) Psychodynamic view of the causes and symptoms of major psychoses, neuroses, and adjustment disorders. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

574 Child Psychopathology (3) Varieties and origins of abnormal behavior in children. Prereq: 511 and consent of instructor.

576 Object Relations (3) European and American conceptions of normal and psychopathological development of object relations. Significance for psychotherapy, psychoanalysis, and psychoanalytic theory. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

578 Clinical Aspects of Human Sexuality (3) Variation in human sexual behavior. Theories of etiology, treatment. Prereq: Consent of instructor.

591 Foreign Study (1-15) See page 31.

592 Off-Campus Study (1-15) See page 31.

593 Independent Study (1-15) See page 31.

594 Psychological Assessment I (3) Basic concepts and techniques of adult assessment: intelligence tests and personality tests. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

595 Psychological Assessment II (3) Basic concepts and techniques of adult assessment: intelligence tests and personality tests. Prereq: Admission to doctoral program in clinical psychology and 594 or consent of instructor.

596 Laboratory in Psychological Assessment (3) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. Coreq: 594 or 595. May be repeated. Maximum 6 hrs.

597 Psychological Assessment of Children (3) Behavioral observations, interviews, objective tests, projective techniques. Prereq: 511 and admission to doctoral program in clinical psychology or consent of instructor. May be repeated. Maximum 12 hrs.

598 Clinical Psychology (3) (Same as Management 695.)

600 Research and Dissertation (2-15) P/IP only. E.

601 Seminar in Psychology (3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

605 Seminar in Research and Quantitative Methods (3) Prereq: 505. Statistics 537-538 or equivalent, or consent of instructor. May be repeated. Maximum 12 hrs.

610 Seminar in Applied Psychology (3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

611 Seminar in Developmental Psychology (3) Prereq: 511 and consent of instructor. May be repeated. Maximum 12 hrs.

613 Seminar in Existential-Phenomenological Psychology (3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

616 Seminar in Behavioral Neuroscience (3) Prereq: 461, 466, and consent of instructor. May be repeated. Maximum 12 hrs.


620 Seminar in Social and Organizational Psychology (3) Prereq: 440 or 550 and consent of instructor. May be repeated. Maximum 12 hrs.

622 Seminar in Comparative and Ethological Psychology (3) Prereq: 546 or consent of instructor. May be repeated. Maximum 12 hrs.

623 Seminar in Methods of Naturalistic Research (3) Prereq: 546 or consent of instructor. May be repeated. Maximum 12 hrs.

624 Seminar in Psychometrics (3) Prereq: 555 or consent of instructor. May be repeated. Maximum 9 hrs.

625 Seminar in Organizational Psychology (3) (Same as Management 625.)

626 Seminar in Industrial Psychology (3) (Same as Management 626.)

627 Seminar in Applied Industrial Psychology (3) (Same as Management 627.)

635 Ethical, Legal, and Professional Issues in Psychology (3) (Same as Educational and Counseling Psychology 635.)

638 Current Topics in Industrial/Organizational Psychology (3) (Same as Management 638.)

661 Advanced Psychometrics (3) Construction and standardization of psychological tests, questionnaire scaling; theory of errors of measurement; item analysis, scaling, equating, and development of norms: latent trait models; factor analysis; and other topics. Prereq: 555 or consent of instructor. May be repeated. Maximum 9 hrs.

670 Psychodynamic Psychotherapy I (3) Theories and principles. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

671 Psychodynamic Psychotherapy II (3) Theories and principles. Prereq: Admission to doctoral program in clinical psychology and 670 or consent of instructor.

672 Laboratory in Psychotherapy (3) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. Coreq: 670 or 671. May be repeated. Maximum 6 hrs.

674 Group Psychotherapy (3) Theory and practice. Prereq: Admission to doctoral program in clinical psychology or consent of instructor. May be repeated. Maximum 6 hrs.

675 Inference in Psychotherapy (3) Uses of actuarial data for assessment of strategies and tactics in psychotherapy. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

676 Special Techniques in Psychotherapy (3) Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

680 Seminar in Psychotherapy (3) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. May be repeated. Maximum 12 hrs.

681 Seminar in Assessment (3) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. May be repeated. Maximum 12 hrs.

682 Seminar in Psychopathology (3) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. May be repeated. Maximum 12 hrs.

683 Seminar in Behavioral Medicine (3) Current research and theory concerning relationships between behavior and health. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

684 Neuropsychology (3) Investigation of brain-behavior relationships in adults and children. Introduction to administration of REITAN neuropsychological screening battery, Luria battery, and other tests of brain dysfunction. Prereq: Consent of instructor.

685 Psychopharmacology (3) Connections between pharmacology and psychology. Prereq: Consent of instructor.

690 Field Work in Industrial and Organizational Psychology (1-12) (Same as Management 690.)

695 Field Placement in Clinical Psychology (1-3) Prereq: Admission to doctoral program in clinical psychology and consent of instructor. May be repeated. Maximum 24 hrs.

696 Psychology Clinic (1-3) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. May be repeated. Maximum 24 hrs.

Religious Studies

(College of Liberal Arts)

Charles H. Reynolds, Head

Professors:

D. L. Durigan, Th.D. Harvard;

W. L. Humphreys, Ph.D. Union; D. E. Linge, Ph.D. Vanderbilt; F. S. Lusby, B.D. Colgate Rochester; R. V. Norman, Jr., Ph.D. Yale; C. H. Reynolds, Ph.D. Harvard.

Associate Professors:

J. L. Fitzgerald, Ph.D. Chicago; M. Levering, Ph.D. Illinois.

Assistant Professor:

M. Harris, Ph.D. Harvard.

A Master’s degree in Philosophy with a concentration in religious studies is available.
Romance Languages
(College of Liberal Arts)

MAJORS DEGREES

French ........................................ M.A.
Spanish ....................................... M.A.
Modern Foreign Languages ................ Ph.D.

John B. Romeiser, Head

Professors:

P. E. Barrette, Ph.D. California (Berkeley);
C. W. Cobb, Ph.D. Tulane; J. C. Elliott, M.A.
Illinois; W. H. Hefflin, Ph. D. Florida State;
T. B. Irving (Emeritus), Ph.D. Princeton;
F. D. Maurino (Emeritus), Ph.D. Columbia;
M. Petrovska, Ph. D. Kentucky; C. Pinsky
(Emeritus), Ph.D. California, (Berkeley);
J. B. Romeiser, Ph.D. Vanderbilt; A. M. Vazquez-
Bigi, Ph.D. Minnesota; A. H. Wallace, Ph.D.
North Carolina, (Chapel Hill);
Y. M. Washburn, Ph.D. North Carolina
(Chapel Hill).

Associate Professors:

W. F. Byess (Emeritus), Ph.D. Wisconsin;
E. J. Campion, Ph.D. Yale; R. M. DeRycke,
Ph.D. Illinois; D. M. DiPuccio, Ph.D. Kansas;
M. H. Handelsman, Ph.D. Florida; K. D. Levy,
Ph.D. Kentucky.

Assistant Professors:

A. S. Allen, Ph.D. California (Berkeley);
S. DiMaria, Ph.D. Wisconsin; C. K. Duncan,
Ph.D. Illinois; F. Pérez-Pineda, Ph.D.
Pennsylvania State; C. V. Rogers, Ed.D.
Georgia; B. S. West, Ph.D. North Carolina,
(Chapel Hill); L. Williamson, Ph.D. Illinois.

The Department of Romance Languages
offers two advanced degrees: the Master of
Arts in French and in Spanish and the Doctor
of Philosophy in Modern Foreign Languages.
Inquiries should be addressed to the head
of the department. The head, through the
coordinators of Spanish and French, will
make available further departmental require-
ments, regulations, and materials not listed
below.

THE MASTER'S PROGRAM

Thesis Option

1. Completion of a minimum of 24 semes-
ter hours in course work plus at least 6
hours in course 500 Thesis. In French, 501
is required; in Spanish, 550. A maximum of 6
hours may be taken at the 400 level, the rest
at the 500 level, and under certain conditions
the student may take 600-level seminars. If
the student chooses to have a minor (such as
Italian or Portuguese), at least 24 hours
(including 6 hours of thesis) must be taken
in the major, 6 in the minor.

2. A thesis, with a minimum of 6 semester
hours in course 500.

3. A written examination covering the
course work and selected items from a
master reading list.

4. A final oral examination covering the
thesis.

Non-Thesis Option

1. Completion of at least 30 semester
hours, with a maximum of 9 at the 400 level,
the rest at the 500 level, including 501
(French) or 550 (Spanish). Under certain
conditions, the student may take 600-level
seminars. If the student chooses to have a
minor (such as Italian or Portuguese), at least
24 hours must be taken in the major, 6 in
the minor.

2. Three term papers that have been
accepted by the student's advisory commit-
te.

3. A written examination covering the
course work and selected items from a
master reading list.

4. A final oral examination to discuss the
papers (French M.A. only).

THE DOCTORAL PROGRAM

The Ph.D. in Modern Foreign Languages
is offered jointly by the Department of Ger-
amic and Slavic Languages and the
Department of Romance Languages and
requires advanced training in at least two
foreign languages.

Admission Requirements

Applicants must have completed a B.A. in
either French, German or Spanish to be
accepted into this program. Both graduates
of institutions in the United States and those
with undergraduate degrees from institutions
outside the United States must have a grade
point average of at least 3.0. Consideration
will also be given to applicants who do not
have an undergraduate degree in one of the
three foreign languages but do have the
equivalent of an undergraduate major in
one of them. Applicants should present scores
that are no lower than the 40th percentile on
the Graduate Record Examination (GRE)
score test in the foreign language of their
first concentration.

Requirements for the Ph.D.

Candidates must complete a minimum of
63 semester hours of course work beyond the
Bachelor's degree in addition to 24 hours
of doctoral research and dissertation. The
program shall consist of a first concentra-
tion, a second concentration, and a cognate
field.

1. First Concentration: French, German or
Spanish. It will consist of a minimum of 39
semester hours beyond the Bachelor's
degree, distributed as follows:

- A minimum of 21 hours at the 500 level
(exclusive of thesis hours) including French
584 (3), German 560 (3), or Spanish 550 (3);
German 521-22 (1,1), French 512 (2), or
Spanish 512 (2); French 515-16 (2,2), or
German 520 (3).

- At least 12 hours at the 600 level (exclu-
sive of dissertation hours).

2. Second Concentration: French, German,
Italian, or Spanish (different from the first
concentration). It shall consist of at least 18
hours of courses beyond the Bachelor's
degree, at least 12 of which must be at the
500 or 600 level.

3. Cognate Field: Six hours must be in
courses numbered 400 and above in a field
outside the department of the first concen-
tration but related to the student's principal
area of research. If the cognate field is yet a
third foreign language, a reading proficiency
exam will be administered after comple-
French


411 French Literature of the 16th Century (3) Highlights of 16th-century French literature. Excerpts from Rabelaisian works; readings of poems from writers from Lyon and members of Plaide. Prereq: 212, 411 French Literature of the 16th Century (3) High-


413 French Literature of the 18th Century (3) Major works of Enlightenment. Prereq: 212, 218 or equivalent.


416 Survey of Francophone Literature (3) Writing in French outside of France. Prereq: 212, 218 or equivalent.

420 French Cinema (3) French cinema from earliest days through New Wave. Prereq: 212, 216 or equivalent. May apply toward major.

422 Advanced Grammar (3) Improving one's written French by studying basic and more refined structures of French language. Writing creative free-style compositions. Prereq: 342 or 345.

423-24 Advanced Conversation (1,1) Informal conversation with native speaker on contemporary topics. Stresses in-context contact rather than outside preparation. Prereq: 342 or 345. 2 hrs weekly.

425 Introduction to Descriptive Linguistics (3) Phonetics and phonemics, morphology and syntax. Types of languages, linguistic groups, dialects, and dialect geography. Application of descriptive linguistics—field linguistics, dialect study, its practical use in learning languages and in language teaching. Introduction to transformational grammar. Prereq: 6 hrs of upper-division English or 6 hrs of upper-division courses in a modern or ancient language (exclusive of German and French 301-62, courses in literature in translation, and general courses in Latin and Greek requiring no knowledge of these languages), or consent of department. (Same as German 425, Russian 425, Spanish 425, and Linguistics 426.)

426 Methods of Historical Linguistics (3) (Same as German 426, Russian 425, Spanish 426 and Linguistics 426.)

429 Romance Linguistics (3) Development of Classical Latin through Vulgar Latin into major Romance languages. (Same as Spanish 429 and Linguistics 429.)

430 Theatrical French (2-3) Performance in one or more French plays. Prereq: 212, 218 or equivalent and consent of instructor. May apply toward major.

431 Highlights of French Civilization (3) Survey of French civilization from the Gauls to World War II. Historical events, daily life, all forms of arts. Prereq: 212, 218 or equivalent.

432 Contemporary French Culture (3) French contemporary civilization and culture since World War II. Problems, trends, and organization of French society today. Prereq: 212, 218 or equivalent.

500 Thesis (1-15) P/NP only. E

501 Techniques in Literary Analysis (2) Required for M.A. program. Intensive course in explanation de texte, a close stylistic analysis of texts representative of different eras and of different genres.

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time that is before degree is consented. May not be used toward degree requirements. May be repeated. S/NC only. E

512 Teaching a Foreign Language (2) Practical application of methods for teaching and evaluating basic language skills and foreign language skills, and cultural aspects through seminars, demonstrations, peer teaching, and observation of foreign language classes. Required of all M.A. and Ph.D. students holding Graduate Teaching Assistantships, except those whose previous training and experience warrants their being excused by department.

515-16 Bibliography and Methods of Research (2,2) Survey of critical research tools and scholarly contributions in French literature and language. Practical exercises in compiling of scholarly data.


531 French Literature of the 16th Century I (3) Literature of first half of 16th century. Rabelais and other prose writers, humanists, and poetry of Marot, Lyon- nais groups and contemporary. Prereq: 212, 218 or equivalent. Second half of 16th century, mature works of -lade writers and such poets, as d'Aubigné and Sponde; Montaigne, writers of scientific works and memorial- istic drama.

541 French Literature of the 17th Century I (3) French poems and prose works of 17th century.

542 French Literature of the 17th Century II (3) Classical French theatre of 17th century.

551-52 French Literature of the 18th Century: the Philosophes (3,3) Textual analysis of works of Vol-
taire, Diderot, Rousseau, and other major French 18th-century writers.

559 Problems in Linguistics: Romance Languages (3) Maximum 6 hrs with consent of department. (Same as Spanish 559 and Linguistics 559.)

561-62 Lyric Poetry of the 19th Century (3,3) Reading and interpreting great French romantic poets, Tarte pour l'amour, Parnassians, Charles Baudelaire and Manet.

571-72 Trends in Modern French Literature (3,3) In-depth study of some of most revolutionary, challeng-
ing poets, novelists, dramatists of 20th century.

581-82 The French Novel (3,3) French Novel from 17th through 20th centuries.

583 Problems in Stylistics (3) Survey of comparative English-French stylistics. Development and improve-
ment of one's written French.

584 Literary Criticism: The Foundations of Romance Criticism (3) Survey of critical ideas utilized over cen-
turies and applied to various types of literature.

591 Foreign Study (1-15) See page 31.

592 Off-Campus Study (1-15) See page 31.

593 Independent Study (1-15) See page 31.

594-95 French Directed Readings (3,3)

600 Doctoral Research and Dissertation (3-15) P/NP only. E

621-22-23 Seminar in French Literature (3,3,3) Semester when student uses University facilities and/or faculty time that is before degree is consented. May not be used toward degree requirements. May be repeated.

631-32-33 Seminar in French Literature (3,3,3) 631-32-33 Seminar in French Literature (3,3,3) 631-32-33 Seminar in French Literature (3,3,3) 631-32-33 Seminar in French Literature (3,3,3) 631-

633-18th Century; 633-19th Century; 633-20th Century. May be repeated with consent of department. Max-
imum 6 hrs each.

Italian

401 Dante and Medieval Culture (3) Introduction to significance of this great Italian writer. Prereq: 212 or consent of instructor.

402 Petrarch and Boccaccio (3) Prereq: 212 or consent of instructor.

403-04 Literature of the Rinascimento (3,3) From Pico to Tasso, Cinquecento and Quattrocento. Prereq: 212 or consent of instructor.

405 Modern Italian Poetry (3) From Pascoli to Montale. Prereq: Italian 212 or consent of instructor.

406 The Modern Italian Novel (3) From Manzoni to Calvino. Prereq: 212 or consent of instructor.

409 Directed Readings (3)

510-11 Readings in Italian Literature (3,3) Topics vary. May be repeated with consent of department.

512-13 Special Topics (3,3) Topics vary. May be repeat-
ed with consent of department.

591 Foreign Study (1-15) See page 31.

592 Off-Campus Study (1-15) See page 31.

593 Independent Study (1-15) See page 31.
Spanish

421 Phonetics (2) Prereq: 212, or 218 or equivalent.

422 Advanced Grammar (3) Finer points of grammatical structures. Required of all majors. Native speakers must receive consent of instructor. Prereq: 212, 218 or equivalent.

423-24 Advanced Conversation and Composition (3,3) Advanced conversational and written skills in Spanish for pre-professionals.

425 Introduction to Descriptive Linguistics (3) (Same as French 425, German 425, Russian 425, and Linguistics 425.)

426 Methods of Historical Linguistics (3) (Same as German 426, French 426, Russian 426, and Linguistics 426.)

429 Romance Linguistics (3) (Same as French 429, German 429, Russian 429, and Linguistics 429.)

592 Off-Campus Study (1-15) See page 31.

591 Foreign Study (1-15) See page 31.


579 The Spanish American Short Story (3) Short story by major writers in Spanish America from Romanticism to present day, theory and criticism of genre.

591 Foreign Study (1-15) See page 31.

592 Off-Campus Study (1-15) See page 31.

593 Independent Study (1-15) See page 31.

600 Doctoral Research and Dissertation (3-19) P/NP only. E

621-32 Seminar in Spanish Literature (3,3) Topics vary in field of Peninsular literature. May be repeated with consent of department. Maximum 9 hrs.

631-32 Seminar in Spanish American Literature (3,3) Topics vary. May be repeated with consent of department. Maximum 9 hrs.

Rural Practice

(College of Veterinary Medicine)

MAJOR

DEGREE

VETERINARY MEDICINE

D.V.M.

M. H. Shires, Head


See Veterinary Medicine for Program Description.

PROFESSIONAL COURSES

891 Clinical Rotations in Rural Practice (4) Clinical training in medicine, surgery, specialty disciplines and herd health of food animals and horses. Direct responsibility for diagnosis, patient care and treatment of clinical patients.

892 Clinical Rotations in Rural Practice II (4) Clinical training in medicine, surgery, specialty disciplines and herd health of food animals and horses. Direct responsibility for diagnosis, patient care and treatment of clinical patients.

893 Clinical Rotations in Rural Practice III (4) Clinical training in medicine, surgery, specialty disciplines and herd health of food animals and horses. Direct responsibility for diagnosis, patient care and treatment of clinical patients.
GRADUATE COURSES

500 Thesis (1-15) P/NP only. E

501 Special Topics in Large Animal Medicine and Surgery (1-4) May be repeated. Maximum 6 hrs. E

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

600 Doctoral Research and Dissertation (3-15) P/NP only. E

Russian
See Germanic and Slavic Languages

Social Work
(College of Social Work)

MAJOR DEGREES

Social Work----------------------- M.S.S.W., Ph.D.

Ben P. Granger, Head

Professors:
L. M. Beasley, Ph.D. Denver; M. H. Bloch, M.S. Ohio State; R. C. Bonovich, D.S.W. Washington (St. Louis); G. W. Fryer (Emeritus), Ed.D. Columbia; C. A. Glisson, Ph.D. Washington (St. Louis); B. P. Granger, Ph.D. Brandeis; H. Hirayama, D.S.W. Tennessee; M. K. Mullins, Ph.D. Chicago; R. M. Noee, D.S.W. Tulane; B. Orchard (Emeritus), M.S. Western Reserve; J. D. Orten, D.S.W. Alabama; H. Rubenstein, Ph.D. Chicago.

Associate Professors:
R. S. Avery, Ph.D. Brandeis; W. J. Bell, D.S.W. Tulane; M. Cetingok, Ph.D. Washington (St. Louis); C. T. Cruthirds, D.S.W. Tulane; G. Fayer, Ph.D. Michigan; A. E. Moses, D.S.W. California (Berkeley); R. B. Rowen, Ph.D. Arizona; N. P. Tate, Ph.D. Brandeis; H. H. Vaughn, Ed.D. Memphis State; A. R. Wachter, M.S.S.W. Tennessee; C. S. Wilks, Ph.D. St. Louis; P. G. Zarbock, M.S.S.W. Wisconsin.

Assistant Professors:
P. M. Campbell, D.S.W. Alabama; J. W. Charing, Ph.D. Peabody; J. C. Collier, M.S.W. Tulane; I. C. Faust, M.S.S.W. Tennessee; A. R. Ford, M.S.W. Atlanta; V. A. Gates, M.S.S.W. Tennessee; J. Jennings, Ph.D. Michigan; D. C. Johnston, M.S.W. California (Berkeley); N. Lunn, M.S.S.W. Tennessee; M. P. Strong, M.S.W. Tulane.

THE MASTER'S PROGRAM

The Master of Science in Social Work program prepares social workers to provide professional leadership in: 1) the direct provision of social work practice and 2) social welfare administration and planning. These objectives are met through a curriculum requiring of all students a professional foundation and a concentration in either social work treatment or social welfare administration and planning.

Admission Requirements

Admission to the professional curriculum is based on the following requirements:

1. A Bachelor's degree from an accredited college or university with some preparation in the social sciences. At least three-fourths of the applicant's undergraduate work should be in the social sciences, humanities, physical sciences, and other liberal arts subjects. Those with other academic backgrounds may request consultation regarding ways in which they might be admitted.

2. A grade point average of 2.5 on a 4.0 scale, with those falling below this average considered for provisional admission on the basis of supplemental evidence of ability to perform at a satisfactory level.

3. Personal qualifications acceptable for entrance into the professional practice of social work.

Preference is given to applicants with a B average in undergraduate work and substantial preparation in the social sciences. Applications should be filed no later than March 1 for the year in which admission is desired.

Advanced Standing

The University of Tennessee College of Social Work has an advanced standing program. Admission to advanced standing requires:

1. A grade point average of 3.0 or above (on a 4.0 scale) in undergraduate work.

2. An undergraduate major in social work or a combination of social work and social welfare administration and planning.

3. Passing a qualifying examination administered by the College of Social Work faculty.

Specific information about the advanced standing program is available from the college. Application for admission to the advanced standing program is through the regular admission process.

Extended Study

Planned part-time programs are available in all three branches of the college. Admission requirements are the same as for full-time study. Course work can be completed over a three- or four-year period. One year of the student's period of study must be on a full-time basis.

General Requirements

1. A minimum of 54 semester credit hours including a) administration and foundation courses and field practice (15 hours), b) the course Social Work with Oppressed Populations (2 hours), and c) at least five courses (15 hours) and three semesters of field (16 hours) in the social work treatment concentration or at least four courses (12 hours) and three semesters of field (16 hours) in the social welfare administration and planning concentration.

2. Students may select a thesis or non-thesis option. Those students pursuing the thesis option receive 6 credit hours for successful completion of a thesis. Successful completion of an oral comprehensive exam or thesis defense.

3. An overall GPA of 3.0 or better on all graded courses and satisfactory performance in field.

The Professional Curriculum

The professional curriculum is a 15-semester hour sequence of five basic areas required of all students before entering either of the concentration programs. As the initial phase of the educational program, the foundation curriculum contributes to the process of professional identification while presenting a comprehensive and broad knowledge base from which to operate in the future as practitioners, supervisors, administrators, and planners.

Upon completion of the foundation curriculum (at the beginning of the second semester), students select a concentration in either social work treatment or social welfare administration and planning.

Social Work Treatment:
The social work treatment concentration provides the educational basis for practice with individuals, families, and groups in order to enhance their social functioning, ameliorate problems, and prevent social dysfunction. The specialization provides knowledge of the theory and methodology basic to varied individual, family, and group methods applicable in the treatment of diverse client problems.

Social Welfare Administration and Planning:
The social welfare administration and planning concentration provides the educational basis for leadership in the design, implementation, and continued delivery of effective human service programs at local, regional, and state levels. This concentration emphasizes theory and skills related to administration and planning, and permits considerable flexibility in tailoring a program to fit the student's individual interests, capabilities, and career goals.

Field Practice

Field instruction is a critical component of the student's first- and second-year program. Through cooperation with a wide range of social agencies and human service programs throughout Tennessee and areas adjacent to the state, the college is able to provide field placements in a variety of social work practice areas. The faculty works closely with the placement agencies and the field instructors to ensure that students have quality field practice experiences, meeting the objectives of the core curriculum and the concentration.

The college uses a concurrent class and field plan. Students are in field two days per week during the first year and three days per week in the second year.

First-year agency placements are selected to provide a broad range of experiences related to the foundation curriculum content and beginning concentration. Within the placement, each student's experiences are planned and designed according to educational objectives.
Second-year placements are selected according to the student's area of concentration, individual career interests, and educational needs. The student actively participates in the practice coordinator and the concentration committee in selection of the second-year placement. The second-year field placement experience focuses on the integration of social work knowledge and values, and emphasizes the acquisition and development of skills.

Students are responsible for meeting the requirements of their placement agencies in terms of office hours and workload coverage. This responsibility takes precedence over scheduled University breaks and may result in variations in holidays and office hours for the student.

Transfer Credits
Course work equivalent to the first year of the Master's program, completed in another accredited graduate social work program, is usually accepted toward degree requirements. Applicants must meet the admission requirements of The Graduate School and the College of Social Work. Transfer courses must be approved as equivalent to required and/or elective courses taken for graduate credit and passed with a grade of B or better. S/NC credit earned for the field practice is also accepted. In addition, transfer courses must be part of an otherwise satisfactory graduate program (B average) and be approved by the dean. This course work must be completed within the six-year period prior to the receipt of the degree.

A maximum of 6 semester credits from work earned in disciplines other than social work may be transferred as elective credits. The student's academic committee must approve the request and the transfer credit must meet Graduate School requirements.

Proficiency Examination
Students in the Master's program may earn a maximum of nine hours by proficiency examination, with the exception of field practice courses. Students interested in proficiency examinations are referred to The Graduate School for a form describing the procedure for applying for examination.

THE DOCTOR(7,13),(991,990)
561 Supervision and Consultation in Social Work (3) Roles, techniques, and practices of social work supervision and consultation. Prereq: Foundation or consent of instructor.

562 Social Work and Black Families (3) Historical and contemporary theories about black family systems. Development of frameworks to assess and plan for black families within their service delivery systems. Prereq: Foundation or consent of instructor.

563 Social Aspects of Illness (3) Social, economic, and emotional problems arising from or related to illness and disability and their implications for social work. Prereq: Foundation or consent of instructor.

564 Substance Abuse (3) Survey and analysis of social, cultural, medical and psychological factors underlying alcoholism and drug abuse and addiction; recent research and treatment innovations. Prereq: Foundation or consent of instructor.

565 Roles and Status of Women (3) Causes and consequences of women's social and economic roles and statuses in American society. Variations in women's experiences by race and ethnicity, class, age, and life-cycle. Prereq: Foundation or consent of instructor.

566 Social Gerontology (3) Physical, psychological and social aspects of aging. Major social policies and programs. Prereq: Foundation or consent of instruc-

570 Advanced Standing (12) Twelve-week program providing qualified students with intensive academic and field experience to cover first year of graduate study upon successful completion of term. S/NC only. Su

580 Field Practice (3) Instruction and supervision in social work practice. Prereq or coreq: 512. S/NC only. E

581 Field Practice (4) Instruction and supervision in social work practice, student's selected concentration in social work treatment or social work administration and planning. Prereq: Foundation. S/NC only. Sp

582 Field Practice (6) Instruction and supervision in social work treatment or social welfare administration and planning. Prereq: Foundation, 581. Prereq or coreq: Treatment: 520, 524. S/NC only. F

583 Field Practice (8) Instruction and supervision in social work treatment or social welfare administration and planning. Prereq: 582. S/NC only. Sp

584 Field Practice (2-6) Instruction and supervision in social work practice. Prereq or coreq: 512. May be repeated. S/NC only. E

593 Independent Study (3-15) P/NP only. E

600 Doctoral Research and Dissertation (3-15) P/NP only. E

610 Research for Social Work Practice I (3) Epistemological and methodological considerations for both quantitative and qualitative research for social work practice. F

620 Research for Social Work Practice II (3) Epistemological and methodological considerations for both quantitative and qualitative research for social work practice. Sp

604 Research in Social Service Settings (3) Advanced research, under faculty supervision, of practice issues in community agency. Prereq: First year required Ph.D courses or consent of instructor. Prereq or coreq: Treatment: 520, 524. S/NC only. Sp


613 Social Work Practice and Its Social Context II (3) Critical analysis of knowledge bases of major practices in administration and planning. Sp

640 History of American Social Work (3) Social, cultural, economic and political contexts for development of social work profession, development of education for profession, and modern welfare system. F

660 Issues in Social Work Knowledge Building (3) Advanced seminar in theory and model building in direct intervention, administration and planning. Prereq: First year required Ph.D courses or consent of instructor. May be repeated. Maximum 9 hrs. F,Sp

693 Directed Study in Social Work Research (3) Advanced individual study under faculty guidance, of social work practice issues. Prereq: First year required Ph.D courses or consent of instructor. May be repeated. Maximum 9 hrs. F,Sp

Sociology (College of Liberal Arts)

MAJOR

DEGREES

Sociology ................. M.A., Ph.D.

Thomas C. Hood, Head

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

Associate Professors:

The Sociology Department offers graduate study leading to the Master of Arts and the Doctor of Philosophy. The M.A. program includes a thesis and non-thesis option. The graduate program has concentrations in criminology; energy, environment, and resource policy; and political economy. The criminology concentration includes 505, 551, 653, and 655. The energy, environment and resource policy concentration includes 560, 561, 562, 563, and 663. The political economy concentration includes 504, 540, 541, 643, 644, and 645. Both the Master's and the doctoral program allow for the construction of individualized programs of study. Detailed information may be obtained from the Director of Graduate Studies in Sociology. All incoming students will be advised by the Director of Graduate Studies.

ADMISSION REQUIREMENTS
1. Acceptable scores on the general Graduate Record Examination (GRE scores in sociology are requested but not required).
2. Three letters of recommendation (forms may be obtained from the department).
3. Completion of the appropriate previous degree (baccalaureate, preferably with a major in one of the social sciences, for the M.A. program; Master's degree in one of the social sciences for the doctoral program).

THE MASTER'S PROGRAM

Thesis Option
A total of 30 hours, including 24 hours of course work and 6 hours of Thesis 500, is required for the Master of Arts degree in Sociology. The dissertation option is also available for those students who wish to pursue advanced study toward a Ph.D. degree in Sociology.
required. Students are strongly encouraged to complete 3-6 hours of theory (521, 622), 6 hours in methodology (531, 534), and 6 hours in statistics (535-36). Non-thesis students may select one of two plans: Plan 1 (concentration and secondary area) or Plan 2 (special studies).

Plan 1: A final written examination in one of the department's concentrations is required. The student must complete 3 hours of theory (521, 531, 534), and 6 hours of statistics (535-36). Non-thesis students may select one of two plans: Plan 1 (concentration and secondary area) or Plan 2 (special studies).

Plan 2: The student must complete a special course of studies, subject to the approval of the student's committee and the Graduate Program Committee. A final written examination in the area of specialization is required. Subject to approval by the student's committee, up to 12 hours may be taken in courses outside the department for either program.

THE DOCTORAL PROGRAM

Course Work
Forty-eight hours of course work beyond the baccalaureate degree are required (exclusive of S/NC credits). Students who enter the program without the courses recommended for the M.A. program (521, 531, 534, 535-36) or equivalents are required to take remedial work beyond the minimum course requirements. Completion of 622 is recommended. Completion of nine hours in each of two concentrations is encouraged. A student who cannot achieve his/her educational goals within the department's concentrations may construct an individualized course of study subject to the approval of the student's doctoral committee and the Graduate Program Committee. Twelve hours of course credit in sociology at the 600 level is required. Sociology courses at the 400 level may not be taken without the consent of the student's advisor and the Graduate Program Committee. Six hours may be taken in related fields without petitioning the Graduate Program Committee for approval. The student's program may include a minor or cognate field.

Comprehensive Examinations
Written examinations in four areas are required (theory, methodology, and two substantive areas). Doctoral students are eligible to take the theory and methodology examinations whenever offered. Substantive examinations may be taken upon completion of theory and methodology examinations, specializations within concentration, or other areas of specialization. Detailed information on examinations may be obtained from the department.

Dissertation and Final Examination
A dissertation based on original research must be completed (24 hours). The candidate must pass a final defense of the dissertation, including the theory and methodology related to the research, in accordance with the deadlines specified by The Graduate School.

405 Sociology of Sport (3) Social meaning, organization, and process of sport. Prereq: 291 or consent of instructor. (Same as Physical Education 405.)
413 Formal Organization (3) Analysis of organizational models, typologies, and theories; hierarchies of authority; communication; interpersonal relations in work settings; organizational change.
414 Organization of Medical Care (3) Organization of health care facilities, staff-patient relationships, demographic characteristics, and prevalence of disease.
415 Sociology of Aging (3) How roles and statuses change with the aging process to major social institutions; impact that rapidly increasing number of older people has on society, effect of society on older people.
446 The Modern World System (3) Critical examination of capitalistic world-system as social system, its coherence, boundaries, regions, member groups, cleavages, and patterns of conflict. Analysis of who gets what, why, and how in global political economy.
455 Society and Law (3) How laws and legal processes are affected by social change, social impact of legal sanctions, relations between law and social justice.
459 Organizational and Corporate Crime (3) Analysis and intentional for-profit organizations, and government and non-profit organizations. Case studies of corporate and organizational crime, organizational dynamics of crime, theories of corporate crime, and organized responses to this type of crime by governmental regulatory agencies.
462 Populations (3) Demographic factors and social structure; trends in fertility, mortality, population growth, migration, distribution, and composition; population policy.
464 Urban Ecology (3) Relation of humans to their urban environment: conservation and use of appropriate technology. (Same as Urban Studies 464.)
471 Sociolinguistics (3) (Same as English 471 and Linguistics 471.)
480 Diffusion of Agricultural Technology (3) (Same as Rural Sociology 480.)
500 Thesis (1-15) P/NP only. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. SYNC only. E
504 Sociological Foundations of Political Economy (3) Survey of contemporary sociological theories of political economy, sources of political and economic power and conflict.
505 Foundations of Criminology (3) Critical overview of contemporary developments in criminology, theories of crime causation and theories of responses to crime. Prereq: 350 or equivalent.
507 Foundations of Social Psychology (3) Current and classical theoretical perspectives in social psychology.
510 Teaching Sociology (3) Art and craft of teaching sociology from curricular to course and classroom teaching techniques. May be repeated. Maximum 6 hrs.
521 Sociological Theory I (3) Assessment of what sociological theory is, its major figures and their approaches to understanding society.
531 Research Methods in Sociology (3) Research design, measurement, sampling, quantitative and qualitative data collection techniques, data, reduction, and analysis.
534 Advanced Sociological Analysis (3) Underlying assumptions and logical procedures used by sociologists in formulating explanations; foundations of sociological research strategies and techniques.
535-36 Statistical Analysis I and II in Sociology (3,3) Should be taken in sequence. 535—Data reduction, exploratory data analysis, general linear model, 536—Sampling, inferential statistics, based on general linear model, introduction to multi-variate analysis. Prereq: Statistics 201 or consent of instructor.
540 Occupations (3) Occupations in relation to individuals and society, technology, economic stratification, and social organizations.
541 Collective Behavior, Social Movements, Social Change (3) Basic theory and research on conditions of social unrest in human collectivities and efforts of collectives to change existing society.
542 Sociological Aspects of Sports and Physical Education (3) (Same as Physical Education 542.)
551 Delinquency and the Social Structure (3) How study of delinquency and juvenile justice is affected by changing social structures of childhood and adolescence, changing demographic and institutional influences, and changing views about responsibility and punishment.
560 Environmental Sociology (3) Systematic treatment of current research in environmental sociology. Social impact analysis and conflicts over environmental issues.
563 Demographic Techniques (3) Standard rates and measures of demographic variables, life table analysis, increment-decrement models, and survey techniques of population analysis.
580 Advanced Rural Sociology (3) (Same as Rural Sociology 580.)
591 Foreign Study (1-15) See page 31.
592 Off-Campus Study (1-15) See page 31.
593 Independent Study (1-15) See page 31.
594 Social Theories of Sport (3) (Same as Physical Education 515.)
595 Special Topics in Rural Sociology (1-3) (Same as Rural Sociology 593.)
598 Readings (3) Selected topics. May be repeated. Maximum 6 hrs.
600 Doctoral Research and Dissertation (3-15) P/NP only. E
611 Complex Organization (3) Selected topics in formal organizations: cases and incident process analysis: examines strategies for dealing with organizational change, authority hierarchies, communication patterns; technology and organizational structure; job satisfaction, motivation, morale and interpersonal phenomena.
622 Sociological Theory II (3) Distinct schools of sociological theory and contributions of their principal exponents. Prereq: 521 or consent of instructor.
629 Supplementary Readings in Sociological Theory (3) Individual guidance. Preparation for comprehensive examination. Prereq: Consent of instructor. S/NC only.
633 Survey Design and Analysis (3) Systematic exploration of survey problems through student participation in design and analysis of survey. Prereq: 531 or consent of instructor.
Spanish
See Romance Languages

Special Programs
(College of Liberal Arts)

Lynn Champion, Director

The following courses are restricted to participants in the James R. Stokely Fellows Program in the College of Liberal Arts. Selection of participants is based on academic ability, references, an application essay, and a personal interview. Secondary school teachers, administrators, guidance counselors, and librarians may apply. For additional information, contact the program director.

510 Perspectives in the Liberal Arts (2) Seminar on nature and development of liberal arts through study of formative tests and critical figures, Bible, Plato, Descartes, Milton, Darwin, Freud, Marx.

520 Inquiry in the Liberal Arts (2) Seminar on nature of creative inquiry in liberal arts and sciences; an overview of pivotal issues within and between disciplines pertinent to identifying and solving problems related to personal and social progress.

530 Learning in the Liberal Arts (2) Builds upon readings, presentations, and discussions of 510 and 520 by reflecting on them in distinct but related contexts—classroom, region called Appalachia, and perspectives and experiences associated with liberal arts.

Special Services Education
(College of Education)

MAJORS

DEGREES

Special Education ..................................................... M.S.
Rehabilitation Counseling ....................................... M.S.
Education ............................................................... Ph.D.

Laurence J. Coleman, Head

Professors:

Associate Professors:

Assistant Professors:
J. D. McLean, Ph.D. Chicago; K. M. Warden, Ph.D. Tennessee.

Instructors:
D. H. Ashmore, M.S. Tennessee; M. Griffin, M.S. Tennessee; G. D. Tyler, M.S. Tennessee.

Lecturer:
H. L. Byrd, Jr., M.S. Tennessee;

The Department of Special Services Education offers graduate programs leading to the Master of Science with a major in Special Education, or in Rehabilitation Counseling. The department also participates in the Doctor of Philosophy program in Education as described under Education. A new curricular area, Human Services, has joined the department and the faculty will share in teaching cross-disciplinary courses in special education and in rehabilitation.

THE MASTER'S PROGRAMS
The Master's program in Special Education offers concentrations in the following areas: 1) hearing impaired; 2) gifted; 3) learning disabilities; 4) mental retardation; 5) multiple disabilities; 6) socially or emotionally maladjusted; and 7) general special education.

Teacher certification can be obtained while working toward the Master's degree. Course offerings are available that lead to general special education teacher certification and to certification to teach hearing impaired children.

The Rehabilitation Counseling program enables counselors to acquire competencies which facilitate the movement of a person with disabilities toward optional functioning in the three broad areas of living, learning, and working. The rehabilitation counselor works primarily with adults who are being served in various public and private settings. Students should expect to spend a minimum of four semesters, including summer, in classwork and in internships.

Both majors have a thesis and non-thesis option. If a student elects to do a thesis, the Master's program will contain a minimum of 30 semester hours including 6 hours of Thesis 500. Eighteen semester hours in special education course work is required. The non-thesis option requires a minimum of 24 semester hours total with a minimum of 18 in special education. In the non-thesis option, a final written comprehensive with an oral examination is required.

ADDITIONAL PROGRAMS
Under the sponsorship of the Office of Special Education and Rehabilitative Services (R.S.A.), a specialized institute for the preparation of professionals to adapt their skills toward services to hearing impaired and deaf people is provided.

Details concerning each program can be obtained by writing to the department head.

Special Education
410 Pre-Internship Seminar (1) Orientation, objectives and policies of internship program. Must be completed term immediately preceding internship. Prereq: Admission to teacher education program. S/NC only. Sp,Su

423 Communication Processes for the Hearing Impaired (3) Expressive and receptive vocabulary development in sign communication. Fingerspelling and educational applications of sign language.

424 Nature of Hearing Impairments (3) Basic principles of audiology; anatomy and physiology of hearing; nature and causes of hearing loss; methods and instrumentation for assessment of hearing level; interpretation of audiologic services to medical and other rehabilitative disciplines.

425 Introduction to the Psychology and Education of the Hearing Impaired (3) Primarily for those planning to teach hearing impaired. Overview of research related to psychology, social adjustment, communication methodology, language development and education of hearing impaired. Survey of literature. Visits to programs. (Same as Audiology and Speech Pathology 425.)

433 Clinical Practice in Speech-Language Pathology I (1-4) (Same as Audiology and Speech Pathology 433)

434 Clinical Practice in Speech-Language Pathology II (1-4) (Same as Audiology and Speech Pathology 434)

440 Voice Disorders (3) (Same as Audiology and Speech Pathology 440)

451 Psychology and Education of the Mildly Handi-
Speech Communications

(College of Liberal Arts)

Professors:


Associate Professors:

M. L. Ambrester, Ph.D. Ohio State; 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.

Graduate courses in Speech Communications provide opportunities for students in a variety of disciplines to investigate how oral language can effect changes in the knowledge, the understanding, the ideas, the attitudes, or the behavior of other human beings.

420 Communication and Conflict (3) Communication as significant factor in development, management, and resolution of conflict at interpersonal, small group, organizational or societal levels.

440 Organizational Communication (3) Organizationally and participants of communication process that affect quality of human interaction both within and outside organization. May be repeated. Maximum 6 hrs.

460 History of Rhetorical Theory (3) Western rhetorical theory from Plato to present.

465 Studies in Rhetorical History and Criticism (3) Historical and critical study of public address. May be repeated. Maximum 6 hrs.

466 Rhetoric of the Women's Rights Movement (3) Historical and critical study of public address in campaign for women's rights from 1830's to present. (Same as Women's Studies 465.)

470 Theories of Argumentation (3) Studies of conceptual bases of argumentation from classical to contemporary theorists. Prereq: Consent of instructor.

480 Ensemble Interpretation (3) Study and presentation of literature texts through group performance.

500 Thesis (1-15) P/NP only. E

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

505 Fundamentals in Graduate Research in Speech (3) Techniques of historical, descriptive and experimental research.

510 Studies in Persuasion (3) Prereq: 310 or equivalent or consent of instructor.

530 Topics in Group and Interpersonal Communication (3) Prereq: 320, 330, 420 or consent of instructor. May be repeated. Maximum 6 hrs.

550 Communication Theory (3) Analysis of contemporary theories of human communication; similarities and differences of communication processes in interpersonal, intrapersonal, small group, organizational, and public communication. Prereq: 350 or equivalent or consent of instructor.
tactical applications of statistics. Through involvement in The University of Tennessee Institute for Productivity Through Quality and related programs, department faculty participate in a variety of consulting and research projects in cooperation with industry. Students may supplement their classroom study with an industrial internship and participation in research projects dealing with industrial problems. Collaborative research efforts by other department faculty with faculty from other fields, such as the College of Agriculture and the Knoxville Unit of the College of Medicine, provide the student with the opportunity to gain experience as a research assistant. All students are required to participate in supervised internship or consulting activities as part of their graduate program.

Individuals with undergraduate or graduate degrees in other disciplines are encouraged to enter the program. The candidate's mathematics background should include differential and integral calculus of several mathematics courses.

Part of their graduate program.

Students are required to participate in supervised internship or consulting activities as part of their graduate program.

Individuals with undergraduate or graduate degrees in other disciplines are encouraged to enter the program. The candidate's mathematics background should include differential and integral calculus of several variables. Individuals with limited mathematics background should seek departmental advice regarding specific ways in which they may prepare themselves for the program by taking course work as non-degree students. Requests for application forms and further information may be sent to the Director of Graduate Studies. Department of Statistics, Stokely Management Center, University of Tennessee, Knoxville, TN 37996-0532.

Curriculum

A minimum of 33 credit hours must be completed for the Master's degree. Required of all students are 6 hours in statistical methods, 6 hours in statistical theory, 1 hour in statistical computing, and 3 hours in approved statistics courses, exclusive of consulting, internship, independent study, or thesis.

Thesis or Independent Study

The thesis option for the Master's degree requires the student to complete 6 hours for the thesis. Alternatively, the non-thesis option requires a minimum of 3 hours for an independent study project. A maximum of 9 thesis hours may be applied toward the M.S. degree.

Comprehensive Examination

Students must pass a written comprehensive examination covering statistical methods and theory. For students writing a thesis, this examination must be passed before the thesis is defended.

INTERCOLLEGIATE GRADUATE STATISTICS PROGRAM

The Intercollegiate Graduate Statistics Program is a formal University of Tennessee academic program established to recognize graduate students for completing the requirements of a major or minor in Statistics or a graduate program. The program enables a student to obtain the M.S. in Statistics alone or simultaneously with the Ph.D. or Ed.D. in another department. The program also enables a student to obtain a Statistics minor along with the M.S., Ph.D., or Ed.D. in another department. The program is administered by an executive committee with advisory input from the program faculty. The program is open to well qualified graduate students in all departments which have an approved Statistics minor and/or joint major curriculum offered through the program. Curriculum requirements for the statistics component of the joint degree are specified in terms of completion of alternative sequences of course options. Course options consist of courses in statistics, offered either by the Department of Statistics or by other departments, that have been reviewed and approved by the Executive Committee. Interested students should contact their major department head for information on specific course requirements.

General Admission Requirements

1. The student's sponsoring department must have established with the executive committee an approved joint degree program along with specified sequences of statistics courses taught by the Statistics Department and/or other departments.

2. The student's Admission to Candidacy form must contain all courses required for the Statistics minor/major set off in a group and labeled 'Statistics courses required for the minor/major'.

3. In many cases, a student may not decide to apply for participation in the program until he/she has completed two or three statistics courses. In that case the student's major professor should file a program change with the cooperating departments and assist the student in obtaining a Statistics Department faculty member to serve on the student's committee.

Degree Requirements

The program offers the M.S. in Statistics with a minor in another department, a joint major program in which the student earns a Master's or doctoral degree in the student's sponsoring department along with the M.S. in Statistics, and a joint major and minor program in which the student earns a Master's or doctoral degree in the student's sponsoring department along with a minor in Statistics. The table below presents the minimum number of semester hours in statistics for each of these alternatives. Students will select courses to satisfy the requirements established by the student's sponsoring department and approved by the Program Executive Committee.

Degree Program: Hours
M.S. in Statistics, minor outside of Statistics 21
M.S. outside of Statistics, minor in Statistics 28
M.S. outside of Statistics, both degrees Doctorate outside of Statistics,*** minor in Statistics 16

411 Introduction to Statistical Computing (3) Use of computer operating system commands and packaged programs for statistical analysis and management. Not available for credit for statistics majors. Prereq: 201 or 251.


500 Thesis (1-15) P/NP only. E.

501 Statistics for Management (3) Fundamentals of descriptive and inferential statistics. Introduction to probability models, statistical inference: statistical process control, correlations and regression, time series. Open only to M.B.A. students.

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when user has University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E.

531 Statistical Methods for the Social Sciences I (3) Probability distributions, sampling distributions, parametric and nonparametric estimation and hypothesis testing, simple linear regression and correlation. Credit not given for both 531 and 537. Prereq: 1 yr college mathematics and 1 course in statistics.

532 Statistical Methods for the Social Sciences II (3) Multiple regression and correlation, use of dummy variables, general linear model, analysis of variance and covariance. Prereq: 531.

537 Statistics for Research in the Behavioral and Biological Sciences I (3) Principles and applications of statistical methodology, integrated with considerable use of major statistical computing system. Probability and probability distributions, forming and testing hypotheses using parametric and nonparametric inference methods. Matrix-based simple linear regression and correlation. Career in research. Credit not given for both 531 and 537. Prereq: 1 yr undergraduate mathematics and 1 undergraduate statistics course.

538 Statistics for Research in the Behavioral and Biological Sciences II (3) General linear model as applied to multiple regression and analysis of variance. Diagnostic and influence techniques. One-way, factorial, blocking, and nested designs, preplanned versus post-hoc contrasts. Random factors and repeated measures. Prereq: 537.

561 Introduction to Computing for Data Management and Analysis (1) UTK computing environment for beginning graduate students. Operating system commands, system editor, utility programs and major statistical packages, SAS, IBM, CMS, and MVS. Use of microcomputers for statistical analysis. Coreq: 531, 537, or 571, or consent of instructor.

654 Theory of Statistical Inference (3) Introductory theory underlying common statistical procedures of hypothesis testing and estimation. Prereq: 563.

656 Statistical Techniques in Industrial Processes (3) Applications of control charts and other techniques of statistical process control. Attributes and variables quality control, process capability analysis, aspects of sampling, statistical tolerancing, estimation of variance components, problems of measurement, special industrial applications. Prereq: 571 or equivalent.


572 Applied Linear Models (3) Simple and multiple linear regression using matrix algebra and general linear model: polynomial regression, weighted least squares regression, variable selection techniques, multicollinearity, regression diagnostics; general linear model approach to analysis of data from designed experiments. Use of standard computer packages. Prereq: 571 and matrix algebra.

573 Design of Experiments (3) One-way ANOVA, multiple range tests, equal and unequal variances, transformations, factorial experiments, completely randomized designs, analysis of covariance, split-plot and nested designs, fractional factorials, sequential designs. Prereq: 571.

585 Principles of Statistical Process Management (3) Control charts and other statistical techniques applied to management of business processes. Prereq: Consent of department head.

587 Graduate Seminar (1) Directed readings and active participation in colloquium program of Department of Statistics and of student's minor program. Prereq: Consent of statistics department director of graduate studies. May be repeated. Maximum 2 hrs. S/NC only.

592 Internship (1-6) Supervised off-campus experience in business, industry, or government. Written and oral report. Prereq: 4 courses in graduate-level statistics and permission of department director of graduate studies. May be repeated. Maximum 6 hrs. S/NC only.

593 Independent Study (2-4) Faculty directed readings and investigations of specified topic in probability or statistics. Written report and oral presentation. Prereq: 2 courses in statistics and consent of the statistics department director of graduate studies. May be repeated. Maximum 6 hrs. S/NC or letter grade.

595 Statistical Consulting Practicum (1-4) Supervised experience helping on-campus researchers plan, manage data, and develop and perform analyses specific to designs and hypotheses. Discussion of activities in regular seminar meetings. Written reports and/or detailed diaries. Prereq: 572 or 538. May be repeated. Maximum 4 hrs. S/NC or letter grade.


673 Linear Models (3) Review of full rank models and models not of full rank with application to unbalanced designs. Estimable functions, b.l.u.e., linear hypothesis testing, reductions in sums of squares, least squares means, mixed model equations, methods of variance component estimation from unbalanced data. Prereq: Analysis of variance.

675 Categorical Data Analysis (3) Log-linear analysis of multidimensional contingency tables. Logistic regression. Theory, applications, and use of statistical software. Prereq: 1 yr graduate-level statistics, regression analysis and analysis of variance and familiarity with CMS or VAX or consent of instructor.

681 Special Topics in Probability (1-3) Presentation of specialized topics in probability and stochastic processes. May be repeated. Maximum 6 hrs.

683 Special Topics in Statistics (1-3) Presentation of specialized topics in statistics. May be repeated. Maximum 6 hrs.

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**Technological and Adult Education**

(College of Education)

### MAJORS

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<tr>
<th>DEGREES</th>
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<tbody>
<tr>
<td>Adult Education</td>
<td>M.S. Business Education</td>
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<td>Business Education</td>
<td>M.S. Industrial Education</td>
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<tr>
<td>Vocational-Technical Education</td>
<td>M.S., Ed.S., Ed.D. Education</td>
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**Professors:**

- W. A. Cameron, Ph.D. Ohio State
- C. P. Campbell, Ed.D. Maryland
- G. D. Cheek, Ph.D. Kansas State
- B. C. Coakley (Coordinator, Marketing Education), Ed.D.
- R. W. Haskell (Coordinator, Industrial Education), Ph.D.
- J. I. Matthews, Ph.D. Arizona State
- K. O. McCullough, Ph.D. Florida State
- J. M. Peters (Coordinator, Adult Education), Ed.D.
- N. C. Pottington, M.S. Oklahoma State
- G. A. Wagoner (Emeritus), M.S., Indiana
- G. W. Wiegert, Jr., Ed.D. Missouri
- R. J. Woodin (Emeritus), Ph.D. Ohio State

**Associate Professors:**

- E. Brewer, Ed.D. Tennessee
- R. Hanson, Ph.D. Purdue
- G. K. LaBorde, Ed.D.
- T. J. Ledford, Ed.D. Tennessee
- E. C. Mann, Ed.D. Pennsylvania State
- G. C. Petty, Ph.D. Missouri
- B. J. Redciff, (Coordinator, Business Education), M.S.
- West Virginia

**Assistant Professors:**

- R. Pierce, Ph.D. Ohio State
- T. L. Powell, M.S. Oklahoma
- C. W. Wright, M.T. Arizona State

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### THE MASTER'S PROGRAM

The Department of Technological and Adult Education offers programs leading to the Master's degree in Technological-Technical Education, Adult Education, Business Education, and Industrial Education. Each of the degrees has two options: a thesis option requiring a minimum of 33 hours and a non-thesis option requiring a minimum of 36 hours. The Technological-Technical Education major is available with concentrations in business and office education, distribution and marketing education, industrial education, industrial training, and technical education. Details and specific requirements for the various degree options may be obtained from the coordinators of the service areas.

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**THE DOCTORAL PROGRAM**

The Ed.D. program is a cooperative undertaking involving all vocational service areas. Concentrations are available in industrial, business, marketing and distributive, home economics, industrial, and technical education, and in general vocational education.

The degree requires a minimum of 80 hours of graduate study. Credits earned for the Master's degree may meet program requirements in the courses which contribute to the program objectives of the candidate. A major core of studies offers advanced concepts in technological and adult education.

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**THE DOCTORAL PROGRAM**

The comprehensive Ed.D. program in the department is designed to provide opportunities for graduate students to achieve professional objectives, develop needed competencies, and gain desirable experiences and understanding of technological and adult education.

The minimum requirements in the doctoral program consist of the following: departmental specialization, 12 hours; departmental core and electives, 21 hours; cognate field, 9 hours; professional education core, 9 hours; research techniques, 12 hours; and dissertation, 24 hours. A minimum of 90 hours above the baccalaureate is required.

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**401 Utilization of Community Resources (3)** Strategies of developing linkages between vocational education and private sector through advisory councils, committees, and working partnerships. Development and management of public relations programs. Prereq: 3 yrs teaching experience. Sp.

**415 Coordination Techniques (3)** Necessary procedures, duties and responsibilities to implement, maintain, and evaluate successful cooperative education program. Prereq: Senior standing and consent of instructor. Sp.

**430 Principles and Organization of Business and Marketing Education (3)** Historical background and development needs. Principles of vocational education in business and marketing, curriculum implications; establishing, evaluating, and improving programs. Sp.

**432 Methods and Materials in Business and Marketing Education (3)** Teaching techniques, and evaluation in subject matter fields. Prereq: Consent of instructor. F,Su

**436 Supervised Occupational Experience (3)** Practica field experience in business and marketing settings under supervision of practitioner and departmental representative. May be repeated. Maximum 9 hrs.

**435 Areas of Marketing (3)** Marketing, personnel development, operations, and management as affects instructional program in marketing education. Prereq: 432. F,Su

**454 Training Aids Development (3)** Study and preparation of instructional aids and non-print media commonly used by technical instructors and trainers. Prereq: Senior standing or consent of instructor. F,Su

522 Adult Development (3) Changes in characteristics of adults over lifetime. Prereq: Consent of instructor. F,Su

523 Post-Secondary Education for Adults (3) History, evolution, philosophy, structure and functions of post-secondary, sub-university institutions, their programs and clientele. Prereq: Consent of instructor. Sp,Su

524 Continuing Professional Education (3) Theories and concepts supporting design and management of educational programs for adults in professions. Prereq: 510 or equivalent. F,Su

530 Methods and Materials for VOE Programs (3) Development of instructional aids, recent developments and research, individualized instructional, and occupational clusters. Prereq: 510 or equivalent. Sp,Su

531 Organization and Supervision of VOE and Marketing Programs (3) Developing office and marketing occupations, guidelines in cooperative laboratory, and model office programs. Trends in office and marketing education, physical facilities, state plans, instructor qualifications and advisory committees. Prereq: Consent of instructor. F,Su

532 Improvement of Instruction in Basic Business and Marketing Education (3) Issues, research findings, methods and improved instruction in both secondary and post-secondary levels. Prereq: 12 hrs of graduate credit. Sp,Su

533 Improvement of Instruction in Office Technological Education (3) Issues, research findings and materials in typewriting, wordprocessing, business communications, and office procedures. Prereq: Consent of instructor.

534 Improvement of Instruction in Accounting and Data Processing (3) Principles of learning, issues, research findings and materials in basic accounting, automated accounting and data processing at secondary and post-secondary levels. Prereq: Consent of instructor. F,Su

535 Curriculum in Business and Marketing Education (3) Curriculum designs in career, secondary, post-secondary education, Legislation, technology, social, economic and political forces affecting the business and marketing education. Prereq: Consent of instructor. Sp,Su

536 Organizing and Teaching Adult Business and Marketing Education (3) Planning, organizing, promoting, teaching and evaluating continuing education programs in business and marketing education; utilizing trade associations, employment agencies, business groups, and advisory committees in program implementation. Prereq: 3 yrs teaching experience and consent of instructor. F,Su

537 Measurement in Business and Marketing Education (3) Testing and evaluation of learner performance in business and marketing education; teacher-made tests. Prereq: Consent of instructor. Sp,Su

540 Special Topics in Business and Marketing Education (3) Special topics, activities, and evaluations vary. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

541 Practicum in Business/Marketing Education (3) Practical updating and upgrading experiences in non-traditional settings for business and marketing teachers. Prereq: 15 hrs of graduate credit. E

542 Problems in Business and Marketing Education (3) Selective research problems in teaching of business and marketing education and related areas. Prereq: Consent of instructor. E

549 Administration of Industrial Education Programs (3) Developing, staffing, administering and evaluating trade, industrial and technical education programs in secondary and post-secondary school settings. Prereq: Consent of instructor. Sp,Su

551 Supervision of Industrial Education Programs (3) Techniques used to improve industrial education programs. Staff development, curriculum improvement, and program monitoring techniques. Prereq: 455 or equivalent. F,Su

552 History and Philosophy of Industrial Education (3) Social, political, and economic events that impact development of industrial education. Philosophical problems, justification, values, principles and concepts of industrial education. Prereq: Consent of instructor. F,Su

553 Planning Technical Education Facilities (3) Preparation of educational specifications, site selection, planning evaluation and implementation of special-purpose facilities. Prereq: Consent of instructor. Sp,Su

554 Technical Program Planning (3) Instructional systems and models for analysis, design, development, implementation, and evaluation of trade, technical supervision and related training. Prereq: Curriculum development course and consent of instructor. F,Su

555 Curriculum Planning for Industrial Education Programs (3) Developing and evaluating performance-based criteria and referenced institutional programs. Prereq: 374 or 554 or consent of instructor. Sp,Su

556 Staff Development Programs (3) Strategies for assessing, planning, and implementing programs for professional development of vocational-technical personnel. Prereq: 551 or consent of instructor. Sp

557 Advanced Methods of Teaching Technical Subjects (3) Proper selection and effective application of innovative methods and teaching strategies for teaching of technical subjects. Prereq: Consent of instructor. F,Su

558 Seminar in Industrial Education (3-15) Prereq: Senior residency. May be repeated. Maximum 15 hrs. F,Su

559 Evaluation of Technical Training Programs (3) Internal and external evaluation of training programs to maintain quality control and/or to justify revisions. Prereq: 455 and consent of instructor. F,Su

571 Supervisory Skills for Improving Industrial Productivity (3) Philosophy of improving industrial productivity through quality and introduction into basic tools of statistical process control. Deming philosophy of control charting and its impact on quality capability, techniques for training hourly workers in quality control, and measurement procedures for quality control. Prereq: Statistics course and consent of instructor. F,Su

572 Advanced Training Methods for Industrial Productivity (3) Techniques of training hourly workers in use of statistical process control tools. Techniques for involving hourly workers and supervisors in quality assurance, inventory control, and productivity improvement programs. Prereq: 571. Sp,Su

600 Doctoral Research and Dissertation (3-15) P/NP only. E

601 Curriculum Planning in Technological and Adult Education (3) Curriculum theory, models, contents, planning evaluation and implementation of specialized program areas. Prereq: 555 or equivalent. Sp,Su

602 Planning and Evaluation of Programs in Technological and Adult Education (3) Techniques utilized in planning, developing, and evaluating instructional programs. Prereq: 500-level planning course and consent of instructor. Sp,Su

604 Seminar in Technological and Adult Education (1-6) May be repeated. Maximum 3 hrs. S/NC only. E

605 Administration and Supervision of Technological and Adult Education (3) Leadership, policy, organization and planning, personnel, student development services, and budgeting relating to vocational, technical and adult education at secondary, post-secondary, and higher education levels. Problem solving, and management activities. Prereq: Administrative theory course and consent of instructor. F,Su

610 Research Development in Technological and Adult Education (3) Proposal development, theoretical base, research design, sampling, application of statistics, and evaluation of research in technological and adult education. Prereq: Statistics courses and consent of instructor. Sp,Su