551 Topics in the History of Foreign Relations (3) Reading seminar: secondary sources on foreign relations. Focus varies. May be repeated. Maximum 15 hrs.

552 Topics in Military History (3) Reading seminar: secondary sources on military history; military operations, social impact of war and naval strategy in foreign policy. May be repeated. Maximum 15 hrs.

554 Topics in Comparative Social and Economic History (3) Reading seminar: secondary sources on multi-societal topics in structured and focused discussions. Focus varies. May be repeated. Maximum 15 hrs.

555 Topics in United States Social and Economic History (3) Reading seminar: secondary sources on U.S. social and economic history. Focus varies. May be repeated. Maximum 15 hrs.

556 Topics in European Social and Economic History (3) Reading seminar: secondary sources on social or economic history of European nations. Focus varies. May be repeated. Maximum 15 hrs.

557 Topics in Cultural and Intellectual History (3) Reading seminar: secondary sources on cultural and intellectual history. Focus varies. May be repeated. Maximum 15 hrs.

558 Topics in United States Regional and Local History (3) Reading seminar: secondary sources on regions, states and cities of the South. Focus varies. May be repeated. Maximum 15 hrs.

561 Topics in Latin American History (3) Reading seminar: secondary sources in Latin America. Focus varies. May be repeated. Maximum 15 hrs.

562 Topics in Asian History (3) Reading seminar: secondary sources on Asian history; East Asia and Middle-East. Focus varies. May be repeated. Maximum 15 hrs.

566 Topics in U.S. Religious History (3) (Same as Religious Studies 566.)

571 Topics in Applied History (3) Seminar to develop practical skills applicable to museology, historical preservation, material culture, historical archives, historical editing, and other areas of applied history. Focus varies. May be repeated. Maximum 15 hrs.

580 Topics in History (3) Reading seminar: secondary sources for new topics. Focus varies. May be repeated. Maximum 15 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

621 Directed Readings (3) Directed readings to prepare candidate for doctoral comprehensive examination. May be repeated. Maximum 1 per doctoral field. S/N only.


658 Seminar in United States Regional and Local History (3) Research seminar in primary sources culminating in scholarly paper in regional and local history. Focus varies. May be repeated. Maximum 15 hrs.


680 Seminar in History (3) Research seminar in primary sources culminating in scholarly paper in aspect of history not covered in another 600-level research seminar. Focus varies. May be repeated. Maximum 15 hrs.

Home Economics

(College of Human Ecology)

MAJOR DEGREE

Home Economics .................................................. M.S.

The Master of Science with a major in Home Economics is a college-wide, multidisciplinary program. This degree provides a flexible graduate program for students wishing to pursue in-depth study subject areas of home economics/human ecology. Teachers, extension personnel, family life educators and other professionals interested in broad-based areas will find that a diversity of subject matter combinations can be tailored to meet individual needs.

ADMISSION REQUIREMENTS

A completed file for review includes a College of Human Ecology application, Graduate Record Examination (GRE) scores for the general section, and completion of three Graduate School Rating Forms by individuals who can attest to the potential for graduate education. Forms may be obtained from the Dean's Office, College of Human Ecology. The M.S. in Home Economics requires an undergraduate degree in Home Economics.

THE MASTER'S PROGRAM

The M.S. in Home Economics is designed to meet graduate study needs of professionals who work in programs encompassing all areas of home economics. Thesis (33 hours) and non-thesis (36 hours) options are offered. The program includes 3-6 hours in research methodology, 6-9 hours in program planning and implementation (agricultural extension, home economics education, other areas of education), 3 hours in the integrative nature of home economics, and 12-15 (thesis) to 15-18 (non-thesis) hours in the College of Human Ecology. At least one course is to be from each department in the college. The non-thesis option requires a practical application component and a comprehensive examination will be administered at the end of the program.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. program in Home Economics is available to residents of the state of South Carolina. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

Home Economics Education

(College of Human Ecology)

Students pursuing graduate study in home economics education or extension are encouraged to enroll in the multidisciplinary Master's degree in Home Economics. Home Economics Education courses may be selected to meet requirements of that program. Home economics teachers may choose courses within this area for updating and certification renewal. Graduate coursework in Home Economics Education may also be selected for development of a concentration or minor within other areas of specialization.

GRADUATE COURSES

510 Curriculum in Home Economics (3) Development of home economics educational materials and instruction. Prereq: 420 or equivalent or consent of instructor. F, A

515 Evaluation in Home Economics Education (3) Assessment of programs and pupil progress; techniques, methods and purposes. Prereq: 420 or equivalent. F, Sp, A

520 Supervision of Home Economics in the Public Schools (3) Program planning, organization and administration of vocational home economics education. Supervision of pre-service and in-service home economics programs. Prereq: Classroom teaching experience. Su, A

525 Home Economics Adult Education (3) Development and administration of community-based home economics programs for adults. Prereq: Consent of instructor. Sp, A

530 College Teaching in Home Economics (3) Instructional effectiveness, techniques, organization, and evaluation. Prereq: Consent of instructor. F, A

563 Family Life Education Programs (3) (Same as Child & Family Studies 563.)

580 Special Topics in Home Economics Education (1-3) Current issues and trends in home economics. Prereq: Consent of instructor. May be repeated. Su, A

581 Directed Study in Home Economics Education (1-3) Prereq: Consent of instructor. May be repeated. E

Human Ecology

(College of Human Ecology)

MAJOR DEGREE

Human Ecology .................................................. Ph.D.

Graduate study leading to the Doctor of Philosophy with a major in Human Ecology is available in the Departments of Child and Family Studies, Nutrition and Food Sciences, and Textiles, Merchandising and Design. Concentrations are child development, family studies, food science, nutrition science, and textiles and apparel. A major challenge of the doctoral program in Human Ecology is to draw upon the basic research generated from the natural sciences, social sciences, humanities, and the arts, and to provide a holistic perspective that contributes to the improvement of...
individual and family well being. For example, the physiological chemist may study metabolic-diary interrelationships and psychologists may study child behavior. But, it is within human ecology that the nutrient needs of the growing child are considered along with the factors that affect the child's acceptance of different foods. Within the College of Human Ecology, research from one discipline is enhanced by encompassing and utilizing the findings of research from other disciplines.

ADMISSION REQUIREMENTS

A completed file for review includes a College of Human Ecology application, Graduate Admissions (GRE) scores for the general section, and completion of three Graduate School Rating Forms by individuals who can attest to the potential for graduate education. Forms may be obtained from the Dean's Office, College of Human Ecology.

THE DOCTORAL PROGRAM

The doctorate is a research degree granted only to individuals who demonstrate proficiency in conducting original research. Course requirements for the degree are determined by the student's faculty committee, based upon college and departmental requirements and student needs and interests. The Graduate School sets minimum requirements for the doctoral degree. Additionally, the college has requirements that include:

1. Selection of a concentration and fulfillment of the requirements as directed by the major professor and approved committee;
2. Minimum of 78 semester hours in courses beyond the baccalaureate degree (exclusive of Master's thesis);
3. College Professional Seminar in Human Ecology 610;
4. Minimum of 9 semester hours of 600-level coursework (not including dissertation);
5. Successful completion of written/oral comprehensive examinations as provided by each department's procedures and the student's doctoral committee;
6. Original research project, which culminates in a dissertation; 24 semester hours of credit are required for dissertation;
7. Defense of the dissertation. The doctoral committee shall determine whether a reading knowledge of a foreign language is required.

More specific information about the course of study is given under the individual academic units that administer the Ph.D. concentrations.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The Ph.D. program in Human Ecology is available to residents of Alabama, Arkansas, Kentucky, Louisiana, Mississippi, South Carolina, Virginia or West Virginia. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

GRADUATE COURSES

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

501 Microcomputer Research Applications in Human Ecology (3) Advanced microcomputer concepts and applications for research. Overview of statistical analysis software, computer graphics, computer-assisted design and national data base searches.

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 beyond 5 hours is completed. May not be used toward degree requirements. May be repeated. S/N only. E

510 Integrative Nature of Home Economics (3) History and philosophy of home economics. Analysis of current programs and future directions in field. Examination of research, integrative framework. F, A

515 Issues and Trends in Human Ecology (1-3) Research and theory related to current issues. Prereq: Consent of instructor. E

520 Directed Study in Human Ecology (1-3) Integrative topics. Prereq: At least 9 hrs of graduate study in college including courses from at least two departments or consent of instructor. May be repeated. Maximum 6 hrs. E

525 Practicum in Home Economics (1-6) Field based experiences. Prereq: Consent of instructor. E

585 Seminar in Gerontology (1) Scope of gerontology as discipline and as related to other academic and professional disciplines. Speakers both internal and external to UTK. Prereq: Consent of instructor. May be repeated. Maximum 3 hrs. (Same as Educational and Counseling Psychology 585, Nursing 585, Physical Education 585, Public Health 585, Psychology 585, Social Work 585, and Sociology 585). S/N only.

610 Professional Seminar in Human Ecology (3) Review of various approaches taken by different disciplines to study of ecology; ecological applications in human ecology; temporal/spatial properties of human ecosystems; model building/systems thinking and future thinking in human ecology. Sp

Human Performance and Sport Studies

(College of Education)

MAJORS

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

Joan Paul, Head

Professors:


Associate Professors:


Mead, B. J., Ph.D. Purdue Morgan, W. J., Ph.D. Minnesota

Assistant Professors:


Adjunct Faculty:


THE MASTER'S PROGRAM

The Department of Human Performance and Sport Studies 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 Human Performance and Sport Studies.

The following retention policy applies to all graduate students seeking a degree in the Department of Human Performance and Sport Studies:

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 ASSISTANSHIPS

A limited number of graduate assistant- ships 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 Assistants Coordinator, Department of Human Performance and Sport Studies, The University of Tennessee, Knoxville, TN 37996-2700.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. program in Physical Education is available to residents of the state of Texas. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

Physical Education

GRADUATE COURSES

405 Sociology of Sport (3) (Same as Sociology 405.)
411 Adapted Physical Education (3) Developmental and invariance characteristics of specific syndromes germane to motor development/programming for those with special education needs.
414 Physical Activity and Fitness (2) Relationship of exercise to cardio-respiratory function, body composition, healthful low back, and stress. Prereq: Human physiology. Recommended coreq: 415. (Same as Health 414.)
480 Physiology of Exercise (3) Functions of body in muscular work: physiological aspects of fatigue, training and adaptation to environment. Prereq: Human Physiology or general physiology. 2 hrs and 1 lab. (Same as Zoology 480.)
500 Thesis (1-15) P/NP only. E
501 Special Project (3) Culumination experience for nonthesis major. Research study suitable for publication, or pricum requiring special written work. Prereq: 532. 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
509 Graduate Seminar in Public Health (1) (Same as Public Health 509, Nursing 509, Nutrition and Food Science 509 and Social Work 509.)
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 principles and theories 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. Varieties 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 coreq instructor.
531 Biomechanics of Human Performance (3) Human movement: teaching, coaching 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 experiences in appropriate review, design, and analysis procedures, and proposal development.
533 Psychology of Sport (3) Social psychological factors influencing sport and physical education. Prereq: General psychology course or consent of instructor.
534 Motor Behavior and Skill Acquisition (3) Topical explanations and application of principles of human movement behavior to acquisition and performance of skills; discussion of current research and methodology.
535 Sport Administration (3) Development of knowledge and analytic skills desirable for middle and upper level managers/administrators in sport business/organization.
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 542.)
544 Theories of Physical/Movement Education (3) Integration of various theoretical approaches to physical education/movement education within cultural context; research and fieldwork.
553 Advanced Adapted Physical Education (2) Curriculum development and teaching methodologies in programming for child with special education needs. Prereq: 411 or consent of coreq. Coreq: 554.
554 Advanced Adapted Physical Education Practicum (1) Curricula and methodologies implemented 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 special physical education/motor development needs. Testing protocols which purport to get at basis of dysfunction; those which measure dysfunction to motor development/motor motor development theories and explanations of factors affecting motor behavior.
556 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 special physical education/motor development needs. Testing protocols which purport to get at basis of dysfunction; those which measure dysfunction in terms of motor development/motor development theories and explanations of factors affecting motor behavior.
557 Laboratory Techniques in Exercise Physiology (2) Laboratory course in experimental methodology and instrumentation: respiratory and metabolic measurements, blood chemistry, and gas analysis. Prereq: Zoology 480. S/NC only.
558 Advanced Physiology of Exercise (3) Quantitative approach to current and classical questions in exercise physiology. Prereq: Zoology 480 and 593.
569 Fitness Testing, Programming, and Leadership for Diverse Populations (2) 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: Zoology 480 and 414/415. Coreq: 568. (Same as Public Health 569.)
593 Directed Independent Studies (1-3) May be repeated. Prereq: 532 or consent of instructor. S/NC or letter grade.
600 Doctoral Research and Dissertation (3-15) 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. S/NC or letter grade.
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.
651 Seminar in Exercise and Applied Physiology (1) Selected topics in exercise and environmental physiology. Prereq: 563 and 565. May be repeated with consent of instructor.
662 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.

Dance

GRADUATE COURSES

410 Ballet: Level III (2) Instruction and practice in advanced classical ballet techniques. Prereq: Dance majors and minors or consent of instructor. May be repeated. Maximum 16 hrs.
415 Teaching Creative Dance for Children (2) Theory, methods, materials and assessment of concept; implementation and integration of creative dance in grades K-6. Mini-teaching experience.
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: 250.
450 Rhythmic Analysis (3) Basic nature and principles of music, rhythm, and rhythmic notation; correlation with dance movement and composition. Prereq: Consent of instructor.
456 Dance Notation (3) Fundamentals of movement notation; notation and reading of elementary movement studies.
460 Dance Through the 19th Century (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.
Industrial and Organizational Psychology

(College of Business Administration and College of Liberal Arts)

MAJOR DEGREES

Industrial and Organizational Psychology ......................... M.S., Ph.D.

Michael Rush, Director

The Master's and doctoral programs are offered by the Department of Psychology and the Department of Management. They are designed to prepare students for personnel, managerial, and organizational research; for university teaching; and for consulting relationships with industry. The program emphasizes a scientific/practitioner model in applying and conducting research based on accepted theory, organizational behavior, psychology, management, and statistics. The programs are administered by a joint committee of the two departments, appointed by the Vice Provost and Dean of The Graduate School on recommendation from the two department heads.

It is intended that students entering the I/O Program will represent widely different undergraduate and graduate backgrounds including psychology, business administration, engineering, science, and liberal arts. The first-year program provides the opportunity to take courses that will assist the students in attaining a reasonable level of sophistication in areas of deficiency.

ADMISSION REQUIREMENTS

Applicants for admission should request information and application forms from both The Graduate School and the Director, Industrial and Organizational Psychology Program, 408 Stokely Management Center, The University of Tennessee, Knoxville, TN 37996-0545.

Two separate applications must be completed: one application for admission to The Graduate School (apply for major in "Industrial and Organizational Psychology") and one application for admission to the Industrial and Organizational Psychology program. Deadline: New students are admitted in fall semester only, and applications must be received by the Graduate Admissions and Records Office by March 1.

General Requirements

At least one year of college mathematics and one course in statistics are required. Ordinarily, an undergraduate grade point average of 3.0 or above is required with no evidence of special weakness in mathematics and physical sciences.

Test scores on each section of the general portion (verbal and quantitative) of the Graduate Record Examination (GRE) and the Subject GRE (Psychology-81) are required. Customarily, those students admitted to the program have performed at or above the 69-79th percentile on the general tests. (This corresponds to a raw score of approximately 600 on each of the tests.) The Subject GRE (Psychology-81) score will be used in making admission decisions, although special consideration will be given in the case of non-psychology majors.

THE MASTER'S PROGRAM

Note: Curriculum under review and subject to change effective Fall 1991.

A thesis is required with 6 semester hours of Management or Psychology 500. The Master's degree can be completed with a minimum of 33 semester hours in the major as follows:

- Management 567, 568 or Psychology 517-18;
- Psychology 557; Statistics 537, 538.

Twelve hours of additional coursework to be selected primarily from the following with the approval of the student's advisor:

- Management 511, 522, 610; Management/Psychology 625, 626, 627, 638; Psychology 505, 550, 610, 620, 624.

Electives, as approved for an individual's plan of study, may be selected from graduate courses in psychology, social work, sociology, management, education, planning, etc. Students who wish to pursue special research interests aside from their dissertation may register for Management 525, 526 (Maximum 6 hrs per term; courses may be repeated) or Management/Psychology 690.

An internship, practicum, or field experience is recommended. A student is expected to be in residence full time one year (two years recommended).

Doctoral candidates must pass a final oral examination on their dissertation research.

In addition to course requirements, a doctoral student must attain a score of 650 (90th percentile) on the Subject GRE (Psychology-81) within two years of entry, successfully complete the qualifying examination covering scientific methodology before or during the third fall semester, and successfully complete the comprehensive examination in the areas of the student's major research and professional interests.

An overall B average is required in the course sequence Management 567-68 or Psychology 517-18 to continue in the program beyond the first year.

THE DOCTORAL PROGRAM

Note: Curriculum under review and subject to change effective Fall 1991.

Any student in the doctoral program may be required to prepare a Master's thesis by the Industrial and Organizational Psychology Committee. This policy will be implemented by the committee at such time as a review of the student's record suggests that additional data on the qualifications for pursuing a Ph.D. are required.

A dissertation is required with a minimum of 24 semester hours of Management or Psychology 600.

The doctoral degree can be completed with a minimum of 54 semester hours in the major as follows:

- Management 567-68 or Psychology 517-18;
- Psychology 557, Statistics 537-38.

A minimum of five doctoral seminars (15 hours) selected from: Management 610; Management/Psychology 625, 626, 627, 638; Psychology 620, 624. (Five doctoral seminars are viewed as the absolute minimum; more are recommended. Statistics 677 and Psychology 605 are also recommended.)

Electives, as approved for an individual's plan of study, may be selected from graduate courses in psychology, social work, sociology, management, education, planning, etc. Students who wish to pursue special research interests aside from their dissertation may register for Management 525, 526 (Maximum 6 hrs per term; courses may be repeated) or Management/Psychology 690.

An internship, practicum, or field experience is recommended. A student is expected to be in residence full time one year (two years recommended).

Doctoral candidates must pass a final oral examination on their dissertation research.

In addition to course requirements, a doctoral student must attain a score of 650 (90th percentile) on the Subject GRE (Psychology-81) within two years of entry, successfully complete the qualifying examination covering scientific methodology before or during the third fall semester, and successfully complete the comprehensive examination in the areas of the student's major research and professional interests.

An overall B average is required in the course sequence Management 567-68 or Psychology 517-18 to continue in the program beyond the first year.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. and Ph.D. programs in Industrial and Organizational Psychology are available to residents of the states of South Carolina or Virginia. The Ph.D. program is also available to residents of Arkansas or Kentucky. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.
not be used for graduate credit in the M.S. graduate program in Industrial Engineering.

**GRADUATE COURSES**


402 Production System Planning and Control (3) Theory and application of forecasting systems, regression and time series models. Independent demand inventory models, development of safety stock. Coverage of all modules of Manufacturing Resource Planning (MRP) systems: master production scheduling, resource requirements planning, bill of material and inventory file structures, material requirements planning, capacity planning, shop floor and purchase order control. Overview of just-in-time inventory concepts and MRP’s role in manufacturing automation. Prereq: 301.

403 Production Facilities Design and Material Handling (3) Design of production facilities: plant layout, analysis and planning for overall moving, packaging and storage of materials. Office layout and service areas. Design of facilities for such diverse groups as hospitals, banking, industrial plants. Prereq: 200.

405 Engineering Economy (2) Methods and problems in selection or replacement of equipment. Decisions among engineering alternatives involving capital recovery, economic life of equipment, and rate of return on investment.


412 Quantitative Methods in Project Management (2) Project planning, scheduling, and control based on network and precedence diagramming methods. Resource allocation and time-cost trade off algorithms, multi-project control, computer applications, andPERT methods of handling uncertainty in activity time estimates.

413 Research Methods in Industrial Engineering (3) Methods to collect and analyze data. Process control, statistical modeling of processes, behavioral sampling, single subject experimental designs, classical experimental design methods, and time series models of experiments. Validity and reliability concepts as related to measurement and collection of data. Strategies to control rival hypotheses: randomization, matching, yoking, fixing variables, and building extraneous variables into experiments. Proprietary experience in designs for given research situations and to analyze messy data. Prereq: 300 and senior standing. Statistics 251.


421 Informational Systems (1) Systems engineering approach to design, development, implementation, and evaluation of systems of information. Informational aspects of systems structures and database management systems. Prereq: 200 and senior standing.

422 Senior Industrial Engineering Problems Analysis (3) Application of industrial engineering to field assignments in local organizations, problem definitions, analysis and presentation. Prereq: 403, 405, and 406.


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

501 Design Project (1-3) Enrollment limited to industrial engineering students in non-thesis program. May be repeated. Maximum 6 hrs. S/NC only.

502 Registration for Use of Facilities (3-15) Required for the student each semester the student intends to use University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.


513 Facilities Planning and Design (3) Modern materials handling techniques, computer-aided layout techniques, application of operation research models; and use of these to design manufacturing facility. Prereq: Production facilities planning or consent of instructor.

514 Information Systems (3) Systems analysis and control concepts applied to systems of information. Role of IE in office and factory of future. Management support systems, decision support systems, and integrated support systems.

515 Production and Inventory Systems (3) Application of OR techniques to production and inventory systems. Deterministic and stochastic inventory models. Use of mathematical programming for product mix, process selection, and other related aggregation using learning systems. Application of simple and complex queueing models in manufacturing environment.


518 Advanced Engineering Economy (3) Financing and investment functions of firms; deterministic analysis of after-tax cash flow projections; separation theorem and basic horizon models; stochastic analysis of capital budgeting problems; Monte Carlo simulation techniques; multiple attribute decision analysis. Prereq: Statistics.


521 Human Factors Engineering Methodology (3) Background in methodology used by human factors engineering designer and systems analyst. Observational methods, function/task analysis, design aiding techniques, and applications to reliability.
Consent of instructor. May be repeated.

591-92-93 Special Topics in Industrial Engineering
Mechanical or Chemical which enter into successful production and inventory control, linear programming, quantitative systems: methods analysis, work measurement, control systems through IE techniques. Qualitative and quantitative methods illustrate theories and concepts.

593 Theory and Practice of Engineering Management I (3) Comparison of classical management principles and theory with environment, needs, and practices of research and development and other scientific-engineering organizations. Cases used to illustrate contemporary problems and environments. Technical management function, marketing of technical services and products.

594 Engineering Management Control Systems (3) Underlying framework of accounting principles and practices reviewed as basis for evaluating productivity costs, requirements for new ventures, changes in strategy, financial condition. Computer data bases examined for control system alternatives.

595 Organizational Behavior and Managerial Decisions (3) Theories of individual and group behavior and their application to management decision making processes. Roles of various people categories and managerial decision making processes in normal mode. Case studies used to identify causes of irrational decision-making policies, and organizational behavior and to suggest corrective action.

596 Project Management (3) Management and control of multifaceted engineering and technological projects. Coordination and interactions between client and various service organizations. Selection of project manager and progress and management management typical problems associated with various phases of life cycle of project. Case studies illustrate theories and concepts.

597 Industrial Engineering Analysis and Control Techniques (3) Stress analysis of management analysis and control systems through IE techniques. Qualitative and quantitative systems: methods analysis, work measurement, incentive systems, wage and salary development, production and inventory control, linear programming, and applied operations research techniques. Not for credit for students with undergraduate degrees in industrial engineering.

598 Industrial Development (3) Factors other than mechanical or chemical which enter into successful establishment or development of service enterprise. Organizational and financial planning and evaluation. Cost and location studies and market analysis to determine commercial feasibility of new ventures.

591-92-93 Special Topics in Industrial Engineering (3,3,3) Individual or group research projects. Prereq: Consent of instructor. May be repeated.

591-92-93 Special Topics in Industrial Engineering (3,3,3) Individual or group research projects. Prereq: Consent of instructor. May be repeated.

601 Operations Research Models in Engineering Economy (3) Mathematical programming techniques applied to capital budgeting; advanced topics in multiple attribute decision analysis; Bayesian analysis of sequential decision making; artificial intelligence in complex decision analyses. Prereq: 518, 523.


604 Advanced Topics in Optimization (3) Multi-stage optimization theory. State increment dynamic programming adaptive optimization theory. Prereq: 603.


691-92-93 Advanced Topics in Industrial Engineering (3,3,3) Forum to study individually or in groups. Prereq: Graduate standing and consent of instructor. May be repeated with consent of instructor.

Interdisciplinary Programs

(College of Liberal Arts)

The College of Liberal Arts offers a series of interdisciplinary undergraduate majors and minors through its Interdisciplinary Programs. These programs include Afro-American Studies, American Studies, Ancient Mediterranean Civilizations, Asian Studies, Cinema Studies, Comparative Literature, Latin American Studies, Linguistics, Urban Studies, and Women's Studies. Certain courses within these programs are available for graduate credit as listed below. See the Undergraduate Catalog for program descriptions and directors.

Afro-American Studies

GRADUATE COURSES

421 Comparative Studies in African and Afro-American Societies (3) Education, religion, and social stratification. Views Afro-Americans and Africans have of each other. Prereq: 301 or 537.

450 Issues and Topics in Afro-American Studies (3) Problems, topics, issues, and individuals. May be repeated. Maximum 6 hrs.

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

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


483 Afro-American Women in American Society (3) Historical and contemporary socio-economic-political factors in American society as related to Black women. (Same as Women's Studies 483.)

Asian Studies

GRADUATE COURSES

421 Readings in Islamic Literature (3) Prereq: Mastery of intermediate-level Arabic or consent of instructor. May be repeated. Maximum 9 hrs.

431 Readings in Chinese Literature (3) Prereq: Mastery of intermediate-level Chinese or consent of instructor. May be repeated. Maximum 9 hrs.

451 Readings in Japanese Literature (3) Prereq: Mastery of intermediate-level Japanese or consent of instructor. May be repeated. Maximum 9 hrs.

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

Cinema Studies

GRADUATE COURSES

420 French Cinema (3) Same as French 420.)

489 Special Topics in Film (3) Same as English 489.)

Comparative Literature

GRADUATE COURSES

401-02 Special Topics in Comparative Literature 3,3) Content varies. May be repeated. Maximum 9 hrs.

Latin American Studies

GRADUATE COURSES

401 Cultural Plurality and Institutional Changes in Latin America (3) Value systems, behavioral pattern, political parties, role of military, church, educational institutions, dictatorship and nationalism.

402 Latin American Studies Seminar (3) Selected topics. May be repeated. Maximum 6 hrs.

Linguistics

GRADUATE COURSES

400 Topics in Linguistics (3) Content varies. May be repeated. Maximum 6 hrs.

411 Linguistic Anthropology (3) Same as Anthropology 411.)

429 The Development of Historical Linguistics as a Science (3) Scientific understanding of language change. Emergence of Neogrammarian paradigm from 19th-century intellectual trends. Impact of synchronic, descriptive, structural and transformational-generative linguistics on contemporary diachronic theory. Prereq: 6 hrs of courses required for linguistics concentration or consent of instructor.

425 Introduction to Descriptive Linguistics (3) Same as French 425, German 425, Russian 425, and Spanish 425.)

426 Methods of Historical Linguistics (3) Same as German 426, French 426, Russian 426, and Spanish 426.

429 Romance Linguistics (3) Same as French 429 and Spanish 429.)

430 The Development of Synchronic Linguistics as a Science (3) Development of first synchronic paradigm of linguistics. Impact of social sciences on American descriptiveists. Prague School. Transformational-gen-
485 Special Topics in Language (3) (Same as English Language II (3) (Same as English 475.)
475 Teaching English as a Second or Foreign Language I (3) (Same as English 474.)
474 Teaching English as a Second or Foreign Language II (3) (Same as English 475.)
485 Special Topics in Language (3) (Same as English 485.)
559 Problems in Linguistics: Romance Languages (3) (Same as French 569 and Spanish 569.)

Urban Studies

GRADUATE COURSES

401 The City in the U.S. (3) (Same as Planning 401.)
441 Urban Geography (3) (Same as Geography 441.)
464 Urban Ecology (3) (Same as Sociology 464.)

Women's Studies

GRADUATE COURSES

400 Topics in Women's Studies (3) Content varies. May be repeated.
422 Women Writers in England (3) (Same as English 422.)
425 Women's Health (3) (Same as Health 425.)
434 Psychology of Gender (3) (Same as Psychology 434.)
466 Rhetoric of the Women's Rights Movement (3) (Same as Speech 466.)
483 Afro-American Women in American Society (3) (Same as Afro-American Studies 483.)

Journalism

(College of Communications)

MAJOR

Communications .................... M.S., Ph.D.

James A. Crook, Director

Professors:

Adamson, June N., M.S. ........................................ Tennessee
Ashdown, Paul G., Ph.D. ....................... Bowling Green
Crook, James A., Ph.D. ....................... Iowa State
Everett, George A., Ph.D. ....................... Iowa
Leiter, B. Kelly, Ph.D. ....................... Southern Illinois
Singletary, Michael W., Ph.D. ....................... Southern Illinois
Wilford, John N., M.A. ....................... Syracuse

Associate Professors:

Bowles, Dorothy, Ph.D. ....................... Wisconsin
Miller, M. Mark, Ph.D. ....................... Michigan State

Morrow, Jerry L., Ph.D. ....................... Toledo
Puett, Sammie Lynn, M.S. ....................... Tennessee

Assistant Professors:

Caudill, C. Edward, Ph.D. ....................... North Carolina
Caudill, Susan M., Ph.D. ....................... Tennessee
Heller, Robert B., M.A. ....................... Syracuse

Adjunct Professor:

Haley, Alex

The School of Journalism offers a concentration area for the Master's with a major in Communications and participates in the interdisciplinary doctoral program. See Communications for additional information.

GRADUATE COURSES

403 International Communications (3) Development and operations of world mass communications channels and agencies. Comparative analysis of mass, media practices, and flow of news throughout world. Print and broadcast systems in terms of relevant social, political, economic, and cultural factors. Relation of communication practices to international affairs and understanding. Sp.

412 Opinion Writing (3) Analysis of editorial positions, practices, and pages. Writing of editorials and columns for newspapers, magazines, and company publications, rhetorical devices and use of logic. Prereq: Communications 200, or consent of instructor.

414 Magazine Article Writing (3) Techniques of writing in-depth articles of mass circulation and specialized magazines. Organizing and presenting material, problems in specialized areas: business, science, agriculture, humanities. Prereq: Communications 200, or consent of instructor.

416 Issues in Journalism (3) Topics vary. Prereq: of instructor. May be repeated. Maximum 6 hrs.


433 Advanced Editing (3) Sensitivity to language and editing skills. Headline writing, layout, and production. Prereq: 203.

460 Mass Communications History (3) Development of press and role of mass communications in American history. Newspapers, radio, television, and magazines. F.


516 Seminar in Journalism Issues (3) Topics vary. May be repeated. Maximum 6 hrs.

520 Press-Government Relations (3) Development of adversary relationship between journalists and government officials. Philosophical and legal basis for open reporting of government. Use of press by candidates and incumbents. F.

525 Public Opinion (3) Role of press in developing and influencing public consensus. Social theories of public opinion and analysis of mass media's response. F.

535 Publications Management (3) Problems in management, production, market analysis, and design. Techniques of writing, editing, and presenting comprehensive articles and other material: regional and specialized magazines. Individual editorial projects. Prereq: 420 or consent of instructor.

540 Seminar in Newspaper Operations (3) On-site study of newspaper management operations. Positioning medium for its target audience and how this affects profitability. Prereq: 550 or consent of instructor.

550 Writing and Editing Projects (3) Specialized writing or editing interests: agriculture, politics, labor, finance, science; technical, general publications. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

571 Seminar in Public Relations (3) Analysis and management of problems in communication between institutions and organizations and their publics. Measurement and evaluation of effectiveness of communication programs. Prereq. 470 or consent of instructor. Sp.

580 Seminar in Visual Communication (3) Behavioral aspects of communication with images. Theories of psychological effect in color, shape, texture, and other design elements. Prereq: 203 or Advertising 350 or Broadcasting 430 or equivalent.

590 Communications and International Development (3) Relationship between mass communications and development of nations. Role of communications media of developed nations in "Third World" regions of globe. Communications as facilitator of international cooperation.

597 Independent Study (3) Prereq: Consent of instructor. May be repeated. Maximum 8 hrs.

598 Internship (3) Professional work in journalism supervised by editor or manager with faculty approval. No retroactive credit for previous work experience. Prereq: Completion of core curriculum.

Law

(College of Law)

MAJOR

DEGREES

J.D. .............................................. J.D.-MBA, J.D.-M.P.A.

Marilyn Yarbrough, Dean

Professors:

Cohen, Neil P., LL.M. ....................... Harvard
Cook, Joseph G., LL.M. ....................... Yale
Gray, R. Macdonald (Emeritus), LL.M. ....................... George Washington
Hardin, Patrick, J.D. ....................... Chicago
Hess, Amy M., J.D. ....................... Virginia
Jones, Durward S., J.D. ....................... North Carolina
King, Joseph H. (Distinguished Prof.), J.D. ....................... Pennsylvania
Lacey, Forrest W. (Emeritus), S.J.D. ....................... Michigan
Le Clerc, Frederick S., LL.B. ....................... Duke
Lloyd, Robert M., J.D. ....................... Michigan
Miller, Charles H. (Emeritus), J.D. ....................... Duke
Overton, Elvin E. (Emeritus), J.D. ....................... Harvard
Phillips, Jerry J., J.D. ....................... Yale
Picquet, Cheryl, M.S.L.S. ....................... Vanderbilt
Rikvin, Dean H., J.D. ....................... Michigan
Sebert, John A., J.D. ....................... Michigan
Sewell, Torey H. (Emeritus), LL.M. ....................... George Washington
The College of Law offers the Doctor of Jurisprudence degree program and a dual program with the College of Business Administration leading to the J.D. and the Master of Business Administration degree. In addition to the J.D., graduate students may be eligible to take a Master of Science in Public Administration degree. In this program, a student may earn the M.P.A. and J.D. degrees in about four years rather than the five years that otherwise would be required. Students pursuing the dual degree program should plan to be enrolled in coursework or an internship for one summer term in addition to taking normal course loads for four academic years.

**DEGREE OF DOCTOR OF JURISPRUDENCE**

The degree of Doctor of Jurisprudence will be conferred upon candidates who complete, with the required average, six semesters of resident law study and who have 89 semester hours of credit, including all required courses. The required average is 2.0 and that average must be maintained on the work of all six semesters and also for the combined work of the grading periods in which the last 28 credit hours taken in residence were earned. Averages are computed on weighted grades. Grades are on a numerical basis from 0.0 to 4.0. A grade of 0.9 or below is a failure.

Eligible law students may receive up to six (6) semester hours of credit toward the J.D. degree for acceptable performance in upper-level courses that materially contribute to the study of law and which are taken in other departments at The University of Tennessee. Credit for such courses may be granted only upon written approval of the law faculty which include the requirement that any such course be acceptable for credit toward a graduate degree in the department offering the course.

Refer to the Law Bulletin for current degree requirements.

**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 conferral 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 coursework than would be required if the two degrees were to be earned separately.

**Admissions**

Applicants for the J.D.-M.B.A. program must make separate application to, and be competitively and independently accepted by, the College of Law for the J.D. degree and The Graduate School and College of Business Administration for the MBA degree, and by the Dual Degree Committee. Students who have been accepted by both colleges may 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 a maximum of nine (9) semester hours toward the J.D. degree for acceptable performance in approved graduate-level courses offered by the College of Business Administration. Three of the 9 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 Accounting for Lawyers (Law College Course 837).

The College of Business Administration will award credit toward the MBA for acceptable performance in a maximum of 12 semester hours of approved courses offered by the College of Law, 3 hours of which will replace the same hours required for the MBA degree.

Except while completing the first year courses in the College of Law, students are encouraged to maximize the integrative facets of the dual program by taking courses in both colleges each 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 bettered on a regular graded basis 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.-M.B.A. degree program may not receive credit towards the J.D. degree for courses taken in other departments of the University except for those taken in conjunction with the dual program.

**Note:** 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.

**DUAL J.D.-M.P.A. PROGRAM**

The College of Law and the Department of Political Science in the College of Liberal Arts offer a coordinated dual degree program leading to the conferral of both the Doctor of Jurisprudence and Master of Public Administration degrees. In this program, a student may earn the M.P.A. and J.D. degrees in about four years rather than the five years that otherwise would be required. Students pursuing the dual degree program should plan to be enrolled in coursework or an internship for one summer term in addition to taking normal course loads for four academic years.

**Admission**

Applicants for the J.D.-M.P.A. program must make separate application to, and be independently accepted by, the College of Law for the J.D. degree and the Department of Political Science and The Graduate School for the M.P.A. degree. Applicants must also be accepted by the Dual Degree Committee. All applicants must submit a Law School Admission Test (LSAT) score. An applicant's LSAT score may be substituted for the Graduate Record Examination (GRE) score, which is normally required for admission to the M.P.A. program. Application may be made prior to or after matriculation in the J.D. degree program. However, application to the dual program must be made prior to entry into the last 29 semester hours required for the J.D. degree and prior to entry into the last 15 hours required for the M.P.A. degree.

**Curriculum**

A dual degree candidate must satisfy the requirements for both the J.D. and the M.P.A. degrees, as well as the requirements for the dual program. The College of Law will award a maximum of 9 semester hours of credit toward the J.D. degree for successful completion of approved graduate business courses (500 or 600 level) offered in the Department of Political Science. The M.P.A. program will award a maximum of 9 semester hours of credit toward the M.P.A. degree for successful completion of approved courses offered in the College of Law. All courses for which such cross-credit is awarded must be approved by the J.D.-M.P.A. coordinators in the College of Law and the Department of Political Science. All candidates for the dual degree must successfully complete Administrative Law (Law 821) and be encour-
aged to take Local Government (Law 824). An internship is strongly recommended for students in the dual degree program, as it is for all M.P.A. candidates, but an internship is not required.

During the first two years in the dual program, students will spend one academic year completing the required first year of the College of Law curriculum and one academic year taking courses solely in the M.P.A. program. During those first two years, students may not take courses in the opposite area, without the approval of the J.D.-M.P.A. coordinator in both academic units. In the third and fourth years, students are strongly encouraged to take both law and political science courses each semester.

Dual degree students who withdraw from the program before completion of the requirements for both degrees will not receive credit toward either the J.D. or the M.P.A. degree for courses taken in the other program except as such courses qualify for credit without regard to the dual program.

Awarding of Grades

For grade recording purposes in the College of Law and the Department of Political Science, grades awarded in courses in the other unit will be converted to either Satisfactory or No Credit and will not be computed in determining a student’s GPA or class standing. The College of Law will award a grade of Satisfactory for an approved M.P.A. course in which the student earns a grade of B or higher and a grade of No Credit for any lower grade. The Political Science Department will award a grade of Satisfactory for an approved M.P.A. course in which the student earns a grade of 2.3 or higher and a grade of No Credit for any lower grade. 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.

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/N only. If a 2.0 or above is earned in a law course, an S will be recorded on the transcript. If a student earns 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.-M.B.A. or J.D.-M.P.A. Programs. Credit is not given toward a degree upon approval of the Dual J.D.-M.B.A. or J.D.-M.P.A. Programs. Grades must be earned in a grading system of the respective college, e.g., numerical grades for law courses, letter grades for graduate courses. Refer to section on Grades 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 cumulative will be shown on the permanent record.

PROFESSIONAL COURSES

801 Civil Procedure I (3) Binding effect of judgments, selecting proper court (jurisdiction and venue), ascertaining applicable law, and federal and state practice.


803 Contracts I (3) Basic agreement process and legal protections afforded contracts; offer and acceptance, consideration and other bases for enforcing promises; the Statute of Frauds, unconscionability and other controls of promissory liability. Introduction to relevant portions of Article 2 of the Uniform Commercial Code.

804 Contracts II (3) Continuation of Contracts I. Issues arising after contract formation: interpretation, duty of good faith; conditions, impracticability and frustration of purpose; remedies; third party beneficiaries, assignment and delegation. Considerable coverage of Articles 2 of the Uniform Commercial Code with respect to remedies, antirepudiation, impracticability and good faith.

805 Legal Process I (2) Lawyer-like use of cases and statutes in prediction and persuasion. Analysis and synthesis of common law decisions; statutory interpretation; fundamentals of expository legal writing and legal research.

806 Legal Process II (3) Continuation of Legal Process I. Formal legal writing, appellate procedure, and oral advocacy.

807 Torts I (3) Intentional torts, including battery, assault, false imprisonment, conversion and trespass; privileges and defenses to intentional torts; negligence, including standard of care and proof of recovery; limitations on actions on torts; cause in fact; and proximate cause.

808 Torts II (3) Defenses, including contributory negligence, assumption of risk, comparative negligence, and statutes of limitations; vicarious liability; strict liability; nuisance; products liability; settlement; problems of multiple defendants; damages; non-tort alternatives for recovery for personal injury; law reform; defamation, invasion of privacy, and wrongful public proceedings; misrepresentation, improper falsehood, misappropriation of commercial values, and interference with contract; constitutional torts.

809 Criminal Law (3) Substantive aspects of criminal law; general principles applicable to all criminal conduct; specific analysis of particular crimes; defenses to crimes.

810 Property (4) Introductory course treating issues of ownership, possession, and titles in the areas of: landlord-tenant relations; estates in land and future interests; co-operation and co-ownership; real estate sales agreements and conveyances; title assurance and recording statutes; servitudes; and selected aspects of nuisance law, eminent domain.

812 Constitutional Law I (3) Judicial review, limits on judicial power; national legislative power; regulation of commerce; intergovernmental immunities.

813 Evidence (4) Rules regulating introduction and exclusion of relevant, probative, and non-redundant evidence at trials and other proceedings; rules of relevance, completeness, impeachment, hearsay, privilege, expert testi-

814 Legal Profession (3) Legal, professional and ethical standards applicable to lawyers.

815 Computer-Assisted Legal Research (9) Introduction to major legal research, legal data base retrieval systems, LEXIS and WESTLAW. Offered periodically throughout year. A student must be beginning spring of first year after completion of their first year of study in the College of Law. Prereq: 806. S/N only.

816 Income Tax I (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; rates (form and structure). S/NC only.

821 Administrative Law (3) Administrative agency decision-making processes and judicial review of administr-
Library and Information Science

(Office of the Provost)

MAJOR

Library Science M.S.L.S.

Gary R. Purcell, Director
Glen E. Estes, Assistant Director

Professors:
Estes, Glenn E., M.L.S. Kent State
Griffiths, Jose-Marie, Ph.D. London (UK)
Mauldin, E. F. (Emeritus), M.S.L.S. Illinois
Purcell, Gary R., Ph.D. Case Western
Wilson, P. (Emeritus), Ph.D. Michigan

Associate Professors:
Karrenbrock, Marilyn H., Ed.D. Georgia
Pemberton, J. Michael, Ph.D. Tennessee
Robinson, William C., Ph.D. Illinois
Sinkankas, George M., Ph.D. Pittsburgh

Assistant Professors:
Palmquist, Ruth A., M.A. Iowa
Pollard, Richard, Ph.D. Brunel (UK)

The Graduate School of Library and Information Science provides a program leading to the preparation of librarians and information professionals for work in all types of libraries and information centers. The program of study includes a graduate curriculum leading to the Master of Science in Library Science. The program is accredited by the American Library Association.

The mission of the school is to provide excellence in teaching, research, and public and private service in library and information science. The goals and objectives of the school are:
A. To prepare students to understand the nature of information and the role of the library and other information agencies in the management of information resources, and the facilitation of information transfer. Students will demonstrate:
1. Knowledge of the historical role of libraries and other information agencies in society.
2. A knowledge of how information flows through contemporary society.
3. An understanding of the role of the librarian and/or information specialist as a mediator between information and the user with an emphasis on the improvement of the quality of information services in response to the needs of society.
4. An understanding of and competence in the selection, acquisition, organization, storage, retrieval, and dissemination of information.
5. An understanding of bibliographic control and knowledge of information sources in various formats and subjects.
6. An understanding of management theory and practice, particularly as these are related to library and information services.
7. A knowledge of research methods sufficient to enable them to engage in effective problem solving.
8. To provide services to the state, region, and nation in association, consulting, and continuing education activities which will promote the development and improvement of information systems and services such that the school's contributions reach beyond its immediate academic programs. The school will provide:
1. Continuing education for information professionals and, on a selective basis, to persons outside the information field.
2. Advisory services to libraries and other types of organizations.
3. Leadership for professional associations.

FINANCIAL ASSISTANCE OPPORTUNITIES

Employment with The University of Tennessee Libraries may provide a work-study opportunity for selected students who wish to obtain experience in academic librarianship while pursuing the degree. Such students usually work at least 20 hours each week and thus may extend the period required for the degree. Similar opportunities exist with other libraries and information agencies in the Knoxville area.

Work opportunities in a scientific-technical environment are available through subcontracts with Oak Ridge National Laboratory and the Department of Energy. A limited number of graduate assistantships are available through the school. Assistance of this type carry a waiver of tuition and fees as well as a stipend and require that recipients work 10 hours per week in the school.

For application forms and information about financial aid and other information about the M.S.L.S. in Library and Information Science, write to the Admissions, Graduate School of Library and Information Science, University of Tennessee, 804 Volunteer Blvd., Knoxville, TN 37996-4330.

Library and Information Science® 111
GRADUATE COURSES

430 History of the Book (3) History of writing and various methods of bookmaking from earliest times through 19th century. Sp

475 Utilization of Instructional Media (3) (Same as Curriculum and Instruction 475.)

500 Thesis (1-15) P/N 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 taken toward degree requirements. May be repeated. S/N only. E

510 Information Professionals and Their Organizations (3) Variety and prospects of information professionals: achievements, responsibilities, goals, and issues. E,Su,A

520 Technical Services I (3) Technical services principles and techniques: acquisitions, basic manual and automated cataloging, structure and use of library catalogs, basic subject organization and indexing. E,Su,A

521 Technical Services II (3) Library of Congress subject organization and description, automated cataloging and cataloging of serials and more difficult materials. Prereq: 520. Sp

530 Information Sources and Services (3) Basic bibliographic and information sources, online databases, interview and search techniques, selection and evaluation of information collections and development and evaluation of services. E,Su,A

531 Sources and Services for the Social Sciences (3) Information sources in social sciences: political science, sociology, psychology, geography, history, anthropologystylesources and services in business, education, and law. Prereq: 530. Sp

532 Sources and Services in Science and Technology (3) Information sources in engineering, physical and life sciences. Prereq: 530. Sp

533 Sources and Services for the Humanities (3) Information sources in philosophy, religion, fine arts, performing arts, literature and language, and history. Organization of collections for optimum use. Prereq: 530. Su


540 Research Methods in Library and Information Science (3) Research methods applicable to librarianship and information management. Process and conduct of empirical research; analysis of published research. Prereq: Admission to program or consent of instructor. E,Su,A

550 Library and Information Agency Management (3) Management and organizational concepts applicable to libraries and other information agencies. Prereq: Admission to program or consent of instructor. E,Su,A

551 School Libraries and Media Centers (3) Planning, implementing and evaluating school library programs. Curriculum development, role of technology, relationships with district and state services. F,Su

552 Academic Libraries (3) Development and present status, mission and objectives within higher education institutions, trends, problems, recurring issues. F

553 Special Libraries and Information Agencies (3) Development and present status, scope and objectives, administrative and organizational problems and techniques. F

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: 560 or consent of instructor. Sp

563 Nonbook Materials (3) Selection, acquisition, bibliographic representation, storage, utilization, and programming; microformats, films, video, sound recordings, and as 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

565 Advanced Production of Audiovisual Software (3) (Same as Curriculum and Instruction 509.)


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 objectives 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 science; information theory, relevance, use and user studies, bibliometrics, and major components of information retrieval system design. Related research findings to library and information system practice. F,Sp

581 Information in Society (3) Characteristics of an information society, knowledge and information, effect of 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. Su

584 Bibliographic Database Design (3) Design and construction of bibliographic databases, record and database structure, document representation, indexing, abstracting, thesaurus construction and maintenance, and information retrieval. Sp

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

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

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

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

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

599 Practicum (3) Opportunity to translate theory into practice under guidance of qualified information professionals. Prereq: Completion of core 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. E
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 Biology 520, 521, Human Anatomy, Comparative Vertebrate Biology 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 of 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 471 or Zoology 560; Plant and Soil Science 551; Microbiology 410.

**GROUNDS COURSES**

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

562 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

509 Biotechnology Seminar (1-3) Topics of importance to biotechnology. May be repeated. Maximum 6 hrs.

510 Special Topics in Life Sciences (1-3) Specializations in biotechnology; cellular, molecular, and developmental biology; environmental toxicology; ethology; plant, physiology and genetics; and physiology. May be repeated. Maximum 9 hrs.

511 Advanced Cellular Biology (3) Cell structures and functions at molecular and supramolecular level. Membrane structure, function, and biogenesis; cellular communication; receptor and membrane flow, growth regulation and onogenes; plant cell structure and function; contractility and motility; mitosis and meiosis; blood and immune cells.

512 Advanced Molecular Biology (4) (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 or research agencies. May be repeated. Maximum 12 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.
GRADUATE COURSES

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 a 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 resource 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 Logistics and 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 organization effectiveness; motivation, leadership, group behavior, intergroup relations, organizational politics. Must be taken in sequence. Coreq: Business Administration 509.

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

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

522 Labor Relations and Collective Bargaining (3) American labor history, structure and philosophy of bargaining, dispute settlement, and contract administration. (Same as Economics 592.)

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

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

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

542 Operations Management II (3) Operations planning and control function. Application of models to real-world systems.

551 Management of New Ventures (3) Integration of various functional disciplines and their application to general management of ventures formed both within larger corporations and independence. Preparation of a venture plan, case analysis.

567-68 Proseminar in Industrial/Organizational Psychology (3,3) Basic: thought, concepts, and issues required for advanced graduate study in industrial and organizational psychology. Must be taken in sequence during student's first year of study in industrial and organizational psychology program. Consent of instructor required for all non-industrial/organizational psychology program students. (Same as Psychology 517-18.)

571 International Management (3) Analysis of environment of international business firms and impact of international and organizational complexities on managerial decisions.

593 Directed Independent Study (1-3) Topic of mutual interest. Available only by prearrangement with supervising faculty member. May be repeated. Maximum 6 hrs. S/NC or letter grade.

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

601 Research Methods (3) Seminar covering broad range of issues: research process as applied to study of strategic management. Literature and examples of research. Research proposal.

610 Seminar in Advanced Organization Theory (3) Analysis of functioning of complex organizations. Classical and open systems models, organization growth and change, organizational effectiveness and design of complex organizations.

611 Seminar in Strategic Management I (3) Analysis of concepts and research in strategic management.

612 Seminar in Strategic Management II (3) Analysis of concepts and research in strategic management.

625 Seminar in Organizational Psychology (3) In-depth analysis of current theories, concepts, and issues associated with psychology of organizational leadership and work motivation. Prereq: 567, 568, consent of instructor. May be repeated. (Same as Psychology 625.)

626 Seminar in Industrial Psychology (3) In-depth analysis of current issues and problems: performance appraisal/critique, development and training and development. Prereq: 567, 568, consent of instructor. May be repeated. (Same as Psychology 626.)

627 Seminar in Applied Industrial Psychology (3) In-depth analysis of the current issues, concerns, and methods: advanced quantitative psychometrics and employee selection. Prereq: 567, 568, consent of instructor. May be repeated. (Same as Psychology 627.)

638 Current Topics in Industrial/Organizational Psychology (3) In-depth analysis of various topics: organizational change and development, psychology and problems of interviewing, consumer behavior. Prereq: 567, 568, consent of instructor. May be repeated. (Same as Psychology 530.)

640 Seminar in Operations Management (3) Research and concepts. Application of quantitative methods to operations management problems. May be repeated.

690 Field Work in Industrial and Organizational Psychology (1-12) Supervised field practice in industrial and organizational psychology. 1 hr per 30 hrs of practice. May be repeated. Maximum 12 hrs. (Same as Psychology 690.)

MANAGEMENT SCIENCE

(College of Business Administration and Intercollegiate Program)

MAJORS DEGREES

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

Kenneth C. Gilbert, Chair
Professor:
Ho, James K., Ph.D. ................................. Stanford
Associate Professor:
Gilbert, Kenneth C., Ph.D. ............................ Tennessee
Assistant Professors:
Bowers, Melissa R., Ph.D. ........................... Clemson
Kaplan, Lori A., Ph.D. ............................... Michigan
Noon, Charles E., Ph.D. ............................. Michigan
Patel, Minnie H., Ph.D. .............................. Georgia Tech

Additional Committee Members:
Fowler, Oscar S., Management Liardoff, Jimmy E., Finance

Leitnaker, Mary G., Statistics
Raihston, Bruce A., Geography
Sullivan, William G., Industrial Engineering

THE MASTER'S PROGRAM

The M.S. program in Management Science is an inter collegiate program and is designed as preparation for a career in the application of quantitative techniques for the solution of complex problems. The program's flexibility also makes it appropriate for doctoral study in Management Science.

Management Science coursework will expose students to both the theoretical development of quantitative techniques and their application to managerial decision making. In addition to the development of sufficient mathematical maturity for creative use of quantitative skills, the program 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 Master'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
Statistics 563
Applied specialization area
(approved by advisor) or
Statistics elective—500 level or
above (approved by advisor) or
Mathematics—400 level or
above (approved by advisor)
Electives selected from mathematics,
statistics, computer science, and/or
management science area
TOTAL ................................................. 38

A thesis option is available to qualified students who substitute 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; and
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 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 computer science, a high degree of mathematical maturity to enhance a potential career in management, research, or teaching.

Admission Requirements

The doctoral program requires three Graduate School Rating Forms and the GRE or GMAT, in addition to The Graduate School’s requirements.

Coursework

A minimum of 48 semester hours of coursework taken for graduate credit (exclusive of thesis or dissertation) is required. Some of this may be the coursework from a Master’s program although a Master’s is not a prerequisite for the doctorate. The candidate must complete a minimum of 24 semester hours at The University of Tennessee, Knoxville, at least 6 of which must be at the 600 level. Both of these requirements are also exclusive of thesis or dissertation credits. Entering students who have completed graduate studies in applicable fields will be granted course credits for work which is equivalent to required courses in the program.

The program includes approximately 16 to 20 semester hours of coursework in the applied area.

Qualifying Examinations

The student must demonstrate mastery of probability theory and statistical inference, Statistics 563, 564, by passing a written qualifying examination.

Mastery of 12 to 14 semester hours in mathematics coursework must be demonstrated by passing a written qualifying examination. Topics normally include numerical analysis, either Mathematics 471, 472, 453, and 571, or 571-572, and real analysis, Mathematics 445-446. Other options may be approved. In exceptional circumstances, the faculty will consider waiving the mathematics and/or statistics qualifying examinations.

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

There is no foreign language requirement.

Comprehensive Examination

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

Research and Dissertation

The student must complete 24 semester hours of Management Science 600: Doctoral Research and Dissertation, through which he/she is expected to make a significant contribution to the science. A final oral examination is conducted over the dissertation and such other segments of the program that the faculty committee deems appropriate. This effort, which is beyond the minimum 48 hours of coursework, normally is completed in the third year of the program.

ACADEMIC STANDARDS

A graduate student in the College of Business Administration whose grade-point average falls below 3.0 will be placed on probation. A student on probation will be dropped from the program unless his/her cumulative grade-point average is 3.0 or higher at the end of the probationary period. The probationary period is defined as the next semester's coursework as established by the degree program for full-time students and the next two semester's coursework as established by the degree program for part-time students.

PREREQUISITES FOR MANAGEMENT SCIENCE COURSES

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

BUSINESS ADMINISTRATION CONCENTRATION

For complete listing of MBA program requirements, see Business Administration. MBA Concentration: Management Science. Minimum course requirements are 531, 532 and 534.

GRADUATE COURSES

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

531 Mathematical Programming (3) Linear programming procedures, duality and sensitivity analysis.


533 Computational Mathematical Programming (3) Advanced modeling, computational and reporting techniques in practical mathematical programming. Prereq: 531 and proficiency in PASCAL.

534 Application of Management Science Methods (3) Application of methods from 531 and 532 to real world problems. Exposure to existing problem in industry or elsewhere.


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

593 Management Science Problems (1-6) Directed study on subject of mutual interest.

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

621 Network Flows (3) Treatment of network optimization algorithms, transportation and transshipment models and primal-dual and primal-basis tree methods. Prereq: 531 or equivalent.

631 Integer Programming (3) Theoretical and computational aspects of linear programming with integer variables, branches and bound, cutting plane, and group theoretic algorithms. Prereq: 531 or equivalent.


651 Nonlinear Optimization (3) Solution of constrained and unconstrained nonlinear programming problems. Practical algorithms that perform well in recent practice. Prereq: 531 or equivalent.


681 Special Topics (3) Prereq: 531, 532 and consent of instructor. May be repeated. Maximum 9 hrs.

691-92 Management Science Seminar (1-1) Subjects selected from current literature. S/NC only.

Marketing, Logistics, and Transportation 115

MAJOR

DEGREES

Marketing, Logistics, and Transportation

(Course of Business Administration)

MAJOR

DEGREES

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

David J. Barnaby, Chair
Marketing

Professors:
Jenkins, Roger L., Ph.D. .......... Ohio State
Cadotte, E. R., Ph.D. .......... Ohio State
Barnaby, David J., Ph.D. .......... Purdue

Associate Professors:
McMillan, J. R., Ph.D. .......... Ohio State
Reizenstein, Richard C., Ph.D. .......... Cornell
Rentz, J. O., Ph.D. .......... Texas Tech

Assistant Professors:
Faudus, D. J., Ph.D. .......... Iowa
Gardial, S. F., Ph.D. .......... Houston
Schumann, D. W., Ph.D. .......... Missouri
Speck, P. S., Ph.D. .......... Texas Tech

BUSINESS ADMINISTRATION CONCENTRATIONS

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

MBA Concentration: Marketing

Minimum course requirements are three courses from the following: 503, 504, 505, 506, 550, 593, 599. Logistics and Transportation 507, Business Administration 510, 599.

Ph.D. Concentration: Marketing

Minimum course requirements are 12 hours from among the following courses: 601, 602, 603, 604, 605, 606.

GRADUATE COURSES

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 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

503 Buyer Behavior--Analysis for Marketing (3) Consumer behavior concepts and processes developed 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 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 analyses 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 MAO and various information sources and procedures; identity and analyze sales opportunities in markets for new product or service. Prereq: Consent of instructor.

593 Independent Study (3) Directed research and study. Prereq: MBA Core and consent of instructor. May be repeated. Maximum 9 hrs.

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

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

601 Marketing Theory (3) Nature and scope of marketing, role of theory development and theory testing important to marketing research.

602 Research Methods I (3) Research process: problem formulation, research and experimental design, measurement and implementation of results. Design, experimental design, survey research, and measurement.

603 Marketing Thought (3) Marketing literature across number of research areas. Examine individual works, determine state of research in each area, and identify areas that merit further study.

604 Seminar in Buyer Behavior Research (3) Behavioral study of people in their roles as buyers and users of goods and services both individual and group processes.

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 strategy, advanced consumer behavior, influence and persuasion theory and strategy, pricing issues, international marketing issues, and nonprofit organization marketing issues.

Logistics and Transportation

Professors:
Davis, F. W., Jr., Ph.D. .......... Michigan State
Icer, Gary N., DBA .......... Indiana
Frye, J. L. (Emeritus), Ph.D. .......... Florida
Hendrix, F. L. (Emeritus), Ph.D. .......... North Carolina
Langley, J. R., Ph.D. .......... North Carolina
Mundy, Ray A., Ph.D. .......... Penn State
Patton, E. P., Ph.D. .......... North Carolina

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

BUSINESS ADMINISTRATION CONCENTRATIONS

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

MBA Concentration: Logistics and Transportation

Minimum course requirements are 501, 508, and one course from the following: 504, 506, 507, 593, and 599.

Ph.D. Concentration: Logistics and Transportation

Minimum course requirements are 12 hours to include 601, 602, 603.

GRADUATE COURSES

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 toward degree requirements. May be repeated. S/NC only. E

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 Strategy (3) Capstone, integrative case course in logistics and transportation strategy; participation in Executive-In-Residence program that provides student interaction with top-level logistics and transportation executives.

593 Independent Study (3-6) Directed research and study. Prereq: Consent of instructor. May be repeated.

599 Special Topics in Logistics and Transportation (3-6) Seminar designed to study specific current problem areas in logistics and transportation. Topic announced prior to offering. Prereq: Consent of instructor. May be repeated.

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

601 Seminar in Logistics and Transportation Models (3) Analysis of contemporary models and methodologies in logistics and transportation research, topical coverage at discretion of instructor.

602 Seminar in Macrotransportation Systems (3) Contemporary national logistics and transportation systems, governmental policies in logistics and transportation sectors, and current literature and research in field.

603 Research Methodology in Logistics and Transportation (3) Fundamental research process in areas of logistics and transportation, history and development of body of knowledge, and contemporary research methodology to develop student dissertation topics.

Materials Science and Engineering

(College of Engineering)

MAJORS

DEGREES

Metallurgical Engineering .......... M.S., Ph.D.
Polymer Engineering .......... M.S., Ph.D.

Joseph E. Spruill, Head

Professors:
Ashbee, K. H. G. (Racheff Chair of Excellence), Ph.D. .......... Birmingham (UK)
Bogue, Donald C., Ph.D. .......... Delaware
Borie, Bernard S., Ph.D. .......... MIT
Brooks, C. R., Ph.D. .......... Tennessee
Buchanan, Raymond A., Ph.D. .......... Vanderbilt
Clark, Edward S., Ph.D. .......... California
Canonic, D. A., Ph.D. .......... Lehigh
from a wide range of disciplines; these include Stansbury, E. E. (Emeritus), Ph.D \tn Cincinnati
Spruill, Joseph E., Ph.D \tn Tennessee
Oliver, Ben F., Ph.D \tn Penn State
McHargue, C. J., Ph.D \tn Kentucky
Lundin, Carl D., Ph.D \tn Rensselaer
Fellers, J. F., Ph.D \tn Akron

Association of the department and covering the review paper and other areas of metallurgical or polymer engineering.

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.

Department requirements consist of the satisfactory completion of:

1. Graduate courses in materials science and 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. 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, technology, materials, physics, chemistry, and other related fields.
4. Active participation in graduate seminars conducted by the department. Resident students must register for the appropriate 503 or 504 every semester offered.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of the state of Arkansas, Kentucky, Louisiana, Texas, or Virginia. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

GRADUATE COURSES

421 Mechanical Metallurgy (3) Brittle fracture due to metallurgical and environmental factors; stress-life and strain-fatigue analysis; residual stresses; creep and stress-rupture; finite plastic strain, ductile fracture, fabric-
522 Defects in Crystals (3) Analytical and experimental analysis of defect interactions in solids. Prereq: 421 or consent of instructor.

523 Plastic Deformation of Metals (3) Geometry and mechanisms of single crystal plastic deformation: slip, twinning, and cleavage, work hardening, effect of ternary and quaternary elements on deformation, extrusion alloying, polycrystalline behavior in terms of single crystal deformation mechanisms; texture formation, orientation distribution functions. Coreq: 520 or consent of instructor.

524 Metallurgical Thermodynamics (3) Applications of chemical thermodynamics to metallurgical problems: refining, oxidation, surface treatments, alloy systems. Prereq: 570 or equivalent.

526-26 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.

529 Diffusion in Solids (3) Phenomenology and atomic mechanisms of diffusion in solid state. Solution and applications of diffusion equations; random walk problem and mechanisms of diffusion; diffusion in dilute and concentrated alloys; Kirkendall effect; high diffusivity paths.


531 Advanced Corrosion (3) Analysis of corrosion processes in terms of polarization measurements and Potentiodynamic polarization diagrams; physical factors contributing to pitting, crevice, fretting, wear, fatigue and stress corrosion. Prereq: 470 or consent of instructor.


540 Basic Polymer Chemistry (3) Synthesis, reactions and degradation of polymers. Molecular characteriztion: solution methods and spectroscopy. Prereq: Semester of organic chemistry and thermodynamics or equivalent.

541 Fluid Mechanics and Polymer Processing (3) Continuum mechanics, theory of mixture: applications to polymer processing: screw extrusion, fiber spinning, injection molding. (Same as Chemical Engineering 541.)

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


545 Physical Characterization of Polymers (3) Broad range of techniques: single x-ray and light scattering, spherulitic and fibrous structures; introduction to electron microscopy.

546 Mechanical Properties of Solid Polymers (3) Types of mechanical behavior: Hookan and rubber elasticity, fracture: linear viscoelasticity; dynamic mechanical behavior and testing; loss tangent, experimental methods. Introduction to mechanical properties of polymer composites.

549-50 Laboratory Methods in Polymer Engineering (1,1) Basic experimental techniques and instrumentation associated with characterization, x-ray and light scattering, calorimetry, rheometry, mechanical properties of solid polymers, polymer processing operations. Coreq: 540 or consent of instructor.


551 Inorganic Glass Forming Systems (3) Physical and chemical processes for formation of glass; structural theories of glass formation; major glass forming systems: silica, other oxide glasses, nitrile glasses, water glasses, and chloroalumine glasses. Prereq: 363, Chemistry 371.

570 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: 303 or equivalent.

571 Electron Microscopy (3) Operation of electron microscope; kinematical and dynamical diffraction theories; structure determination; analysis of lattice defects. Prereq: 304 or equivalent.

572 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; characterization of orientation; application to inorganic, metallic and polymer structures.

573 Biomaterials Analysis and Development (3) Physical-property limitations of current implant surgical materials and methods of improvement: resistance to corrosion and mechanical damage; detrimental effects of specific metal ions; development of new biomaterials and new materials processing techniques. Prereq: 470, 474 or consent of instructor.

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

576-77 Special Topics in Materials Science and Engineering (3,3) Topics of current significance and interest. Prereq: Consent of instructor. May be repeated.


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

621-22 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.

623-24 Solidification and Crystal Growth (3,3) Theories of solidification, fluid flow effects, phase metahydrodynamics of incomparable flows, growth stability theory, thermodynamic applications, rapid solidification theory, metastability. Prereq: Consent of instructor.

641 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.

642 Advanced Topics in Polymer Processing (3) Application of theories of rheological behavior and of structure development to analysis of polymer processing operations. Prereq: 541.

643 Phase Transformations in Polymers (3) Glass transition and glassy consolidation, melting of polymeric glasses; crystallization of polymers; nucleation, growth and morphology; secondary nucleation theory; solidification of composites; crystallization under stress. Prereq: 543.

671 Quantitative Microscopy (3) Principal acoustic, optical, x-ray neutron, electron and field-ion techniques for examination of microstructures of materials. Prereq: 406.


676-77 Advanced Topics in Materials Science and Engineering (3,3) Latest developments and/or advanced special topics. Prereq: Consent of instructor. May be repeated.

679-79 Seminar in Recent Advances in Materials Science and Engineering (3,3) Directed and independent study of advanced topics. Prereq: Consent of instructor. May be repeated.

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Mathematics

(College of Liberal Arts)

MAJOR

DEGREES

Mathematics

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

G. Samuel Jordan, Head

Professors:

Albert, G. E. (Emeritus), Ph.D. — Wisconsin
Alexiades, V., Ph.D. — Delaware
Anderson, D. P., Ph.D. — Chicago
Baker, G. A., Ph.D. — Cornell
Bradley, John S., Ph.D. — Iowa
Carruth, J. H., Ph.D. — Louisiana State
Clark, C. E., Ph.D. — Louisiana State
Daverman, Robert J. H., Ph.D. — Wisconsin
Desart, Donald J., Ph.D. — Maryland
Dobb, D. E., Ph.D. — Cornell
Eaves, E. D. (Emeritus), Ph.D. — Texas
Frandsen, Henry, Ph.D. — Illinois
Hallam, T. G., Ph.D. — Missouri
Hinton, D. B., Ph.D. — Tennessee
Householder, A. S. (Emeritus), Ph.D. — Chicago
Husch, L. S., Ph.D. — Florida State
Johannson, K. P., Ph.D. — Bielefeld
Jordan, G. Samuel, Ph.D. — Wisconsin
Kupperschmidt, B. A. (U.SI), Ph.D. — MIT
McConnel, R. M., Ph.D. — Duke
Mathews, H. T., Ph.D. — Tulane
Miller, D. D. (Emeritus), Ph.D. — Michigan
Rajput, B. S., Ph.D. — Illinois
Reddy, K. C. (U.SI), Ph.D. — Indian Institute
Schafer, P. W., Ph.D. — Maryland
Serbin, Steve, Ph.D. — Cornell
Son, K., Ph.D. — Oregon State
Stallman, F. W. (Emeritus), Ph.D. — Giessen
Stephenson, K. R., Ph.D. — Wisconsin
Wachspus, E. Ph.D. — San Jose
Wade, W. R., Ph.D. — California (Riverside)
Wagner, C. G., Ph.D. — Duke

Associate Professors:

Alikakos, N., Ph.D. — Brown
Dyadk, J. Ph.D. — Warsaw
Gross, L. J., Ph.D. — Cornell
Karakashian, O., Ph.D. — Harvard
Kimble, K. R. (U.SI), Ph.D. — Ohio State
Kuo, Y., Ph.D. — Cincinnat
Lenthart, S. Ph.D. — Kentucky
Muly, S. Ph.D. — Purdue
Rosinski, J. Ph.D. — Wroclaw
Row, W. H., Jr., Ph.D. — Wisconsin
Simpson, H., Ph.D. — Cal Tech
Smith, J. Ph.D. — California
Son, R. P., Ph.D. — Oregon State
Sundberg, C. Ph.D. — Wisconsin
Thistlethwaite, M. B., Ph.D. — Manchester
THE DOCTORAL PROGRAM

For the Ph.D. in Mathematics, the student must meet the following four requirements in addition to those of The Graduate School:
1. Satisfy either of the following: the standard program or the mathematical ecology concentration. A student intending to work in mathematical ecology may complete either, but he/she is encouraged to complete the mathematical ecology concentration. A student may elect to switch from one to the other provided 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 mathematical ecology concentration. A description of both programs is below.
2. Demonstrate proficiency in one foreign language (Arabic, Chinese, French, German, or Russian). This requirement is to be met prior to the examination in the area of specialization. The student's doctoral committee may require that the student pass a second language exam.
3. Pass an examination in the field of specialization. This examination will be given by a committee appointed by the department head at some time after the requirements in 1 have been met. A student may take this specialty examination only twice.
4. Take a one-year, 600-level sequence in mathematics outside of his/her area of specialization. The use of the course selected to fulfill this requirement must be approved by the department head and the student's doctoral committee (such approval may occur after completion of the course).

Standard Program
Pass written examinations covering four subjects, at least three of which must be from the following list:

- a. Modern Algebra 551-52
- b. Complex Analysis 543-44
- c. Topology 561-62
- d. Real Analysis 541-42
- e. Applied Linear Algebra 547-48
- f. Partial Differential Equations 535-36
- g. Ordinary Differential Equations 531-32
- h. Numerical Mathematics 571-72
- i. Statistics 525-26
- j. Probability 523-24

Students may not count examinations in both d. and e. for the purpose of fulfilling the four exams required. Those who choose four from this list must choose at least two from a. through e., and the students who choose only three from this list must choose one from a. through e.

Students selecting only three from the above list will also be required to pass a written exam on an area of applied mathematics (e.g., fluids, elasticity, mathematical ecology) approved as an examination area for that student by the Graduate Committee and the Applied Mathematics Committee. The Graduate Committee will appoint a section of faculty who will submit a list of topics and references to the Graduate Committee and the Applied Mathematics Committee for approval.

Students may take as many of the written examinations as desired at any time these exams are given, subject to the following conditions:
1. The exams to be taken must be approved in advance by the student's advisory committee.
2. At most, 4 minus n exams may be taken at any one time, where n denotes the number of exams previously passed by the student.
3. Students may take a collection of written examinations a maximum of four times, but no one failing five exams, counting possible repetitions, will be permitted to take another round of exams.

Mathematical Ecology Concentration
Students must pass examinations in two areas:
1. Three subjects in mathematics. One must be mathematical ecology and two must be from the list under the standard program. Students may not count passes on examinations in both d. and e. in f. and g. or i. and j. toward the required three passes. At least one exam must be chosen from a. through e.
2. Students may take as many written examinations as desired in areas a. through j. The written examinations are given subject to the following conditions:
   a. The exams to be taken must be approved in advance by the student's advisory committee.
   b. At most, 4 minus n exams may be taken at any one time, where n denotes the number of exams previously passed by the student.
   c. Students may take a collection of written examinations a maximum of three times, but no one failing four exams, counting possible repetitions, will be permitted to take another round of exams.

3. Ecology, covering material selected from nine hours of coursework outside of mathematics at the 500 level or above.
   a. The courses submitted for examination must be approved by the student's doctoral committee and the departmental Graduate Committee. The courses must be prepared, administered, and graded by instructors of the courses involved, along with at least one member of the mathematical ecology section. The student must have the written agreement to participate in the examination from instructors of these courses and from at least one member of the mathematical ecology section before submitting materials to the committees for approval.
   b. Students may take the written examination at most twice.

GRADUATE COURSES

400 History of Mathematics (3) Development of major ideas in mathematics from ancient to modern times and influence of ideas in science, technology, philosophy, art, and other areas. Writing emphasis course: at least one in-class essay examination and 3000 words of writing outside classroom. Prereq: Calculus.

401 Mathematics and Microcomputers (3) Primarily for students seeking certification as mathematics teachers at secondary level. Use of microcomputers to study concepts and problems in mathematics. Does not satisfy the major requirements for a B.S. or M.S. in mathematics. Prereq: 141 plus 1 semester of discrete mathematics, 221 or 250.

404 Applied Vector Calculus (3) Topics from variational and vector calculus, line and surface integrals, divergence theorem and theorems of Gauss and Stokes. Prereq: 241.

405 Models in Biology (3) Difference and differential equation models of biological systems. Prereq: 141-42 or 151-52.

421 Combinatorics (3) Introduction to problems of counting, enumeration, and discrete structures: sequences, partitions, graphs, finite fields and geometries, or experimental designs. Prereq: 323 or consent of instructor.

423 Probability II (3) Law of large numbers and central limit theorems for discrete and continuous random variables; Poisson processes; discrete and continuous parameters. 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; classical and Neyman-Pearson independence of sample mean and variance; basic limit theorems; point and interval estimation, Bayesian estimates; statistical hypotheses, 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 III (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.

453 Matrix Algebra II (3) Matrix theory including Jordan canonical form. Prereq. 353. Offered alternate years.

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

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

460 Geometry (3) Automatic and historical development of non-Euclidean geometry: Euclidean geometry; straight line and circle; proof technique and critical reasoning, Models of Non-Euclidean geometries. Prereq: Calculus and Discrete Mathematics, or consent of instructor.

461 Topology (3) Topology of line and plane, separation properties, compactness, connectedness, continuous functions, homeomorphisms, continuity 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 individual by students. Credit hours announced for each seminar. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

499 Seminar in Mathematics (1-3) Topics vary. Requires out-of-class projects and in-class presentations. Prereq: 300 or consent of instructor. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.


575 Matrix Theory and Techniques in Numerical Analysis (3) Theoretical and practical aspects of eigenvalues and eigenvectors. Proof of iterative and direct methods for large systems of linear equations: sparse matrix analysis, relationship to modern computer architectures. Prereq: 453,471-72 or consent of instructor. May be repeated. Maximum 9 hrs. (Same as Computer Science 575.)

579 Seminar in Numerical Mathematics (1-3) May be repeated. Maximum 12 hrs.

581-82 Mathematical Ecology (3,3) Deterministic and stochastic models of populations, communities, and ecosystems. Prereq: 431,453 or consent of instructor.

583 Mathematical Evolutionary Theory (3) Population genetics and evolutionary ecology. Prereq: 431,453 or consent of instructor.


585 Optimal Control Theory (3) Deterministic optimal control. Examples involving calculus of variations, optimal trajectories, and engineering control problems. Introduction to stochastic control. Prereq: 431,445-46 or consent of instructor.

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. Prereq: Graduate standing and consent of instructor. May be repeated. Maximum 6 hrs.

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

617-18 Lie Algebras in Mechanics and Physics (3,3) Analytical tools of mechanics and physics arising from differentiable manifolds, tensors, Lie derivatives, Lie groups, differential forms, Lie algebras, applications to Hamiltonian mechanics, adiabatic and barotropic fluid dynamics, and plasma models, numerical methods in continuum mechanics. Prereq: 431, 435, 547, 571-72. (Same as Physics 617-18.)

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

623-24 Advanced Probability (3,3) Selected topics in modern theory of probability and stochastic processes: Itô's calculus and stochastic differential equations, integration prediction theory, ergodic theory, probability on algebraic structures, limit theorems, geometry and probability in Banach spaces, probability methods in analysis. Prereq: 523-24 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.

631-32 Advanced Ordinary Differential Equations (3,3) Theory of ordinary differential equations from advanced viewpoint. Topics from current literature. Subject matter varies according to interests and preparations of students. Prereq: 531-32 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.

635-36 Advanced Partial Differential Equations (3,3) Selected topics in classical and modern theoretical partial differential equations. Prereq: 541-42 or 547-48 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.


643-44 Harmonic Analysis (3,3) Fourier series and Fourier transforms on Euclidean spaces or topological groups; convergence, summability, uniqueness, inversion, duality, Plancherel transform, Hilbert transform, Hardy-Littlewood maximal function, interpolation of operators, or Calderon-Zygmund theory. Prereq: 541-42 and 543. May be repeated with consent of department. Maximum 12 hrs.

649 Seminar in Analysis (1-3) May be repeated with consent of department. Maximum 12 hrs.

651-52 Advanced Modern Algebra (3,3) Selected topics in modern algebra or number theory. Prereq: 551-52 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.

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


669 Seminar in Topology (3) May be repeated with consent of department. Maximum 12 hrs.


679 Seminar in Numerical Mathematics (1-3) May be repeated with consent of department. Maximum 12 hrs.

591 Mechanical and Aerospace Engineering (College of Engineering)

MAJORS DEGREES

Aerospace Engineering .................................. M.S., Ph.D

Mechanical Engineering ................................ M.S., Ph.D

Donald R. Pitts, Head

A. J. Edmonson, Associate Head

Professors:


Johnson, W. S., PE, Ph.D............................................. Clemson Krane, R. J., Ph.D........................................ Oklahoma Liston, Hardy Jr., M.E.A ... George Washington Lo, C. F. (UTSI), Ph.D........................................... Cornell Maxwell, R. L. (Emeritus), PE. ...................................... Case Western


Assistant Professors:

Dubey, R. V., Ph.D............................................. Clemson Jeng, S. M. (UTSI), Ph.D........................................ Penn State Keyhani, M., Ph.D........................................ Ohio State Nguyen, K., Ph.D........................................ Colorado

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, thermodynamics, and space engineering (UTSI only). 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 aeronautics. 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 coursework 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 coursework (400-level or above) in mathematics.
2. Six 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. Minimum of 36 semester hours of coursework 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 coursework (400-level or above) in mathematics. No more than 3 semester hours of engineering coursework may be below the 500 level.
2. Participation in the departmental seminar program.
3. Passing a comprehensive written oral final examination on all coursework submitted for the degree. The student's committee will be of sufficient size to include all of the study areas reflected in the course program.

Problems 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 coursework 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 coursework (400-level or above) in mathematics.
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 coursework submitted for the degree and an oral examination on all work (including projects).

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:
1. A minimum of 72 semester hours credit beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or problems, including:
   - A minimum of 24 semester hours of coursework in doctoral dissertation.
2. A minimum of 12 semester hours of graduate credit in mathematics in courses numbered 400 or above with a minimum of 6 semester hours numbered 500 or above.
3. A minimum of 24 semester hours in mechanical and/or aerospace engineering courses numbered 500 and above, with at least 9 semester hours of 600-level courses. These are exclusive of thesis, problems, or dissertation credit.

Academic Options
The student's advisory committee may approve a student's petition to replace one 600-level course(s) that are more appropriate.

4. Participation in the departmental seminar program.
5. The passing of a written and oral comprehensive examination is required as well as a successful defense of the dissertation.

ACADEMIC COMMON MARKET
An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville in an out-of-state tuition basis. The Ph.D. program in Aerospace Engineering is available to residents of the states of Arkansas, Kentucky, or South Carolina. The Master's in Aerospace Engineering is also available to residents of Kentucky. Additional information may be obtained from the Resident Assistant in the Office of Graduate Admissions and Records.

GRADUATE CREDIT FOR UNDERGRADUATE COURSES
Senior (400-level) mechanical and aerospace engineering coursework may be taken for graduate credit by non-mechanical or non-aerospace engineering majors, if approved by the student's major department. Mechanical or aerospace engineering majors may not normally use more than one 400-level engineering course to meet their advanced degree requirements.

Non-mechanical or non-aerospace engineering graduate students should consult with instructors regarding prerequisites for undergraduate courses.

MECHANICAL ENGINEERING

GRADUATE COURSES
416 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.
449 Mechanical Engineering Laboratory (3) Designing, conducting and reporting results of experimental exercises; selection of test equipment; interpretation of data and formation of conclusions. Prereq: Coreq: 332, 344, 345. Coreq: 475, 3 labs. Sp, Su
451 Systems and Controls (3) Analytical models of physical systems comprised of combinations of mechanical, fluid, electrical, and thermal components; feedback control systems, transient and frequency response, stability analysis; non-linear control of linear systems; sampled data systems, digital filters. Prereq: 341, 363, Electrical Engineering 301-02. F, Sp
455 Introduction to Design (2) 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, patents and product liability; design of mechanical engineering thermal-fluid system. Participation in team design effort; design report. Prereq: 332, F
462 Tool Design (3) Principles underlying tool and die design; design for high production; work holding fixtures; comparison of material removal methods; selection of tool material; plastics production. Prereq: 366 or Industrial Engineering 404, Engineering Science and Mechanics 321.
469 Machine Design (4) Design of complete machine; documentation; complete specifications; design calculations, working drawings, cost analysis. Written and oral report. Prereq: 455, 466, Sp
471 Refrigeration and Air Conditioning (3) Vapor compression and absorption cycles; heat pump systems; psychometric processes; air washers; cooling towers; solar radiation; building heat transmission. Prereq: 332, 344.
474 Solar Energy Utilization (3) Nature and availability of solar radiation; review of selected heat transfer topics pertinent to solar energy collection and use; design analysis of solar energy collectors and method of storing selected applications. Prereq: 332, 344, or consent of instructor.
475 Thermal Engineering (3) Thermal systems, turbomachinery, heat exchangers, combustion and system analysis and design, second law and economic analysis. Prereq: 332, 344, F, Sp
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, Sp
494-95 Selected Topics in Mechanical Engineering (1-1) Problems and topics related to developments and practice in mechanical engineering. Pre req: Consent of instructor.
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 the continuing education program. May not be used toward degree requirements. May be repeated. S/NC only. E
507 Application of Numerical Linear Algebra in Systems and Control Engineering (3) (Same as Chemical Engineering 507 and Electrical and Computer Engineering 507.)
512 Heat Transfer II (3) Analysis of steady-state and time-dependent heat conduction by numerical methods. Analysis of laminar and turbulent convection heat transfer in interior and external flows, forced and free convection.
514 Phase Change Heat Transfer (3) Mechanisms and modeling of nucleate, transition and film boiling processes; critical heat flux; forced convection boiling and pool boiling; heat transfer in heterogeneous nucleation; dropwise and filmwise condensation; flow condensation; liquid-solid phase change processes; adiabatic phase fronts; mathematical modeling. Prereq: 344, 511.

521-22 Thermodynamics I and II (3, 3) Macroscopic thermodynamics, including First and Second Law analyses; properties of pure substances; phase equilibrium; combustion, gas mixtures, and property relations; determination of thermodynamic properties from molecular structures; spectroscopic data, kinetic theory, statistical mechanics, quantum physics, Schrodinger equation. Prereq: 330.

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

525 Combustion and Chemically Reacting Flows I (3) Fundamentals: thermochromy, chemical kinetics and conservation equations; phenomenological approach to laminar flames; diffusion and premixed flame theory; single drop combustion; deflagration and detonation theory; stabilization of combustion waves in laminar streams; flammability limits of remixed laminar flames; introduction to turbulent flames. Prereq: 522, 531.

526 Combustion and Chemically Reacting Flows II (3) Advanced topics: phenomenological approaches to turbulent flames; fundamentals of turbulent flow; application of eddy viscosity model to turbulent reacting flows with premixed and/or non-premixed reactants; spray combustion models; fluidized bed combustion; chemically reacting boundary layer flow; gas turbine and/or rocket motor combustors; furnaces; introduction to supersonic combustion and hypersonic flows. Prereq: 526.


541-42 Research in Mechanical Engineering I and II (3, 3) Design of experiments; data analysis; experimental instruments. P/N P: Instructor.

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

553 Development of Superior Products and Processes (3) Case studies of latest techniques of superior product and process development practiced in industry; Case study of product or process yielding superior results developed by student. Prereq: B.S. in Engineering or consent of instructor.


560 Computer Aided Mechanical Design (3) Applications of matrices and computational techniques in static and dynamic analyses and re-design of complex, three-dimensional, statically indeterminate structures. Prereq: 569 and 464 or consent of instructor.

561 Experimental Stress Analysis (3) Experimental stress analysis. photoelasticity, strain gauges. Prereq: Consents of instructors.

567-68 Dynamics of Machinery (3,3) Kinematics and kinetics; fixed, moving and rotating coordinate systems; linear and angular motion; energy methods; computational techniques derived from Lagrangian mechanics; variable mass; rigid body dynamics. Prereq: 563, 391.

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


581 Rocket Propulsion I (3) Rocket propulsion fundamentals; thermodynamics of nonreacting and chemically reacting ideal gases, rocket nozzle design; ideal rocket performance parameters; rocket heat transfer; chemistry of propellant 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 propel- lant burn rates, erosive burning; analysis of two-phase solid rocket exhaust flow. Introduction to nuclear and electric propulsion: science and resistance and electric field (ion) engine performance, magnetohydrodynamic thrusters, traveling wave thrusters; exotic propulsion systems. Prereq: Consent of instructor.

584-85 Turbomachinery Systems I and II (3, 3) Ideal cycle analysis of turbine and engine, real cycle analysis, component performance analysis, component design and systems integration (turbos, nozzles, combustors, compressors, turbines, turbomachines, high pressure, turbine engines) component matching, transient operation, surge and rotating stall, engine control systems, structural consider- ations. Prereq: First year graduate standing and con- sent of instructor.


588 Measurement Science I (3) (Same as Nuclear Engineering 508, Chemical Engineering 508, Civil Engi- neering 568, Electrical and Computer Engineering 568, Engineering Science and Mechanics 568, and Aero- space Engineering 568.)

589 Measurement Science II (3) (Same as Nuclear Engineering 509, Chemical Engineering 509, Civil Engi- neering 569, Electrical and Computer Engineering 569, Engineering Science and Mechanics 569, and Aero- space Engineering 569.)

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

595 Seminar (1) All phases of mechanical engineering, analysis of data and formation of conclusions. Prereq: Any mechanical engineering undergraduate. Prereq: Consent of instructor.

599 Special Topics in Mechanical Engineering (1-3) Prereq: Consent of instructor. May be repeated. Maxi- mum 6 hrs.

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

610 Advanced Topics in Fluid Mechanics and Heat Transfer (3) Advanced theory and application of fluid mechanics and heat transfer; natural convection, multi- phase flow, high speed flow, heat transfer and reaction flows, advanced boundary layer techniques, combustion, per- turbation and variational methods of analysis, heat ex- changers 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 viscous boundary layer flows; problems in heat transfer at high supersonic and hypersonic speeds; laminar and turbulent boundary layer heat transfer with surface matted and un-matted; effects of gas species recombination; stagnation point heat transfer; Lee's integral solution for high speed boundary layers; heat flux in films; continuous and radiative models for thin film cooling. Prereq: 512 and consent of instruc- tor.


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


624 Advanced Topics in Thermodynamics (3) Com- parison of macroscopic and microscopic approach; equilibrium of pure substances, metastable states; Non- equilibrium thermodynamics. Prereq: Consent of in- structor.


Aerospace Engineering

GRADUATE COURSES

422 Aerodynamics (3) Theory and design of aero- dynamic devices for flight with ideal characteristics. Potential flow theory, viscous effects, compressibility effects, Subsonic, transonic, and supersonic airflow. Prereq: 371.


425 Propulsion (3) Principles of propulsion devices; turbo-jet, ram jet and rocket engines. Prereq: 351. 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, 570, 563, Coreq: Mechanical Engineering 344. F.


449 Aerospace Engineering Laboratory (3) De- signing, conducting, and reporting results of experi- mental exercises. Test standards and specifications. Analysis of data and formation of conclusions. Prereq: 345, 351, 3 labs. F.

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

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

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.

511 Inviscid Flow (3) Kinematics and dynamics of inviscid fluids; potential flow about body, conformal mapping. Prereq: 422 or Mechanical Engineering 531, Mathematics 425 or equivalent.

512 Viscous Flow (3) Equations of viscous fluid flow; laminar and turbulent flow; transition; separation; bound- ary layer theories; exact and approximate solutions. Prereq: Mechanical Engineering 531 or equivalent.

513 Experimental Methods in Fluid Mechanics (3) Experimental techniques with laboratory experiments; representative experiments: hot wire anemometry and
turbulence measurements, flow visualization, wind tunnel tests, water table experiments, supersonic flow experiments, boundary layer measurements, laser-optical measurements. Prereq: 423 or Mechanical Engineering 531.

515-16 Air Vehicle Aerodynamics and Performance (3,3) Application of aerodynamics principles to air vehicles to provide a foundation for estimation of stability, and control characteristics for subsonic to hypersonic speeds. Relations among thrust, drag, lift and attitude, propulsion systems, vehicle performance characteristics, and trajectory optimization. Prereq: 422; 515 for 516.


525 Hypersonic Flow (3) Slender body flow; similitude; Newtonian theory; blunt body flow; viscous interactions; free molecule and rarefied gas flow. Prereq: 512.

527-28 Aerospace Ground Test Facilities (3,3) Atmospheric models and similarity considerations; aerodynamic test facilities: continuous and intermittent wind tunnels and ballistic ranges; propulsion test facilities or air breathing and rocket engines; space environment and vehicle test facilities. Prereq: 515 and 521, Mechanical Engineering 513 and 522.

529 Rarefied Gasdynamics (3) Binary elastic collisions; kinetic theory; flow regimes; Boltzmann and model equation introductions; gas-surface interactions; slip boundary conditions, free molecule, slip and transition flow. Monte Carlo simulation; experimental technique introduction to general rarefied gas flows. Prereq: 522, Mechanical Engineering 522.

531 Magnetohydrodynamics (3) Electromagnetic field theory; chemical kinetics; thermodynamic and thermophysical processes in plasmas; governing equations and applications. Prereq: 422 and Mathematics 471.

532 Introduction to Turbulence (3) Macroscopic effects, analogies, statistical treatment, correlation functions, energy spectra, diffusion, application of turbulent jets and pipe flow. Prereq: 511-12.

534 Atmospheric Entry (3) Reentry trajectories; lift and drag during reentry; vehicle motion and stability during reentry; aerodynamic heating and heat protection systems. Prereq: 522. Recommended prereq: 512.

544 Transonic Flow (3) Nature of flow at transonic speeds; small disturbance theory; shock wave properties; shock-free flows; strong viscous interaction phenomena. Prereq: 512.


554-55 Aerospace Vehicle Stability and Control (3,3) Static and dynamic longitudinal directional and lateral stability and control. Coupled modes. Motion with free and fixed flight control surfaces. Automatic control systems. Prereq: 423, 551.

556 Vertical or Short Take Off and Landing Aircraft (3) Performance, stability, control of rotary wing, tilt wing, vectored lift and jet vertical/short type aircraft. Vertical and transition flight modes. High lift airfoils. Automatic control. Simulation of vehicle types and flight testing. Prereq: 556.


561 Fundamentals of Aerocoustics (3) Generation, propagation and absorption of aerodynamic and moving media. Prereq: Consent of instructor.

564 Spacecraft Attitude Dynamics and Control (3) Rotational attitude dynamics of space vehicles. Gyroscopic instruments, passive and active attitude control devices. Linear control theory and attitude stabilization. Prereq: 551, Mathematics 471.

574 Space Engineering: Satellite Technology (3) Satellites and rockets (orbit, launch vehicles and launching), spacecraft structure, power systems, attitude control system, telemetry/tracking/command, and communication systems, spacecraft testing, reliability, and application of satellites (communications, weather, Earth observation, and future applications). Prereq: 425, Mathematics 471, 404.

588 Measurement Science I (3) (Same as Nuclear Engineering 588, Civil Engineering 596, Electrical and Computer Engineering 586, Engineering Science and Mechanics 588, and Mechanical Engineering 596.)

599 Measurement Science II (3) (Same as Nuclear Engineering 589, Chemical Engineering 589, Civil Engineering 598, Electrical and Computer Engineering 589, Engineering Science and Mechanics 589, and Mechanical Engineering 589.)

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

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

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

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

631 Magnetohydrodynamics I (3) Electromagnetic field equations, motions of single charged particle, Boltzmann equation, propagation and absorption of sound in static and moving media. Prereq: 522.

632 Magnetohydrodynamics II (3) Alfvén and shock waves, exact solution for magnetohydrodynamic channel flow, one-dimensional model of channel flow, engineering applications of magnetohydrodynamics, propulsion and power generation. Prereq: 631 and Mathematics 662.

641-42 Physical Gas Dynamics (3,3) High speed, high temperature gas flow from molecular point of view. Kinetic theory, statistical mechanics, equilibrium flow, non-equilibrium flow, non-equilibrium kinetic theory, flow with translational non-equilibrium. Prereq: 522, Mechanical Engineering 522.

645 Theory of Turbulence (3) (Same as Engineering Sciences 645) Prereq: 511, 522.

651-52 Advanced Aerodynamics (3,3) Subsonic, transonic, supersonic, and hypersonic flows treated in generalized and unified manner with combined viscous/inviscid effects. Relationships among various regimes of fluid flows. Fundamental assumptions, limitations of approximations and consequences. Foundations of gas dynamic approximation to plane, rotor, ground test and jet propulsion. Discussion of special topics according to interest of students. Prereq: 511, 522.


690 Advanced Topics in Aerospace Engineering (3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

Medical Biology

(Graduate Program in Knoxville Unit)

Carmen B. Lozio, Acting Chair

Professors:

Chen, J. P., Ph.D. Penn State
Farkas, W., Ph.D. Duke
Fuhr, J. E., Ph.D. St. John's
Condon, C. G. (Emeritus), M.D. Michigan
Johnston, J. B., D. V. M. Illinois
Lange, R. D. (Emeritus). M.D. Washington (St. Louis)
Lozio, Carmen B., M.D. Buenos Aires
McDonald, T. P., Ph.D. Tennessee
Wigler, P. W., Ph.D. California
Wust, Carl J., Ph.D. Indiana

Associate Professors:

Carroll, R., Ph.D. Cornell
Hanna, W. T., M.D. Ain-Shams
Ichiki, A. T., Ph.D. UCLA
Schroeder, E. C., D.V.M. Michigan State

Assistant Professors:

Matteson, K., Ph.D. Wisconsin
Switzer, R. C. III, Ph.D. Michigan State
Tyson, J. P., Ph.D. SUNY Buffalo
Worthington, R. E., Ph.D. Washington (St. Louis)

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

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

GRADUATE COURSES

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 research projects under supervision of faculty. Open to all graduate students. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only. E

521 Principles of Oncology (3) Lectures, classroom discussion, and 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. S/NC only. E

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, stereochemistry and metabolic pathways. 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 (3-15) P/NP only. E

610 Medical Biology Seminar (1) Invited speakers. Topics posted in advance. May be repeated. S,NC only. F,Sp

611 Advanced Topics in Medical Biology (1-3) New developments in biological research applicable to clinical medicine. Primarily for doctoral candidates in Comparative and Experimental 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. Primarily for doctoral candidates in Comparative and Experimental Medicine. 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.

Dwayne Savage, Head

Professors:
Beck, Raymond W., Ph.D. ......................... Wisconsin
Becker, Jeffrey M., Ph.D. ......................... Cincinnati
Brian, D. A., D.V.M., Ph.D. .................... Michigan State
Brown, Arthur (Emeritus), Ph.D. ............. Chicago
Montie, T. C., Ph.D. .............................. Maryland
Riggby, W. Stuart, Ph.D. ....................... Yale
Rouse, B. T., Ph.D. ............................... Guelph
Savage, Dwayne C., Ph.D. ...................... California
Saylor, Gary S., Ph.D. ............................ Idaho

White, D. C. (Distinguished Scientist), Ph.D. ......................................... Rockefeller Woodward, J. M. (Emeritus), Ph.D. ........... Kansas Wust, Carl J., Ph.D. ............................. Indiana

Associate Professors:
Bemis, D. A., Ph.D. ............................... Cornell
Moore, R. N., Ph.D. ............................... Texas
Stacey, G., Ph.D. ................................. Texas

Assistant Professors:
Villalb, Robert J., Ph.D. ......................... NYU
Weir, Jerry P., Ph.D. .............................. Vanderbilt

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 coursework 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 that the student pass six comprehensive examinations during the first year of graduate study. The department also requires that the student pass six comprehensive examinations during the first year of graduate study. The major professor assists in the selection of and carries out the research program and the selection of the 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, to permit the acquisition of technical competence in the fundamentals of research, and to encourage scientific and independent thinking. Two to three calendar years are usually needed for the course of study. The following requirements: (1) 30 hours including 6 thesis credits; (2) 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) 3.0 GPA in courses taken in the department; (4) a complete course sequence in biochemistry; (5) coursework in at least five of the subdisciplines 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 thesis 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) 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 research dissertation and its oral defense.

GRADUATE COURSES

410 Physiology and Genetics of Bacteria (3) Modern concepts of structure and function of bacterial cells: metabolism, energy flow, and transmission and expression of genetic information. Prereq: 310. F

419 Bacterial Physiology and Genetics Laboratory (1) Laboratory exercises designed to accompany 410. Coreq: 410. F

420 Pathogenic Bacteriology (2) Disease-producing microorganisms: bacteria, rickettsia, and chlamydia. Prereq: 310. Sp


430 Immunology (2) Principles of inflammation and immunity; immunoglobulin structure and theories of formation and diversity; complement, hypersensitivities, cell cooperation and recognition in immune mechanisms; soluble factors. Prereq: Biology 220. (Same as Zoology 430.) F

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


449 Virology Laboratory (1) Laboratory procedures for isolation, handling, and culturing of animal viruses. Prereq: 310. Coreq: 440. F

470 Microbial Ecology (3) Physiological diversity and taxonomy of microorganisms from natural environments. Functional role of microorganisms in natural and simulated ecosystems. Prereq: 310. Sp


480 Mycology (3) Morphology, physiology, genetics, and taxonomy of yeasts and molds; pathogenesis of disease-causing fungi. Prereq: 310. Sp
Microbiology - Veterinary Medicine

See Veterinary Medicine for program description.

Music

(College of Liberal Arts)

MAJOR

M.M., M.A.

DEGREES

Music

John J. Meacham, Head

Professors:

Bitzas, George C., M.M. ............... Converse
Brock, John P., M.M. ................. Alabama
Carter, W. J. (Emeritus), D.M.A. .... Eastman
Coker, J. A., M.M. ................. Sam Houston
Combs, F. M., M.A. ................. Missouri
DiVeine, George F. (Emeritus), .
Dorn, W., M.A. ..................... Columbia
Fred, Herbert W., Ph.D. ............. North Carolina
Hartford, A. G. (Emeritus), M.M. .... Northwestern
Huber, Calvin R., Ph.D. ........... North Carolina
Lennon, J. A., D.M.A. ............... Michigan
Meacham, John J., M.M. .......... Northwestern
Northington, B. D., D.M.A. ......... Yale
Pederson, D. M., Ph.D. ............. Iowa
Starr, W. J. (Emeritus), M.M. ......... Eastman
Stutenberger, R. D., D., M.A. ...... Maryland
VanVactor, D. (Emeritus), M.M. .... Northwestern

Associate Professors:

Adams, Fay, M.M. ..................... Tennessee
Bommelje, W., M.M. ................. Tulsa
Carter, P. S., M.M. ................. Colorado
Fraley, M., B.M. ..................... Oberlin
Horodysky, P., M.M. ................. Manhattan
Hough, Don, M.M. ................. Tennessee
Hough, Dolly C., M.M. ............. Tennessee
Jacobs, K. A., D.M.A. ............. Texas
Johnson, A. E., D.M.A. ............. Stanford

MacMorrant, W. S., M.M. .......... Wisconsin
McClelland, D. K., M.A. ............ Columbia
Michalopoulos, L. W., M.A. ........ Columbia
Scarlett, William P., M.M. .......... Louisiana State
Searle, S. M., M.M. ............... Tennessee
Teachev, J. C., D.M.A. ............. Florida State
Young, S. E., Ph.D. ............... North Carolina

Assistant Professors:

Boling, M. E., M.M. .................. Tennessee
Brown, Donald R. .................... Yale
Duberry, T. S., M.M.A. ............. Southern Cal
Goolsby, D., M.M. ................. Texas
Hawthorne, W., Ph.D. ............. Cincinnati
Schroeder, E., Ph.D. .......... Stanford
Sper, G. R., M.M. .................... Indiana
Leach, C. F., M.M. ................. New Mexico

The Department of Music offers the Master of Music degree with concentrations in accompanying, choral conducting, composition, instrumental conducting, jazz, performance (organ, piano, saxes, voice, and percussion), piano pedagogy and literature, sacred music, string pedagogy, and theory, and the Master of Arts degree in Music with concentrations in musicology and theory. Applicants for these degree programs must have completed an undergraduate degree approximately equivalent in music requirements to those required in degrees conferred by UT Knoxville, appropriate to the applicant's prospective area of concentration on the Master's level. Applicants who plan to pursue the concentration in performance are required to audition before the appropriate area faculty committee. Applicants for admission to the program in composition must submit scores and tape recordings of representative works. Applicants for the concentration in jazz must audition in jazz improvisation and jazz piano proficiency and interview with members of the faculty in this area. Other applicants are required to have an interview with members of the faculty of the prospective area of concentration. All applicants are required to take the Diagnostic Examinations in music theory and music history/literature. These examinations are given by the Department of Music at the beginning of each semester. All concentrations require a written and oral final examination.

THE MASTER OF MUSIC PROGRAM

A minimum of 30-33 semester hours of coursework is required for the Master of Music degree. These hours are specifically distributed according to the areas of concentration. All concentrations require coursework in music history/literature and music theory and allow for elective courses. Specific curricula are available from the Department of Music. Applicants for these degree programs must complete an undergraduate degree approximately equivalent in music requirements to those required in degrees conferred by UT Knoxville, appropriate to the applicant's prospective area of concentration on the Master's level. Applicants who plan to pursue the concentration in performance are required to audition before the appropriate area faculty committee. Applicants for admission to the program in composition must submit scores and tape recordings of representative works. Applicants for the concentration in jazz must audition in jazz improvisation and jazz piano proficiency and interview with members of the faculty in this area. Other applicants are required to have an interview with members of the faculty of the prospective area of concentration. All applicants are required to take the Diagnostic Examinations in music theory and music history/literature. These examinations are given by the Department of Music at the beginning of each semester. All concentrations require a written and oral final examination.

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Music General

GRADUATE COURSES

500 Thesis (1-15) P/NP only. E
501 Graduate Recital (2)
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
511 Lecture Recital (2)
521 Special Topics in Performance (1-3) Prereq: Consent of Department head.
561 Church Music Performance Project (1-2) May be repeated. Maximum 3 hrs.

Music History

GRADUATE COURSES

410 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 viewpoints 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.
530 Music in the Middle Ages (3) Gregorian and medieval chant, secular monophony, and rise of polyphonic music.
540 Music in the Renaissance (3) From 1400 to 1600. Mass, motet, chanson, madrigal, and other vocal and instrumental forms and genres.
550 Music in the Baroque Period (3) From c.1600 to 1750; rise of opera and oratorio, sacred and secular cantatas, instrumental forms, performance practice.
560 Music in the Classic Period (3) Evolution of classical style from pre-classic music to music of Haydn, Mozart, and early Beethoven.
570 Music in the Romantic Period (3) Nineteenth-century musical styles from Beethoven to post-romantic.
580 Music in the Twentieth Century (3) From 1890, Debussy, to present, Stockhausen and others.
690 World Music (3) Attitudes and techniques of ethnomusicology. Survey of world music cultures. Interview and transcription projects.
593 Independent Study (1-15) See page 31. Prereq: Consent of department head.

Music Instrumental

GRADUATE COURSES

410 Band Arranging (3) Study and application of techniques employed in scoring for marching and concert bands. Prereq: Music Theory 320.
490 Instrumental Conducting (3) Development of knowledge and skills in instrumental conducting; study of various periods and composers and relationship of different styles to conductor's art; musical analysis and practice in conducting. Prereq: Music Education 320 or equivalent.
570 Advanced Suzuki Pedagogy (2) Study of psychology, procedures and literature utilized by Shinichi Suzuki in Japan. Prereq: 495 or consent of instructor. May be repeated. Maximum 4 hrs.
580 Band Literature (3) Band literature and origins of band, its important expanded cultivation during past century in United States and Europe.
582 Instrumental Conducting Performance (1) Jury performance; conducting band or orchestra in public.
583 Practicum for Instrumental Conductors (1) Intern experience in choral music. S/NC only.
584 Practicum for Instrumental Conductors (1) Intern experience in field other than area of major interest. S/NC only.
595 Instrumental Conducting Seminar (3) Rehearsal and performance problems and techniques allied to score reading and preparation. Particular attention to individual problems. Prereq. 490 or equivalent.

Music Jazz

GRADUATE COURSES

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 materials relating to teaching of jazz, designing and administrating jazz programs, and contemporary approaches for jazz ensembles. Prereq: Studio music and jazz major or consent of instructor.
520 Seminar in Jazz (3) Topic varies.

Music Keyboard

GRADUATE COURSES

410 Early Keyboard Literature (2) Keyboard music through baroque period, music for harpsichord. Prereq: Music History 210-220.
420-30 Piano Literature II (2,2) From 1780 to middle 19th century. 430--Middle 19th century to present.
460-70 The Organ and Its Literature 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: Music History 220 and consent of instructor.
485-95 Suzuki Piano Method II (2,3) Psychology, procedures, and literature of Suzuki piano method. Must be taken in sequence. Prereq: Consent of instructor.
520 Piano Literature Seminar (2) Topics vary. May be repeated. Maximum 6 hrs.
531-41 Recital Project (2,2) Preparation and accompaniment of full recital for accompanying concentrations only. 531--Vocal recital, 541--Instrumental recital. Prereq: Consent of instructor.
540-50 Advanced Piano Pedagogy II (2,2) 540--Evaluation and study of methods and materials for teaching piano at all levels. Supervised laboratory teaching. Prereq: 440. 550--Introductions 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

GRADUATE COURSES

430-40 Counterpoint I (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

GRADUATE COURSES

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 6 hrs.
510 Vocal Literature Seminar (3) Topics vary. May be repeated. Maximum 6 hrs.
530 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.
550-59 Advanced Vocal Pedagogy 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 (2,2) Choral music from medieval 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.
595 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

GRADUATE COURSES

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 Violin (1-4)
466 Viola (1-4)
470 Cello (1-4)
475 Guitar (1-4)
479 Guitar (1-4)
480 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.
500 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.
509 Tuba Ensemble (1) May be repeated.
510 Percussion Ensemble (1) May be repeated.
511 Marimba Choir (1) May be repeated.
512 Baroque Ensemble (1) May be repeated.
513 Synthesizer Ensemble (1) May be repeated.
514 Brass Choir (1) May be repeated.
515 Chamber Music Ensemble (1) May be repeated. Maximum 12 hrs.
520 UT Singers (1) May be repeated.
525 UT Singers (1) May be repeated.
526 UT Singers (1) May be repeated.
527 UT Singers (1) May be repeated.
528 UT Singers (1) May be repeated.
529 UT Singers (1) May be repeated.
530 UT Singers (1) May be repeated.
531 UT 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.
551 Campus Band (1) May be repeated.
554 Varsity Band (1) May be repeated.
555 Laboratory Band (1) May be repeated.
556 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 Chorale (1) May be repeated.
585 Men's Chorale (1) May be repeated.
589 Women's Chorale (1) May be repeated.
599 Accompanying (1) May be repeated.

Music Ensemble

GRADUATE COURSES

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 Marimba Choir (1) May be repeated.
512 Baroque Ensemble (1) May be repeated.
513 Synthesizer Ensemble (1) May be repeated.
514 Brass Choir (1) May be repeated.
515 Chamber Music Ensemble (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.
555 Laboratory Band (1) May be repeated.
556 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 Chorale (1) May be repeated.
589 Women's Chorale (1) May be repeated.
599 Accompanying (1) May be repeated.

Nuclear Engineering

(College of Engineering)

MAJOR DEGREES

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

Thomas W. Kerlin, Head

Professors:

Dodd, H. L., PE, Ph.D. .................... Tennessee
Kerlin, T. W., Ph.D. ...................... Tennessee
Keeshock, Edward G., PE, Ph.D. ............... Oklahoma State
Mihalcz, J. T., Ph. D. ...................... Tennessee
Pasqua, P. F. (Emeritus), PE, Ph.D. ................ Northwestern
Perez, R. B., Ph.D. ....................... Madrid
Rohan, H. C. (Emeritus), Ph.D. ............ Tennessee
Rout, P. N., PE, Ph.D. .................... Northwestern
Sivakumaran, A. N., Ph.D. .................. Michigan
Uhrig, R. E. (Distinguished Prof.), PE, Ph.D. .................... Iowa
Upadhyaya, B. R., Ph.D. .................... California

Associate Professors:

Katz, E. M., PE, Ph.D. ...................... Tennessee
Miller, L. F., PE, Ph.D. .................... Texas A&M
Scott, T. H., PE, Ph.D. ...................... Florida

The Department of Nuclear Engineering offers programs leading to the Master of Science and Doctor of Philosophy degrees. Students may elect a traditional nuclear engineering M.S. or Ph.D. program (focusing on fission energy or fusion energy) or a radiation protection engineering concentration at the Master's level. The radiation protection engineering concentration prepares students for careers in the radiation safety field (health physics). The program is designed for graduates of undergraduate programs in engineering, physics, biology and chemistry.

A joint fusion energy program has been developed between the Nuclear Engineering and the Electrical and Computer Engineering Departments. Cross-listed courses from each department are used to satisfy degree requirements. Students may have the opportunity to do their research at the Fusion Energy Division of Oak Ridge National Laboratory or at the Plasma Science Laboratory, affiliated with the Electrical and Computer Engineering Department. A limited number of Graduate Research Assistantships are available at each location. Further information about this program is available from the department.

Students in the Nuclear Engineering Department have an opportunity to affiliate with the Measurement and Control Engineering Center and the Waste Management Research and Education Institute. These organizations provide unique research opportunities.

THE MASTER'S PROGRAM

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.

The student must complete 24 semester hours of coursework approved by the student's advisory committee that includes the following:

1. A major consisting of a minimum of 12 semester hours of graduate courses in nuclear engineering. This must include at least one of the following two-semester sequences: 511, 512; 551, 552; 563, 564; 571, 572.

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

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

The M.S. candidate must also demonstrate research or design capability. This requirement may be satisfied by preparing a thesis or participating in the nuclear engineering practice school, as described below.

Thesis - The student performs independent research on a topic approved by the graduate committee. He/she submits a thesis on this research. The student then must pass an oral examination on the thesis and all graduate coursework. The student must enroll for six semester hours of NE 509 (Thesis).
Practice School - The student addresses two to four separate research problems approved by his/her graduate committee. Each is similar to a thesis problem, but smaller in scope. The student must make an oral report and submit written reports on each project. He/she must pass an oral examination at completion of course work and all graduate coursework. The student must enroll for sixteen semester hours of NE 598 (Nuclear Engineering Practice).

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 institution, with a major in engineering or physics. All candidates will be required to demonstrate general competence in a comprehensive examination in the areas of engineering science, mathematics, physics, and nuclear engineering.

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 undergraduate requirements numbered 400 or above.
5. A minimum of 6 semester hours in courses numbered 400 or above taken 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.

GRADUATE COURSES

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

402 Nuclear Engineering Laboratory (3) Cross-section measurement, diffusion properties of neutrons, critical loading experiment, control rod calibration, statistical weight, shielding, xenon poisoning, dynamics and control experiments. Prereq: 302 or equivalent.


404 Radiation Shielding (3) Types of radiation sources, fundamentals of gamma ray and neutron attenuation, biological effects, approaches to shielding design, discrete ordinates, and Monte Carlo. Prereq: Physics 232.

421 Introduction to Nuclear Criticality Safety (3) Fundamentals of nuclear criticality safety; criticality accidents; safety standards; overview of experiments, computational methods, and applications. Prereq: Introduction to nuclear engineering and nuclear reactor theory.

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.

494 Special Topics in Nuclear Engineering (3) Problems related to topical research and practice. Prereq: Senior standing and consent of instructor. May be repeated. Maximum 6 hrs.

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

502 Registration for Use of Facilities (3-15) Required for the student to be 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 allowed.

511-12 Transport Processes in Nuclear Engineering (3.5) Rheology of newtonian and non-newtonian fluids; integral and system conservation equations for single and multi-component fluids; in-depth development of differential conservation equations for mass, energy, and momentum. 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. Introduction to various methods to nuclear plant dynamics, simulation and control problems.


541 Reactor Fuel Management (3) Topics related to core fuel management. Applicable topics in reactor physics, fuel depletion, isotopic inventories, reactivity control and numerical methods.


543 Selected Topics in Nuclear Criticality Safety (3) Criticality safety computational and experimental methods for enrichment, fabrication, storage, reprocessing, and transport applications. Nuclear reactor safety code review; review of experiments; tours of fissile material facilities in East Tennessee. Prereq: 421.

550 Nuclear Instrumentation (3) Physics and electronics associated with radiometric detection, methods of data analysis, applicability of particular instrument measurements and fundamentals of nuclear instrumentation operation.

551 Radiation Protection (3) Interactions of photons, neutrons, beta particles, and heavy charged particles with matter and mechanisms of energy loss; methods of radiation detection, internal and external radiation dosimetry; chemical and biological effects of radiation; regulations and standards. Prereq: Introduction to Nuclear Engineering or equivalent.

552 Radiation Monitoring and Dose Assessment (3) Methods for area- and environmental monitoring; dose assessment; pathways analysis; risk projections and regulations. Prereq: 551.

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

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 plasmas. Prereq: 464 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 media. Selected topics from literature. Class project: solution of nuclear design problem. Prereq: 571 or equivalent.

581 Reactor Shielding (3) Application of analytic/deterministic techniques to problems in radiation shielding. Topics include spatial shielding effects, shielding techniques for shield design problems. Spectral harmonics, moment methods, discrete ordinates, adjoint calculations, coupled analytic, and fast reactor shield design. Prereq: 406 or equivalent.

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

585 Process System Reliability and Safety (3) Qualitative and quantitative techniques for assessing and improving process system reliability and safety. Fault tree analysis and associated dependent failure analysis. (Same as Chemical Engineering 585.)

THE MASTER'S PROGRAM

The College of Nursing offers the Master of Science in Nursing degree with concentrations in adult health nursing, parent-child nursing, mental health nursing, family nurse practitioner, nurse anesthesia and nursing administration.

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 M.S.N. 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 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 Graduate School Rating Forms from individuals familiar with the applicant's current work performance or academic aptitude.

Special Requirements
1. Each student must hold personal professional 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. Each student must present evidence of current CPR certification.
5. Non-registered nurse students 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.

Program Requirements
All students must complete a minimum of 36 semester hours distributed as follows:

Core (12 credits)
- 503-04 Holistic Nursing
- 540 Theoretical Foundations of Nursing 3
- 520 Nursing Resource Management

Research (9-12 credits)
- 501 Nursing Research: Methods, Design, and Analysis
- 500 Thesis or
- 580 Nursing Project

Concentration (12 credits)--choose one
- 530-31 Adult Health Nursing I,II
- 540-41 Family Nurse Practitioner I,II
- 550-51 Parent-Child Nursing I,II
- 560-61 Mental Health Nursing I,II

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 other written or oral questions designed to measure student mastery of the entire program of study. For non-thesis 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. 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.
2. 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.
3. 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. Those who already hold a Master's or doctoral degree may apply up to 6 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:
The College of Nursing offers a doctoral program leading to the Doctor of Philosophy degree in Nursing. This is a cooperative program offered jointly with The University of Tennessee, Memphis College of Nursing. Students must complete all or part of the program at either site. The dissertation must be completed in its entirety at one site.

The doctoral program prepares nursing scholars capable of integrating research, theory, and practice into their roles as researchers, educators, and/or administrators. Specifically, the graduate of this program should be able to:

1. Analyze, test, refine, extend, and expand the theoretical basis for practice.
2. Conduct research that generates and advances nursing as a discipline.
3. Provide leadership as nurse researchers, educators, and/or administrators in current and emerging health care settings.
4. Collaborate with members of other disciplines in health-related research of mutual concern.
5. Analyze, develop, and recommend health care policy at various levels.

Admission Requirements

1. Meet requirements for admission to The Graduate School.
2. Hold a Master's degree in nursing from a regionally accredited college or university approved by the Accreditation Commission for Education in Nursing, Inc.
3. Have a minimum cumulative graduate grade-point average of 3.3 on a 4.0 scale.
4. Have a cumulative score of at least 1000 on the verbal and quantitative sections of the Graduate Record Examination.
5. Have successfully completed a basic statistics course.
6. Complete Graduate Program Data Form, College of Nursing.
7. Submit Graduate School Rating Forms from three college level instructors and/or nurses and administrators who have supervised applicant's professional work.
8. Have a personal interview with the College of Nursing Graduate Student Admissions Committee.
9. Submit entire application (Graduate Application for Admission, 3 Graduate School Rating forms, Graduate Program Data form, academic transcripts, and GRE scores) and schedule personal interview by March 1st of the year preceding Fall admission.

Program Requirements

The following courses are required for all students:

601-2 Theory Construction and Analysis I: II 6
604-3 Advanced Nursing Research I: II 6
605-6 Nursing Research Seminar 4
611 Advanced Nursing Seminar 2
614 Nursing Preceptorship 3
--- Statistics 3
--- Computer Science 3
--- Electives 12
600 Dissertation 24 TOTAL 66

The electives should constitute a cognate area. All 12 hours should be selected from a specific area of concentration. Appropriate cognate areas are anthropology, child and family studies, clinical psychology, educational administration, educational psychology, management, medical ethics, public health, and social work.

Doctoral Committee

The student and major professor identify a committee composed of at least five faculty members who hold the rank of assistant professor or above, four of whom, including the chair, must be approved by the Graduate Council to direct doctoral research. Two of the faculty members must be from an academic unit other than nursing. The committee should be formed during the student's first year of doctoral study.

GRADUATE COURSES

500 Thesis (1-15) P/NP only. E
501 Nursing Research: Methods, Design, and Analysis I (3) Methodology, design, and analysis issues and their interrelationships in planning, implementation, and evaluation of nursing and health-related research. Investigation of computer applications to data analysis. Prereq or coreq: Graduate level statistics course, 510. F,Sp,Su
502 Registration for Use of Facilities (3-15) Required for 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
503 Holistic Nursing: Wellness (3) Examination of holistic nursing and new paradigms for nursing assessment, diagnosis, intervention, evaluation and application of principles of health promotion, education, and innovative strategies for achievement of wellness. Role analysis, psychological factors, and culture in lifestyle diseases. F
504 Holistic Nursing: Illness (3) Exploration, analysis, and application of principles of holistic nursing to clients with acute and chronic pathophysiological disease: mind-body influences and interactions. Prereq: Nursing Assessment and Wellness Promotion and Physiological Principles or equivalents. Prereq or coreq: 503. F
505 Advanced Clinical Pharmacology (3) Pharmacological agents utilized to treat common, recurrent health problems, including: contraindications, side and interactive effects of commonly prescribed drugs. Prereq or coreq: 501. F
506 Directed Study in Technical Nursing Education (1-15) Course approved by the student's committee, by the Dean of the College, and by the Dean of The Graduate School.
507-81 Directed Study in Technical Nursing Education (1-15) Course approved by the student's committee, by the Dean of the College, and by the Dean of The Graduate School.
510 Theoretical Foundations of Nursing (3) Historical evolution of nursing science; examination and critical analysis of nursing's metaparadigm and selected conceptual models, philosophies, and theories; contemporary ethical theories and their application to nursing practice dilemmas. F,Sp,Su
520 Nursing Resource Management (3) Selected organizational, conflict management, decision-making, leadership, problem-solving, technical, and other theories, principles, and concepts applicable to advanced clinical nursing practice. Prereq or coreq: 503. 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 chronic health problems and crises; role of clinical nurse specialist in helping clients and families achieve optimal wellness. Prereq: 504. Prereq or coreq: 501, 550, 2 hrs and 4 labs. F
531 Adult Health Nursing II (6) Further emphasis on role of clinical nurse specialist in providing and managing nursing care for acutely and chronically ill adults across life span; exploration of advanced, diagnostic, and interventive advanced; management of client's health problems; indications, contraindications, side and interactive effects of commonly prescribed drugs. Prereq or coreq: 501, 550, 2 hrs and 4 labs. F
534 Family Nurse Practitioner I (6) Description of advanced nursing, physiological, developmental, environmental, cultural, and other theories, principles, and concepts to children and their families in community, hospital, or other health care settings. Prereq: 550. 2 hrs and 4 labs. F
540 Family Nurse Practitioner II (6) Continuation of 534. Seminar and clinical experiences designed to facilitate further development of specialized knowledge and skills used for advanced practice. Role refinement of clinical nurse specialist or nurse practitioner in management of health care of women and/or children in community, hospital, or other health care settings. Prereq: 550. 2 hrs and 4 labs. F
541 Parent Child Nursing I (6) Exploration and application of selected advanced nursing, physiological, psychological, developmental, environmental, cultural, and other theories, principles, and concepts to child-bearing and child-rearing families in acute care or community settings; family wellness promotion and interventions designed to recognize and respond to threats to wellness of mothers, neonates, children, and adolescents. Prereq: 504. Prereq or coreq: 501, 520, 2 hrs and 4 labs. F
542 Parent Child Nursing Field Work and Seminar (5) Seminar and intensive clinical experiences designed to facilitate further development of specialized knowledge and skills utilized for advanced practice. Role refinement of clinical nurse specialist in helping clients and families achieve optimal wellness. Prereq: 504. Prereq or coreq: 501, 520, 2 hrs and 4 labs. F
550 Mental Health Nursing I (6) Exploration and application of advanced theories of therapeutic nursing intervention to clients experiencing mental health problems. Options for clinical practice with clients of various age groups in acute care or community facilities. Prereq: 504. Prereq or coreq: 501, 520, 2 hrs and 4 labs. F
551 Mental Health Nursing II (6) Continuation of 550. Seminar and clinical experiences designed to facilitate further development of specialized knowledge and skills utilized for advanced practice. Role refinement of the psychiatric nurse or psychiatric nurse practitioner in management of mental health problems of individuals and their families. Options for clinical practice with clients of various age groups in acute care or community facilities. Prereq: 550. 2 hrs and 4 labs. F
552 Parent Child Nursing Field Work and Seminar (5) Seminar and intensive clinical experiences designed to facilitate further development of specialized knowledge and skills utilized for advanced practice. Role refinement of the psychiatric nurse or psychiatric nurse practitioner in management of mental health problems of individuals and their families. Prereq: 550. 2 hrs and 4 labs. F
560 Mental Health Nursing I (6) Exploration and application of advanced theories of therapeutic nursing intervention to clients experiencing mental health problems. Options for clinical practice with clients of various age groups in acute care or community facilities. Prereq: 504. Prereq or coreq: 501, 520, 2 hrs and 4 labs. F
561 Mental Health Nursing II (6) Continuation of 560. Groups and families with mental health problems. Seminar and clinical experiences designed to focus on advanced practice and development of specialized knowledge and skills. Prereq: 560. 2 hrs and 4 labs. F
563 Teaching Strategies and Practicum (5) Exploration, analysis, and application of selected educational, curricular, teaching-learning, measurement, and evaluation principles to the development of a course for undergraduate nursing students, teaching practicum in collegiate nursing program. Prereq or coreq: 531, 541, 551, or 553. 1 - 3 hrs. F
570-71 Pharmacological Strategies and Nurse Anesthesia Practice I, II (3,3) Application of pharmacological principles to nurse anesthesia practice; pharmacokinetic and pharmacodynamic properties of medications administered in anesthesia and related drugs. Prereq or coreq: 503. F,Sp
572 Chemistry and Physics of Nurse Anesthesia (3) Chemical and physical principles and applications to: (1) clinical nurse anesthesia practice; physical, organic, and biochemical concepts and relationships to administration and pharmacological action of anesthetics and adjuvant drugs; (2) research: dosage, side effects, and interac- tive effects. Prereq or coreq: 503. F,Sp
Nutrition and Food Sciences

(College of Human Ecology)

MAJORS

Nutrition  M.S.
Food Systems Administration  M.S.
Human Ecology  Ph.D.

James D. Moran III, Acting Head

Professors:

Beauchene, Roy E., Ph.D.        Kansas State
Carruth, Betty Ruth, Ph.D.       Missouri
Quinton, H. W., Ed.D.            Duke
Sachan, Dileep S., Ph.D.        Illinois
Smith, John T., Ph.D.          Michigan

Associate Professors:

Andrews, Frances E., Ph.D.       Ohio State
Brooks, M. D. (Memphis), M.S.    Alabama
Houghton, B., Ed.D.             Columbia
Skinner, Jean D., Ph.D.         Oregon

Assistant Professors:

Bailey, James W., Ph.D.         Idaho State
Costello, Carol, Ph.D.          Tennessee
Powell, J. A. (Memphis), M.P.H. North Carolina
Sneed, J. P., Ph.D.             Ohio State

Instructors:

Jones, K., MBA                  East Texas State
McGrath, M., M.S.               Purdue

600-06 Nursing Research Seminar (2,2) Selected research topics. Required of all doctoral students. Prereq: 604. F,Sp

611 Advanced Nursing Seminar (2) Current health and nursing issues; analysis and critique of current research on nursing and health care delivery system. Prereq: 620. Sp

612 Health and Nursing Policy/Planning (3) Policies affecting nursing education and practice; health policies and political processes; interactions between health professionals, consumer groups, and government in health policy development and health planning activities. Prereq: 611. F


614 Nursing Preceptorship (3) Individually-designed practicum, field, or internship experiences in variety of administrative, educational, research, or clinical practice settings. Prereq: 612. Prereq or coreq: 913. Sp

THE MASTER’S PROGRAM

Nutrition

In Nutrition, students may choose a thesis or non-thesis option. Students emphasizing public health nutrition must choose the non-thesis option. Nutrition students who choose the non-thesis option must take 515 or 541 and 2 hours from 542-544, which are designed as courses in which the student will integrate knowledge from coursework and write a major paper upon completion of an individual project.

Thesis Option: The program consists of a minimum of 33 hours with at least 16 hours of coursework in the department. NFS 503 or 504, 511, 512, and 540 are required. Six hours of Thesis 500 are required and may be applied toward the 33 hours. Six hours outside the department are recommended. A minimum of 22 hours at the 500 or 600 level is required.

An oral comprehensive examination is required upon completion of the thesis.

Non-Thesis Option: The program consists of a minimum of 36 hours with at least 20 hours of coursework in the department. NFS 501 or 504, 511, 512, 540, 541, and 2 hours from 542-544 are required. Students in public health nutrition must take 513, 514 and 515. Six hours in one area outside the department are required. A minimum of 24 hours at the 500 and 600 level is required.

A written comprehensive examination is given at the end of the program.

Food Systems Administration

In Food Systems Administration, students may choose a thesis or non-thesis option. Food Systems Administration students who choose the non-thesis option must take 541, 546 and 3 hours from 548, which are designed as courses in which the student will integrate knowledge from coursework and write a major paper upon completion of an individual project.

The thesis option consists of a minimum of 33 hours with at least 16 hours of coursework in the department. NFS 537, 541, and 546 are required. Six hours of thesis 500
are required and may be applied toward the 33 hours. Six hours outside the department are required. A minimum of 22 hours at the 500 and 600 level is required. An oral comprehensive examination is required upon completion of the thesis.

Non-Thesis Option: The program consists of a minimum of 36 hours with at least 20 hours of coursework in the department. NFS 537, 541, 546, and 3 hours from 548 (non-thesis research project) are required. Six hours in one area outside the department are required. A minimum of 24 hours at the 500 and 600 level is required.

A written comprehensive examination is given at the end of the program.

THE PH.D. CONCENTRATION

Students enrolled in the food science concentration specialize in either the physico-chemical or socio-cultural aspects of food in relation to people and their environment. Students will develop exceptional skill and understanding of various food science concentrations and be familiar with the skills necessary to do research in the food product area.

Students are expected to develop strength in cognate areas. The nutrition science concentration enables students to study the science of nutrition from the cellular level to the application of nutritional principles by people in a changing environment.

In either concentration, students may specialize in nutrition education, using nutrition and food science as foundation areas, and incorporating the study of food science and factors that influence dietary change. Cognate areas could include sociology, education, communications, marketing, anthropology, and/or statistics. Students are expected to acquire advanced training in food science, chemistry, biology, and other natural and behavioral sciences. The doctoral program emphasizes human nutrition, experimental nutrition (small animals), and intermediary metabolism.

Requirements for the concentrations:

1. Sixteen hours with a concentration in food science or nutrition including 9 hours at the 600 level (exclusive of dissertation);
2. NFS 511, and 512, 503, or 504 (nutrition science concentration) or 503 and 504 (food science concentration);
3. Minimum 4 hours of NFS 540;
4. Minimum 9 hours of statistics, computer science and research methods;
5. Minimum 8 hours in a cognate area;
6. Students without college teaching experience are required to take the fall semester seminar for GTAs and NFS 548 comprising a faculty-supervised problem in college teaching.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. program in Food Systems Administration is available to residents of the states of Arkansas, Kentucky, South Carolina, or West Virginia. The M.S. program in Nutrition is available to residents of Arkansas, Kentucky, South Carolina, or Virginia. Additional information may be obtained from the Graduate Admissions and Records Office at the University of Tennessee. For the Ph.D., see Human Ecology.

GRADUATE COURSES

413 Experimental Food Science (3) Individual and group laboratory experimentation in food science; microcomputer applications. Prereq: 312, Plant and Soil Science 471, 1 hr and 2 labs. F

414 Nutrient-Drug Interactions (2) Nutrient effects on off-label and over-the-counter drugs; drug effects on absorption and metabolism of nutrients. Prereq: 300 or equivalent. Sp, A

423 Service Systems Design and Equipment (3) Physical facility design; production and delivery system analysis; equipment selection and purchase. Prereq: Quantity Food Procurement, Production and Service work lab or consent of instructor. A

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 or for any faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N/C only. E

503 Physicochemical Properties of Foods I (3) Proteins and lipids: physical and chemical characteristics; behavior in foods. Prereq: 201 or equivalent. 413, F, A

504 Physicochemical Properties of Foods II (3) Sugars, starches, non-starch polysaccharides, hydrocolloids, and pigments: physical and chemical characteristics; behavior in foods. Prereq: 201 or equivalent. 413, F, A

505 Food Texture (2) Classification of foods according to textural parameters; instrumental and sensory methods in evaluation of texture. Prereq: 413 or Food Technology and Science 411, statistics or consent of instructor. 1 hr and 1 lab. Su

506 Sensory Analysis (3) Principles and methodology for sensory evaluation of food; application to laboratory and consumer panels; interpretation of data. Prereq: 413 or consent of instructor. 2 hrs and 1 lab. F

508 Culture, Food, and Nutrition (3) Food-related behavior of individuals and groups in United States. Social/cultural, economic, and technological influences. Nutrition and food surveys, public policy. Prereq: 301 or 313 or consent of instructor. F, A

509 Graduate Seminar in Public Health (1) Same as Public Health 509, Nutrition 509, Physical Education 509 and Social Work 509.

511 Advanced Physiological Chemistry (4) Bioenergetics, flux control and hormonal interrelationships. Prereq: 313 or consent of instructor. F


513 Community Nutrition (3) Orientation to community; assessment of nutrition problems, needs, and resources; 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. F

516 Maternal and Child Nutrition (3) Nutrition principles related to growth and development during pregnancy, infancy, and childhood to age 5, high risk conditions. Prereq: 313 or consent of instructor. Su

517 Childhood and Adolescent Nutrition (3) Application of nutrition principles to school aged 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. F, A

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

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

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. Sp

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; electrophysiological 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

526 Mental Retardation or Other Developmental Disorders of Childhood (1-9) Interdisciplinary course required of all full-time students in training at Child Development Center, UT, Memphis. Supervised project in related area. Prereq: Consent of instructor. E

527 Nutrition in Mental Retardation and Developmental Disorders (1-9) Interdisciplinary diagnosis and treatment of developmentally-handicapped child; role of nutritionist; clinical expertise; application. Prereq: Consent of instructor. F

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

530 Computer-Assisted Service Systems Management (3) Application of computer technology to foodservice industry; inventory control, 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 administration: developing foodservice marketing plan, budgeting, foodservice accounting, and information services. Prereq: 328 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 Systems Management (3) Analysis of food 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) Lectured/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. Prereq: Maximum 6 hrs. E

537 Seminar in Foodservice Systems Administration (1) May be repeated. S/N/C only. Sp

540 Seminar in Nutrition and Food Sciences (1) May be repeated. S/N/C only. Sp

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

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

Nutrition and Food Sciences 133
The Department of Ornamental Horticulture and Landscape Design offers the Master of Science with concentrations in floricultural science and ornamental nursery horticulture, turfgrass science and technology, or turfgrass science and technology. Various interests may be emphasized in any of these commodity areas, including micropropagation, innovative production and maintenance systems, computer-aided management systems, and the molecular biology, genetics, histology and stress physiology of ornamentals. For admission, the student must have a B.S. in ornamental horticulture, agriculture, plant science, or a related agricultural or basic science discipline. Undergraduate transcripts must be evaluated by the department for prerequisite requirements, if any. Graduate 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 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 500 level.
3. The academic program must be approved by the Master's committee which may require additional coursework if the student's progress or background indicates such need.
4. All students are required to include 510 Research Methods and 2 hours of 590 Seminar in their program and are expected to attend the course and participate in discussions each semester enrolled.
5. Twelve hours of coursework in the department must be at the 500 level or above exclusive of Thesis 500.
6. An oral examination covering the thesis and coursework is required.

Non-Thesis Option
1. A Master's committee of no fewer than 3 faculty members will be selected.
2. Thirty-four hours of graduate coursework are required of which 22 hours must be at the 500 level or above.
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 coursework in the department must be at the 500 level or above.
5. Five comprehensive written and oral examinations shall be taken upon completion of no fewer than 32 hours of approved graduate work.

GRADUATE COURSES

410 Nursery Management and Production (3) Modern management of nurseries 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 210, 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 introduction 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, landscape design, 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 applications involving site layout, landscape planning, 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 5-9 hrs labs. Sp

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


550 Microtechnique (3) Methods of investigating histotecture, histochemistry, ploidy, and pathological structures in ornamental and crop plants, light microscopy. Prereq: 8 hrs biological science, 6 hrs chemistry, and consent of instructor. 1 hr and 2 labs. Su

570 Physiology and Development of Ornamental Plants (3) Basic and applied physiology of ornamental plants related to growth and development in production and utilization. Critical review of literature and discussion of juvenility and phase change, flowering, photoperiodism, thermoperiodism, vernalization, cold acclimation, hardiness, dormancy, growth regulators, environmental stress, and post-harvest consideration. Prereq: Botany 351 and consent of instructor. Sp

580 Ornamental Plant Nutrition (3) Applications of nutrition principles and analysis in production of ornamental crops. Comprehensive study of functional roles of nutrients essential to plant growth; critical evaluation of recent developments in nutrient sources and formulas, foliar fertilization and analysis, and nutrient uptake and water relations of ornamental plants grown in containers and in the field. Prereq: Botany 351, Plant and Soil Science 311 and consent of instructor. Sp,A

590 Seminar (1) Current literature and developments. May be repeated. Maximum 3 hrs. E

593 Problems in Ornamental Horticulture and Landscape Design (1-3) Independent study in selected topic related to technology and science. May be repeated. Maximum 6 hrs. E

Pathobiology

(College of Veterinary Medicine)

MAJOR DEGREE
Veterinary Medicine D.V.M.

David O. Slauson, Head
Professors:
McGavrin, M. D., Ph.D. .......... Michigan State
Michel, R. L. (Emeritus), V.M.D.
Ph.D. .......... Michigan State
Patton, S., D.V.M .......... Ohio State
Schuller, H. M., D.V.M., Ph.D. ............ Hanover
Slauson, D. O., D.V.M., Ph.D. .......... California (Davis)

Associate Professors:
Breider, M. A., D.V.M., Ph.D. .......... Texas A&M
Shull, R. M., D.V.M .......... Cornell
Edwards, D. F., D.V.M .......... Georgia
Schuller, H. M., D.V.M., Ph.D. .......... Hannover
Patton, S., D.V.M .......... Ohio State
Michel, R. L. (Emeritus), V.M.D., Ph.D. .......... Michigan State
McGavin, M. D., Ph.D. .......... Michigan State

Residents:
Petersen, M. G., D.V.M .......... Colorado State
Bouley, D., D.V.M. .......... Tennessee
Dean, D. F., D.V.M. .......... Tennessee
Duncan, R. B., D.V.M. .......... Ohio State
Silva-Krott, I., B.V.Sc. .......... Austria

Assistant Professors:
Breider, M. A., D.V.M., Ph.D. .......... Texas A&M
McCracken, M. D., D.V.M., Ph.D. .......... Purdue

Instructor:
Peterson, M. G., D.V.M. .......... Colorado State

Residents:
Bouley, D., D.V.M. .......... Tennessee
Dean, D. F., D.V.M. .......... Tennessee
Duncan, R. B., D.V.M. .......... Ohio State
Silva-Krott, I., B.V.Sc. .......... Austria

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 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 coursework should be determined in consultation with the student’s faculty committee. The non-thesis M.A. requires 36 hours of coursework 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 coursework (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.

Philosophy
(College of Liberal Arts)

MAJOR

DEGREES
Philosophy .......... M.A., Ph.D.

Professors:
Aquila, Richard E., Ph.D. .......... Northwestern University
Brenkert, George G., Ph.D. .......... Michigan State
Cebik, L. B., Ph.D. .......... Nebraska
Davis, John W., Ph.D. .......... Emory
Edwards, R. M., Ph.D. .......... Emory
Graber, Glenn C., Ph.D. .......... Michigan State
Postow, Betsy C., Ph.D. .......... Yale
Van de Vate, Dwight, Jr., Ph.D. .......... Yale

Associate Professors:
Bennett, James O., Ph.D. .......... Tulane University
Cohen, Sheldon M., Ph.D. .......... Northwestern University
Emmett, Kathleen A., Ph.D. .......... Ohio State University
Lavin, Michael, Ph.D. .......... Stanford University
Nott, John E., Ph.D. .......... Ohio State University
Osborne, Martha Lee, Ph.D. .......... Tennessee

Assistant Professor:
Hamil, H. Phillips, Ph.D. .......... Georgia State University

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.

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 may 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.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain pro-
Physic and Astronomy

(College of Liberal Arts)

MAJOR DEGREES

Physics

M.S., Ph.D.

William M. Bugg, Head

Professors:

Bingham, C. R., Ph.D. .................................. Tennessee
Blasi, W. E., Ph.D. ..................................... Michigan State
Breazeale, M. A. (On Leave), Ph.D. ...................... Michigan State
Bugg, W. M., Ph.D. ..................................... Tennessee
Burgdorfer, J., Ph.D. ..................................... Freie Universität Berlin
Callcott, T. A., Ph.D. ..................................... Purdue
Chidlers, R. W., Ph.D. .................................... Vanderbilt
Christophorou, L. G., Ph.D. .............................. Manchester
Close, F. E. (Emeritus) (On Leave), Ph.D. ......... Oxford
Colagrizier, E. W., Ph.D. ................................ Cal Tech
Collins, T. C., Ph.D. ....................................... Florida
Condo, G. T., Ph.D. ................................ ........... Illinois
Crater, H. W. (UTSI), Ph.D. ............................. Yale
Deds, W. E. (Emeritus), Ph.D. ................................ North Carolina
Dicks, J. B. (Distinguished Prof.) (UTSI), Ph.D. .... Vanderbilt
Duckett, K. E., Ph.D. .................................... Tennessee
Fox, K. F., Ph.D. ............................................ Michigan
Gaikar, N. M. (Emeritus), Ph.D. .......................... Ohio State
Georgi, S. D., Ph.D. ........................................... Manchester
Guidry, M. W., Ph.D. ..................................... Tennessee
Harris, E. G. (Distinguished Prof.), Ph.D. .............. Tennessee
Hart, E. L., Ph.D. ......................................... Cornell
Jacobson, H. C., Ph.D. ..................................... Yale
King, D. T. (Emeritus), Ph.D. ............................. Bristol
Lewis, J. W. L. (UTSI), Ph.D. ............................. Mississippi
Lovell, R. J., Ph.D. ......................................... Vanderbilt
Macek, J. (Distinguished Scientist), Ph.D. ................ Rensselaer
Mahan, G. (Distinguished Scientist), Ph.D. .............. California
Mason, A. A. (UTSI), Ph.D. ............................... Tennessee
McGregor, W. K. (UTSI), Ph.D. ........................... Tennessee
Nielsen, A. H. (Emeritus), Ph.D. .......................... Michigan
Obenshain, F. E., Jr., Ph.D. ............................... Pittsburgh
Painter, L. R., Ph.D. ........................................ Tennessee
Pegg, D. J., Ph.D. .......................................... New Hampshire
Quinn, J. J., Ph.D. ........................................... Maryland
Riedinger, L. L., Ph.D. ...................................... Vanderbilt
Ritchie, R. H., Ph.D. ....................................... Tennessee
Rusk, W. R. (Emeritus), M.S. ............................. Tennessee
Schweinere, H. C. (Emeritus), Ph.D. ....................... MIT
Sellin, I. A. (Chancellor's Research Scholar), Ph.D. ...... Chicago
Shih, C. C., Ph.D. .......................................... Cornell
Stelson, P. H., Ph.D. ......................................... MIT
Thompson, J. R., Ph.D. ..................................... Duke
Thomson, J. O., Ph.D. ....................................... Illinois
Wheeler, G. W., Ph.D. ........................................ Yale
White, J. W. (Emeritus), Ph.D. .............................. North Carolina

Associate Professors:

Breinig, M., Ph.D. .......................................... Oregon
Eiston, S. B., Ph.D. ......................................... MIT
Ferrell, T., Ph.D. .......................................... Clemson
THE MASTER'S PROGRAM

Thesis Option

This program is designed primarily for students intending to go into industrial or governmental laboratories as physicists. The course requirements include 24 semester hours of physics courses, of which at least 12 semester hours are taken from Physics 511-12, 521-22, 531-32, 541-42, or 571-72. Each candidate must present an acceptable thesis, 6 hours of 500, and pass an oral examination on course material and thesis.

Non-Thesis Option

This program is designed primarily for students intending to teach in colleges or universities on the elementary or intermediate level, or for students specifically intending to work toward a Ph.D. Students seeking the non-thesis option must apply to the department's graduate committee for permission to enroll under this program. The requirements are the satisfactory completion of 30 hours of coursework composed of 18 semester hours from Physics 511-12, 521-22, 531-32, 541-42, and 571-72; 6 semester hours in a minor field; and 6 semester hours from other courses numbered above 400 (preferably 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 his/her 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, of students in nuclear physics; Physics 663-64, 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 580, 670.

The courses Physics 531, 571-2, 521-2, 541-2, 561-2, 571-2, constitute the core curriculum. They are the usual basis for the departmental comprehensive examination which is normally taken by a well-prepared student after two years of graduate study. 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 laboratories in Knoxville, The University of Tennessee Space Institute at Tullahoma, Tennessee; the Oak Ridge National Laboratory, Oak Ridge, Tennessee; or other research facilities used by the University faculty.

Astronomy

GRADUATE COURSES

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. Consent of instructor. May be repeated with consent of department. Maximum 9 hrs.

Physics

GRADUATE COURSES

401 Background of Physics (2) Survey of historical development and philosophical foundations of natural science. Classical theories of gravitation, electromagnetism, and relativity. Unifying mathematical 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 who plan to teach. Prereq: 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 particles, fields and their interactions. Discussion of unsolved questions in physics, experiments of current interest, readings in recent literature, and applications in other fields, with final oral report and term paper. 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: 232 or equivalent, Mathematics 436.

421 Modern Optics (4) Transmission of light in uniform, isotropic media; reflection and transmission at interfaces; mathematics of wave motion and interference effects. Ray optics and Fourier optics and holography. Prereq: 431 or 232 and consent of instructor. 3 hrs and 3 labs.

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


461-62-63 Modern Physics Laboratory (3,3,3) Experimental techniques: spectroscopy, electronic measurements, computer interfacing, resonance, detectors and statistical analysis, applied to experiments in nuclear, atomic, molecular, and solid state physics. Basic experiments in quantum physics for advanced undergraduates, and more modern experiments useful for entering graduate students. Prereq: 232 and basic knowledge of circuits.

471-72 Health Physics (3,3) Radiactivity, interaction of electromagnetic radiation with matter, radiation quantities and units, point kernel and extended sources, X-rays and gamma rays, neutron activation, interaction of charged particles with matter, stopping power, range-energy relations, counting statistics, shielding, do

490 Senior Seminar (1-3) Topic of current interest. May be repeated with consent of department. Maximum 6 hrs.

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

501 Graduate Research Participation (3) Advanced research participation. Selection of staff research director whose research area coincides with interests of student. Open to all graduate students in good standing. Prereq: Consent of department and research director. May be repeated with consent of department. Maximum 18 hrs. S/NC only. E

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any section of the 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 Physics of Fluids (3) Fluid physics, overview of fluid mechanics and associated computational techniques; general description of laminar and turbulent flows: subsonic, supersonic and hypersonic flows: conduction, transitional and free-molecular flows; pipe flow, nozzle flow and sonic orifice expansion flows; reacting flowfields: shock-tube physics; and an introduction to the method of characteristics and Monte Carlo computational techniques.

506 Experimental Methods (3) Principles, real operations, use of laser types, detectors, photomultiplier tubes, image intensifiers, image converters, image dissectors, streak cameras, and framing and fast-framing cameras. Utilizing cryogenic-based devices, data acquisition techniques including synchronous detection, digital electronics methods and micro-computer data acquisition and registration methods.

507 Contempory Optics (3) Topics in geometrical, physical, Fourier, and nonlinear optics and introductory laser technology. Extensive use of computer calculations and design of practical and sophisticated optical systems.

508 Laser Physics (3) Mode analysis, stable and unstable resonators; rate equations and population inversion, saturation, relaxation oscillations, fluctuations and noise, laser stability; quantum theory of laser, photon coherence; mode-locking, O-switching and frequency stabilization; special laser types: semiconductor and solid-state, excimer, copper vapor and dye lasers.

511-12 Theoretical Physics (3,3) Classical theoretical physics, with limited use of mathematics. Prereq: 312, 432, advanced calculus, differential equations, and vector analysis.


561 The Theory of Relativity (3) Geometry of space-time, relativistic electrodynamics, particle mechanics and continuum mechanics. Einstein's field equations, Schwarzschild solutions, the classical test of general relativity. Prereq or coreq: 531 and 542.


574-75 Group Theory for Physicists (3,3) Introduction to abstract 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, experimental or applied physics topics. Prereq: Consent of department. Maximum 18 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 J-J coupling, fine and Lande Stark effects, spontaneous emission of atomic systems and oscillator strengths, selection rules of dipole and quadrupole transitions; radiation trapping and formation of spectral lines. Study of saturated absorption spectroscopy, resonance fluorescence of atomic and molecular systems. Prereq or coreq: 522.

606-07 Nonlinear Optics (3,3) Nonlinear optical susceptibilities, wave propagation in nonlinear media, sum-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.

609-09 Quantum Electronics and Electro-Optics (3,3) Electromagnetic propagation in anisotropic and periodic media, linear and quadratic electro-optic effects and devices, acousto-optical effects and devices, guided waves, phase conjugate optics, pico- and femtosecond optical switching and electronics, and optical computers and processors. Prereq: 506.

610 Quantum Optics (3) Quantum theory of emission and absorption of radiation; frequency-dependent susceptibility; coherence theory; field quantization and coherent states, radiative interaction functions for two-level 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 field theory methods in condensed matter physics, and quantum optics. Topics vary according to interest of students, instructor and present state of physics. Prereq: 561 or 561 and consent of instructor.

612 Advanced Topics in Quantum Field Theory (3) Rodinne's equation, Feynman diagrams and cut-off theory, confinement, QCD, advanced topics in the theory of photons, gravitons, gauge theories, electroweak theory, quantum chromodynamics, grand unified theories, and advanced topics in the theory of the strong interactions. Topics vary according to interest of students, instructor and present state of physics. Prereq: 522 and 542 or equivalent. Prereq or coreq: 561 or consent of instructor.

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

621-22 Nuclear Structure (3,3) General properties of nuclei; two-body scattering problems; saturation and symmetry properties of nuclear forces: theory of light nuclei; nuclear spectroscopy; special nuclear models; theory of nuclear reactions; theory of beta-decay. Prereq: 571-72.

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

631 Advanced Topics in Relativity of Cosmology (3) Tensor analysis, Riemannian geometry, topology of spacetime and present state of physics. Cosmological solutions of Einstein's 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 interests of students. Advanced dynamics, 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. Angular-momentum 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 astrophysics, boundary value problems in electromagnetic, atomic and nuclear structure and structure on solid state physics, transport problems in statistical mechanics, Monte Carlo simulation of liquids, fitting and interpolation of data, curve fitting, 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, bremsstrahlung, 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)

671-72 Advanced Solid State Physics (3,3) Lattice dynamics, phonons, Brillouin zones, heat capacity, Einstein and Debye structure and structure on solid state physics, transport problems in statistical mechanics, Monte Carlo simulation of liquids, fitting and interpolation of data, curve fitting, correlation analysis, or optimization strategy. Prereq: 522, 531, 542, and 572.

681-82 Molecular Spectroscopy (3,3) Spectroscopic methods of determining molecular properties, theoretical and experimental work on molecular energy and charge transfer, group theoretical methods and selection rules in gases and condensed phases, normal coordinates and potential functions, vibration rotation interaction theory, intensities, frequencies and line shapes of molecular transitions. Prereq: 532 and 542 or consent of instructor.
The Master’s Program

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 Record Examination scores are requested of all applicants whose undergraduate GPA is below 3.0. Other applicants are encouraged to submit them.

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, land use development planning, and real estate development planning.

Students have the latitude to propose an alternate specialization consisting of at least 9 hours of coursework, subject to approval of a faculty committee. Courses are available in transportation, health, education, environmental, and social planning.

Each student is required to demonstrate competence in the subject area. 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. To be eligible for the major study option, the student must have completed at least 12 hours of graduate coursework 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 which will include at least 6 hours of subsequent coursework. 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.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S.P. program is available to residents of the states of Arkansas, Kentucky, South Carolina, and West Virginia. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

GRADUATE COURSES

401 The City in the U.S. (3) Development and character of U.S. cities. Contemporary issues and selected case studies. (Same as Urban Studies 401.)

402 Survey of Planning (3) History of city development and of planning; U.S. experience in urban and other levels of planning. State of the art, process, comprehensive planning, implementation devices. Planning issues in society. Not for credit for M.S.P. degree.

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


502 Registration for Use of Facilities (1-15) 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. SNC only. E

510 Fundamentals of Planning (3) History of planning, structure and development of urban areas, operations of contemporary planning. Trends and issues.

539 Urban and Site Design (3-6) Principles of design of residential subdivisions and some components of physical community, shopping centers, institutional complexes, central business districts. Problems of evaluating alternative designs against each other or written regulations. Extensive laboratory experience.

520 Legal Aspects of Planning (3) Nature and demand for housing in U.S. and abroad, U.S. experience. Private market processes and public influence in housing supply, impact of new technology, and governmental programs to improve supply and quality of housing.

Plant and Soil Science

(College of Agriculture)

MAJOR
Plant and Soil Science .................................. M.S., Ph.D.

John E. Foss, Head

Professors:

Bell, Frank F. (Emeritus), Ph.D. .... Iowa State
Coffey, D. L., Ph.D. ................. Purdue
Conger, B. V., Ph.D. ............... Washington State
Duck, B. N., Ph.D. .................. Auburn
Foss, John E., Ph.D. ............... Minnesota
Fribourg, Henry A., Ph.D. ...... Iowa State
Hayes, R. M., Ph.D. ............... Illinois
Hoskinson, P. E., M.S. .......... Tennessee
Josephson, L. M. (Emeritus), Ph.D. .... Wisconsin
Mullins, C. A., Ph.D. ............ Tennessee
Parks, William L. (Emeritus), Ph.D. ......... Purdue
Pickett, B. S. (Emeritus), Ph.D. .... Michigan State
Reynolds, John H., Ph.D. .......... Wisconsin
Seatz, Lloyd F. (Emeritus), Ph.D. ......... NC State
Skold, L. N. (Emeritus), M.S. .... Kansas State
Springer, M. E. (Emeritus), Ph.D. ........ California
Swingle, H. D. (Emeritus), Ph.D. ......... Illinois
Winters, Eric (Emeritus), Ph.D. .... Louisiana State
Lesman, Gary M., Ph.D. ............. Michigan State
Lewis, R. J., Ph.D. ................. NC State
Miller, R. D., Ph.D. ............... Kentucky
Reich, V. H., Ph.D. ............... Iowa State
Rhodes, G. N., Jr., Ph.D. ......... NC State
Sams, C. E., Ph.D. ............... Michigan State
Tyler, D. D., Ph.D. ............... Kentucky
West, D. R., Ph.D. ............... Nebraska
Wyatt, J. E., Ph.D. ............... Florida

Assistant Professors:

Logan, Joanne, Ph.D. ............. Nebraska
Mullen, M. D., Ph.D. ........... NC State
Newton, D. (Adjunct), M.S. ...... Kentucky
Wilson, G. V., Ph.D. ............. Arkansas

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, according to student credit and course requirements. May be repeated.

THE MASTER'S PROGRAM

The program requires writing a thesis, carrying at least 15 credits must be in courses numbered above the 500 level. The student's advisory committee will consist of the major professor, who will act as chairperson of the committee, and a minimum of two other faculty members. The advisory committee approves the student's research problem and coursework and conducts the final oral examination covering the thesis and graduate courses.

THE DOCTORAL PROGRAM

A minimum of 72 hours beyond the Bachelor's degree program of which 6 credits must be Thesis 500. At least 14 credits must be taken in courses numbered above the 500 level. The student's advisory committee will consist of the major professor, who will act as chair-person of the committee, and a minimum of two other faculty members. The advisory committee approves the student's research problem and coursework and conducts the final oral examination covering the thesis and graduate courses.

GRADES

411 Soil Microbiology (3) Soil microbial population and role in soil ecosystem, microbial transformations of organic and inorganic compounds, decomposition of residues, dynamics of soil organic matter. Prereq: 210 and Chemistry 110 or 350 or consent of instructor. F

412 Soil Genesis, Classification, and Mapping (3) Soil genesis and formation, observing and describing morphology of agricultural and forest soils; chemical and physical properties, classification, mapping. Two Saturday field trips. Prereq: 210 or consent of instructor. 2 hrs and 1 lab. Sp

413 Soil Chemistry (3) Principles concerning structure and chemical properties of soil materials; colloidal fraction, non-equilibrium processes, nutrient availability and waste disposal. Prereq: 311 or consent of instructor. F

414 Soil, Land Use, and the Environment (3) Soil as environmental component and soil properties affecting land use. Soil as resource in development planning; consideration of nonengineering aspects of site selection for land use, soil survey and resource data in land use, recognition and prevention of soil pollution. Prereq: 210 or consent of instructor. Sp, A

431 Crop Physiology and Ecology (3) Principles of crop physiology and ecology as applied to crop production processes. Effects of environmental factors on physiological processes. Prereq: 230, Botany 321, 2 hrs and 1 lab. F, A

432 Agricultural Climatology (3) Interactions between world, regional and local climates and agricultural systems; quantification of macro- and micro-climates. Effects of macro- and micro-climatic factors on plant and animal distributions and productivity. Prereq: 1 yr of physical or biological science. 2 hrs and 1 lab. F, A

433 Agricultural Pesticides (3) Regulation of pesticide development, manufacture, transportation, marketing and use. Structure, use, mode of action, degradation and environmental impact of pesticides used in agriculture, forestry and related areas. Prereq: 1 yr of biological sciences and 1 semester chemistry. 2 hrs and 1 lab. Sp

453 Principles of Plant Breeding (3) Genetic principles and techniques used in crop improvement. Prereq: Botany 220 or equivalent. 2 hrs and 1 lab. Sp

471 Statistics for Biological Research (3) Application of statistics to interpretation of biological research. Notation, descriptive statistics, probability distributions, confidence intervals, and chi-square tests, analysis of variance, mean separation procedures, linear regression and correlation. Prereq: Mathematics 121 or equivalent. F

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

501 Seminar (1) Application of speaking, writing, and organizational skills in preparation and presentation of scientific material to both scientific and general audiences. Preparation of abstracts for scientific presentations. F, Sp

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/NCP only. E

511 Advanced Soil Fertility (3) Concepts of soil chemistry as related to nutrient movement and accumulation by plant roots. Nutrient efficiency as measured by plant response factors. Prereq: 413. Sp, A

512 Pedology (3) Physical and chemical weathering processes, factors of soil formation, soil forming processes. Prereq: 412 or consent of instructor. 2 hrs and 1 lab. F

514 Soil Physics (3) Physical and chemical relations of soil processes, including solid, liquid and gas phases of the soil system. Dynamics, interactions and reaction of phases on soil moisture characteristics, aeration, and relationship to plant growth. Prereq: 413 or consent of instructor. 2 hrs and 1 lab. F

530 Integrated Pest Management (3) (Same as Entomology and Plant Pathology 530.)

532 Advanced Crop Ecology (3) General and specific relations among environmental factors, crop climates, and agricultural systems; quantification of macro- and microclimatic influences on crop growth; world climates, crop distribution and productivity, human cultures, and their interaction. Prereq: 471 or equivalent. 431 or equivalent, or Agricultural Climatology or equivalent. 2 hrs and 1 lab. F, A

551 Advanced Plant Genetics (3) Discovery of genetic controlling elements, induced mutations, genome
organization, polyplody, tetrasomic inheritance, extra-chromosomal inheritance, apomixis, incompatibility systems, and genetic engineering of higher plants. Pre-req: Biology 220, F.A.


571 Design and Analysis of Biological Research (3) (Same as Animal Science 571.)

593 Special Problems in Plant and Soil Science (1-3) May be repeated. Maximum 6 hrs. E

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

601 Special Topics in Soil Science (1-3) Thermodynamics of soil solutions, clay structure and surface chemistry, soil mineralogy, plant mineral nutrition, soil microbiology, water movement and use by plants, soil structure, soil thermal properties, interaction in the soil-plant environment. May be repeated. Maximum 6 hrs. E

603 Special Topics in Crop Physiology and Ecology (1-3) Microclimate of agroecosystems, crop dormancy and responses to stress, physiology of crop growth and reproduction. Interactions of physiology and germplasm in crop production, theory and application of quantitative methods in crop physiology and ecology research. May be repeated. Maximum 6 hrs. E

605 Special Topics in Plant Breeding and Genetics (1-3) Genotype by environment interactions, estimation of quantitative parameters, mutations, chromosome dynamics, polyploidy, genetic engineering, interspecific hybridization, linkage, screening methods, genome organization. May be repeated. Maximum 6 hrs. E

613 Advanced Soil Chemistry (3) Surface and colloid chemistry of soil minerals, recent developments in ion speciation, ion movement, surface charge, surface complexation and soil colloidal stability. Prereq: 413 or consent of instructor. F.A


633 Plant Growth Control and Herbicide Action (3) Principles of uptake, translocation, mode of action and uses of herbicides and plant growth regulators, 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

653 Advanced Plant Breeding (4) Development and utilization of concepts of quantitative parameters, in-breeding, heterosis, methods of selection, in vitro breeding, interspecific hybridization, stability parameters, genetic resistance and vulnerability to pests and environmental stresses. Prereq: 453 and 457 or equivalent or consent of instructor. 3 hrs. and 1 lab. Sp.A

671 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 671.) F.A

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 56 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 average overall 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 - 21 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). Choose two of the following: 560 Public Budgeting and Finance; 562 Public Management; 564 Human Resources Management in Public Organizations.
   e. Specialization - 9 hours.

2. A specialization is designed by the student in consultation with the coordinator of the M.P.A. program. Possible specializations include 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.

DUAL J.D.-M.P.A. PROGRAM

The College of Law and the Department of Political Science in the College of Liberal Arts offer a coordinated dual degree program leading to the conferral of both the Doctor of Jurisprudence and Master of Public Administration degrees. In this program, a student may earn the M.P.A. and J.D. degrees in about four years rather than the five years that otherwise would be required. Students pursuing the dual degree program should plan to be enrolled in coursework or an internship for one summer term in addition to taking normal course loads for four academic years.

Admission

Applicants for the J.D.-M.P.A. program must make separate application to, and be independently accepted by, the College of Law for the J.D. degree and the Department of Political Science and The Graduate School for the M.P.A. degree. Applicants must also be accepted by the Dual Degree Committee. All applicants must submit a Law School Admission Test (LSAT) score. An applicant's LSAT score may be substituted for the Graduate Record
degrees, as well as the requirements for the Master of Public Administration degrees. In this program, the M.P.A. and M.S.S.W. degrees can be earned on a full-time basis in five consecutive terms rather than seven to eight terms.

Admission
Applicants for the M.S.S.W.-M.P.A. program must be admitted to the College of Social Work and to the Department of Political Science. In addition, applications from dual degree students must be approved by the dual degree committee that is responsible for overseeing the program. It is anticipated that some students may apply to the dual degree program before they matriculate in either the M.S.S.W. or the M.P.A. program. Students already enrolled in one program will also be permitted to apply, but must do so prior to the end of the first year of study.

Curriculum
Students in the dual degree program are required to take a set of core courses from each curriculum, but the program is designed to be flexible, providing students the opportunity to develop special areas of competence. For the dual degree program, a minimum of 65 hours are required (35 hours must be in social work and 30 hours must be in public administration). Admission to candidacy will be completed separately for each degree.

A comprehensive examination is required in each discipline for students receiving the dual degrees. A faculty committee from the Department of Social Work and one from Social Work will write and grade the respective examination.

Dual degree students who withdraw from the program before completion of the requirements for both degrees will not receive credit toward either the J.D. or the M.P.A. degree for courses taken in the other program except as such courses qualify for credit toward a degree independent of the dual degree program.

Financial Aid
Students may apply or financial aid to both the College of Social Work and the Department of Political Science. Normally, students will not receive funding from both programs concurrently.

THE DOCTORAL PROGRAM
The Ph.D. program prepares students for careers in college teaching, as well as careers in other occupations related to service in the public or private sectors. Applicants for admission to the program should normally have completed a Master’s degree in political science or a related field with a 3.0 GPA (3.5 for international students) 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 78 hours of coursework beyond the Bachelor’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, students must satisfy a research tool requirement. This requirement may be satisfied either by demonstrating competency in one foreign language, or by completing 12 hours of coursework, numbered 500 or above, in empirical methodology.

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 500 or above.
3. Completion of Political Science 510 and 512.
4. At least 6 hours must be earned in political science courses numbered above 600, exclusive of dissertation hours.
5. A total of 24 hours must be earned by writing the dissertation.

GRADUATE COURSES
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.)
454 Government and Politics of China and Japan (3) Examination of the political setting, structure and political processes in China and Japan.
455 Latin American Government and Politics II (3) Selected topics on Latin American political dynamics, consideration of leading theoretical explanations. (Same as Latin American Studies 455.)
459 Government and Politics of the Soviet Union (3) Origins and development of Soviet political system, and study of selected policy areas.
460 Revolution (3) Examination of characteristics, theories, and consequences of revolution with particular focus on left-wing revolutions and movements.
461 Policy Making in Democracies (3) Comparative approach to theory and process of making public policies.
463 Contemporary Middle East Politics (3) Governments and movements in Middle East, their characteristics, bases, and interrelationships.
464 Special Topics in Comparative Government (3) May be repeated with consent of department. Maximum 6 hrs.
566 Ethics, Values, and Morality in Public Administration (3) Moral-ethical-value dilemmas confronting administrators in American political system.

569 Internship in Public Administration (3-9) Open to students participating in approved internships. May be repeated with consent of department. Maximum 9 hrs. S/N/C 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 political 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, Asia, 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.

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.

595 Readings and Special Problems in Political Science (1-13) Prereq: Consent of instructor. May be repeated. Maximum 15 hrs.

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

610 Special Topics 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 Special Topics in Political Theory (3) Research into selected topics. May be repeated with consent of department. Maximum 9 hrs.

628 Topics in Political Theory (3) Selected issues and problems in normative political theory. Specific content determined by instructor. May be repeated with consent of instructor. Maximum 9 hrs.

631 Topics in Parties and Elections (3) Analysis of party systems and electoral behavior. May be repeated with consent of department. Maximum 9 hrs.

634 Topics in American National Institutions (3) Deals with congress, executive or related subjects. May be repeated with consent of department. Maximum 9 hrs.

636 Comparative State Politics (3) Government and political processes of fifty states: general and particular characteristics. May be repeated with consent of department. Maximum 9 hrs.

640 Special Topics in U.S. Constitutional Law (3) Systematic analysis of published research and judicial decision: development of constitutional law as major component of contemporary political system. May be repeated with consent of department. Maximum 9 hrs.

642 The Politics of Criminal Justice (3) Selective examination of contemporary problems of research and public policy formulation: criminal process; law enforcement; administrative; criminal court administration; and prison administration. May be repeated with consent of department. Maximum 9 hrs.

654 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.

667 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.

668 Special Topics in Public Administration (3) Analysis of selected issues and problems in public administration. May be repeated. Maximum 9 hrs.

670 Special Topics in Comparative Government and Politics (3) Research into selected topics. May be repeated with consent of department. Maximum 9 hrs.

682 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.

688 Special Topics in International Politics (3) Selected issues and problems in international politics. Specific content determined by instructor. May be repeated with consent of instructor. Maximum 9 hrs.

Polymer Engineering

See Materials Science and Engineering

Psychology

(College of Liberal Arts)

MAJOR

DEGREES

MA

Psychology

M.A., Ph.D.

Howard R. Pollio, Acting Head

Professors:

Burleigh, Gordon M., Ph.D. ............... Chicago
Burstein, Alvin G., Ph.D. ............... Chicago
Cahn, William H., Ph.D. ............... California
Cohen, Charles P., Ph.D. ............... Kansas
Cureton, Edward E. (Emeritus), Ph.D. .......... Columbia
Fine, Harold J. (Emeritus), Ph.D. .......... Syracuse
Fowler, Raymond D. (On Leave), Ph.D. ........ Penn State
Handel, Stephen J., Ph.D. ............... Johns Hopkins
Handler, Leonard, Ph.D. ............... Michigan State
Lawler, James E., Ph.D. ............... North Carolina
Lounsbery, John W., Ph.D. ............... Michigan State
Lubker, Joel F., Ph.D. ............... Chicago
Malone, John C., Ph.D. ............... Duke
Newton, Kenneth R. (Emeritus), Ph.D. ........ Tennessee
Pollio, Howard R. (Distinguished Prof.), Ph.D. .......... Michigan
Samejima, Fumiko, Ph.D. ............... Keio
Shrader, Raymond R. (Emeritus), Ph.D. .......... Michigan
Sundstrom, Eric D., Ph.D. ............... Utah
Verplanck, William S. (Emeritus), Ph.D. ........ Brown
Wahler, Robert G., Ph.D. ............... Washington
Wiberley, J. Albert, Ph.D. ............... Syracuse

Associate Professors:

Coleman, Lerita (On Leave), Ph.D. ....... Harvard
Johnson, Michael G., Ph.D. .............. Johns Hopkins
Lawler, Kathleen A., Ph.D. ............... North Carolina
McIntyre, Anne, Ph.D. ..................... Yale
Morgan, Wesley G., Ph.D. ............... Tennessee
Saudargas, Richard S., Ph.D. .......... Florida State
Travis, Cheryl B., Ph.D. ............... California (Davis)

Assistant Professors:

Baldwin, Debora R., Ph.D. ............... Kent State
Hopson, Ronald E., Ph.D. ............... Michigan State
Nash, Michael R., Ph.D. ............... Ohio

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THE MASTER'S PROGRAM

Graduate study leading to the Master of Arts in general psychology is normally available only to students already enrolled 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 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 ethology or physiology is offered through the Department of Management. Doctoral study in industrial and organizational psychology is offered through the Intercollegiate 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 essay 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 in dissertation research (Psychology 600).

General Psychology

This program allows students to select from a variety of specializations oriented toward current research and teaching in psychology in academic, institutional, or industrial settings. The program is highly flexible and individualized and seeks to provide a 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 337-38, 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 c. equivalent from each of four categories in the following list. (This requirement may be met by passing approved written examinations.)

a. Biological psychology: 461-69 Physiological Psychology and Laboratory; 526 Neuroanatomy; 527 Behavioral Neurology.
   d. Developmental psychology: 511 Developmental Psychology; 512 Life-span Development; 574 Child Psychopathology.
   e. Individual differences and personality: 445 Research Methods and Testing; 476 Theories of Personality.
   f. Social and organizational psychology: 440 Organizational Psychology; 590 Social Psychology.
   g. 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.

3. 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.
4. At least 4 graduate seminars in psychology numbered above 600.

Clinical Psychology

This program is designed to lay the groundwork for a career as a 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 embodies the scientist-practitioner model of clinical psychology. Requirements are as follows:

1. Apprenticeship with one faculty member during the first year, one day each week.
2. 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.
3. Supervised clinical placement two days (16 hours) each week during the second, third, and fourth years.
4. 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 (504-505, 506);
   h. Psychotherapy (670, 671, 673, 675);
   i. Ethical, Legal, and Professional Issues (635).
5. Satisfactory completion of at least 3 additional graduate-level courses in any clinical topics in psychology.
6. Satisfactory completion of a one-year clinical internship at a site approved by the program.

GRADUATE COURSES

409 Group Facilitation (3) Study of theory and technique through supervised experience in small groups. Prereq: 350 and consent of instructor. May be repeated. Maximum 5 hrs.
424 Psychology and the Law (3) Psychological aspects of legal systems. Prereq: 110 or equivalent, upper-division standing and consent of instructor.
430 Health Psychology (3) Survey of psychological factors related to health and illness: stress, personality, and environment. Applications of psychological treatments to physical illness. Prereq: 110 or equivalent, 210.
434 Psychology of Gender (3) Biological, psychological, and social factors related to gender and stereotypes for behavior and experience. Prereq: 110 or equivalent, 210, 220. (Same as Women's Studies 434.)
440 Organizational Psychology (3) Social-psychological analysis of organizations, role-theory and systems theory. Prereq: 360.
450 Comparative Animal Behavior (3) (Same as Zoology 450.)
459 Comparative Animal Behavior Laboratory (3) Coreq: 450. (Same as Zoology 459.)
461 Physiological Psychology (3) Nervous system and physiological correlates of behavior. Biological basis of emotion, learning, memory and stress. Prereq: 110 or equivalent, 210, and 1 yr of biology or zoology introductory sequences or equivalents.
469 Laboratory in Physiological Psychology (3) Laboratory studies of nervous system and physiological correlates of behavior. Coreq: 461.
470 Theories of Personality (3) Survey of major theories of human personality and their development. Prereq: 220 and 300 or 330.
480 Theories of Learning (3) Classical and current approaches to learning and cognition. Prereq: 310.
482 Topics in Psychology (3) Intensive analysis of special topics: Afro-American psychology or evaluation of programs in community. Prereq: Biological Basis of Behavior or Behavior and Experience: Humanistic Psychology and at least 9 hrs in 300-level courses. Recommended prereq: Statistics in Psychology, Methods of Research in Psychology. May be repeated. Maximum 6 hrs.
489 Supervised Research (1-9) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs in 399, 489, 491, 492, and 483 combined may apply toward undergraduate major.
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
506 Research Design (3) Techniques for planning and conducting research in controlled and natural settings: experimental design, pretests and posttests, observational studies, and program evaluations. Development of questions and hypotheses for study. Design of studies to maximize validity. Prereq: Consent of instructor.

508 Readings and Special Issues in Psychology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

509 Research Practicum (1-3) Required of first-year graduate students in psychology. May be repeated. Maximum 9 hrs. S/NC only.

510 Topics in Psychology (3) Intensive examination of selected issues in psychology. Prereq: 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. Prereq: 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. Prereq: Consent of instructor.

513 Foundations of Psychology: Biological Factors, Perception, Learning, Thinking, Motivation (4) Intensive survey. Prereq: Consent of instructor.

515 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.) S/NC only.

520 Interventions for Behavioral Change (3) Principles and techniques for planning, implementing, and evaluating interventions derived from social learning theory. Prereq: Behavior Modification in Community: teachers or supervisors. Token economics and strategies for self-control. Prereq: Consent of instructor.

525 Laboratory Techniques and Instrumentation (3) Procedures for laboratory research involving humans and animals in psychology. Techniques for collecting, transforming, storing, and retrieving data using microcomputers. Prereq: 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. Prereq: 461, 469, or equivalent and consent of instructor. (Same as Zoology 526.)

527 Behavioral Neurology (3) Disorders of nervous system, organic brain dysfunctions. Diagnosis and treatment. Prereq: Consent of instructor.

528 College Teaching in Psychology (3) Concepts, techniques, and strategies for teaching psychology at college and/or university level. Supervised practice. Prereq: Consent of instructor. S/NC only.


545 Advanced Animal Behavior (3) (Same as Zoology 545.)

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 549.)

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 12 hrs.

560 Psychology of Learning (3) Review of current evidence from research involving human and 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 personality theories and 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 (3) 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) Psychoanalytic approach to the causation and treatment of psychoses, neuroses, and adjustment disorders. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

574 Atypical Development in Childhood (3) Research on etiologies of atypical patterns of development in infancy and childhood. Prereq: 511 and consent of instructor. Maximum 6 hrs.

576 Object Relations (3) European and American conceptions of normal and psychopathological development of object relations. Significance for psychoanalytic theory. Prereq: Consent of instructor. 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.

585 Seminar in Gerontology (1) (Same as Human Ecology 585, Educational and Counseling Psychology 585, Nursing 585, Public Health 585, Physical Education 585, Social Work 585, and Sociology 585.)

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 (1) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. Coreq: 594 or 595. May be repeated. Maximum 4 hrs. S/NC only.

597 Evaluation of Development in Childhood (3) Structured and projective tests and interview techniques for evaluation of intellectual, personality, and social development in childhood. Prereq: 511 and admission to doctoral program in clinical psychology or consent of instructor. May be repeated. Maximum 12 hrs.

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

618 Seminar in Behavioral Neuroscience (3) Prereq: 461, 469, 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 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, questionnaires, rating scales; 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.

668 Seminar in Psychopathology (3) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. May be repeated. Maximum 12 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.

673 Laboratory in Psychotherapy (2) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. Coreq: 500 or 671. May be repeated. Maximum 6 hrs. S/NC only.

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. May be repeated. Maximum 12 hrs.

679 Hypnosis and Imagery (3) Demonstration and practice of hypnotic induction. Survey of clinical applications of hypnosis and imagery. 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.

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.
584 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.

585 Psychopharmacology (2) 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 (3) Prereq: Admission to doctoral program in clinical psychology and consent of instructor. May be repeated. Maximum 24 hrs. S/NC only.

696 Advanced Psychology Clinic Placement (1-3) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. May be repeated. Maximum 24 hrs. S/NC only.

**Religious Studies**

(College of Liberal Arts)

Charles H. Reynolds, Head

Professors:

Dungan, David L., Th.D. .......... Harvard
Humphreys, W. Lee, Ph.D. .......... Union
Linge, David E., Ph.D. .......... Vanderbilt
Lusby, F. Stanley, M.Div. .... Colgate Rochester规范
Norman, Ralph V., Jr., Ph.D. .......... Yale
Reynolds, Charles H., Ph.D. .......... Harvard

Associate Professors:

Fitzgerald, James L., Ph.D. .......... Chicago
Gwynne, Rosalind W., Ph.D. .......... Washington
Hodges, John O., Ph.D. .......... Chicago
Levering, Mirum L., Ph.D. .......... Harvard

Assistant Professors:

Ehrlich, Linda C., Ph.D. .......... Hawaii
Hackett, Rosalind I. J., Ph.D. .......... Aberdeen

A Master's degree in Philosophy with a concentration in religious studies is available. (Details of this program are described under Philosophy.) Graduate courses in religious studies provide opportunity for students in a variety of disciplines to pursue work in religious studies as a graduate concentration.

**GRADUATE COURSES**

411 Modern Religious Philosophies (3) Religious implications of major Western thinkers and movements from Nicolas of Cusa to nineteenth-century German idealists. (Same as Philosophy 411.)

412 Classical Indian Systems of Philosophy: The Moksha Tradition (3) Investigation of selected writings and philosophic problems of traditions of Samkhya, Yoga, Vedanta; Buddhism, or Jainism. Prereq: 374 or 376 or consent of instructor. (Same as Philosophy 412.)

416 Jesus and Paul Compared (3) Central ideas and concepts of each person compared with equivalent concepts in the other. Advanced study of Gospels and Epistles of Paul, involving extensive independent research.

425 Seminar in Western Religion (3) Selected figures, themes, movements, and problems. Content varies. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

430 Seminar in American Religion (3) Selected figures, themes, movements, and problems. Content varies. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

435 Seminar in Asian Religion (3) Selected figures, themes, movements, and problems. Content varies. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

440 Seminar in Comparative Religion (3) Selected figures, themes, movements, and problems. Content varies. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

446 Theoretical Issues in Medical Ethics (3) (Same as Philosophy 446.)

490 Readings and Research in Religious Studies (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

499 Seminar in Religious Studies (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

531 Topics in Religion and Society (3) Prereq: Consent of instructor.

532 Topics in the History of Religions (3) Prereq: Consent of instructor.

533 Topics in Religious Thought (3) Prereq: Consent of instructor.

544 Applied Ethical Theory (3) (Same as Philosophy 544.)

566 Topics in U.S. Religious History (3) Research in methods and sources for investigating United States religious history. Prereq: 351, 353, 355, 430, or consent of instructor. May be repeated. Maximum 6 hrs. (Same as History 566.)

570 Philosophy of Religion (3) (Same as Philosophy 570.)

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.

**Romance Languages**

(College of Liberal Arts)

MAJORS DEGREES

French ........................................ M.A.

Spanish ........................................ M.A.

Modern Foreign Languages ........................................ Ph.D.

John B. Rumeiser, Head

Professors:

Barrett, Paul E., Ph.D. ............... California
Brady, Patrick, Ph.D. ............... Sorbonne
Cobb, Carl W., Ph.D. ............... Tulane
Elliott, Jacqueline C., M.A. ......... Illinois
Handelman, Michael H., Ph.D. .... Florida
Heflin, William H., Ph.D. .......... Florida State
Irving, Thomas B. (Emeritus), Ph.D. .......... Princeton
Maurino, Ferdinando D. (Emeritus), Ph.D. .......... Columbia
Petrowska, Maria, Ph.D. ............ Kentucky
Pinsky, Clara (Emeritus), Ph.D. ........ California
Romaier, John B., Ph.D. .......... Vanderbilt
Vazquez-Bigi, A. M. (Emeritus), Ph.D. .......... Minnesota
Wallace, Albert H., Ph.D. .......... North Carolina

Associate Professors:

Campion, Edmund J., Ph.D. .......... Yale
DeFeyke, Robert M., Ph.D. .......... Illinois
DiMaria, Salvatore, Ph.D. .......... Wisconsin
DiPuccio, Denise M., Ph.D. .......... Kansas
Duncan, Cynthia K., Ph.D. .......... Illinois
Levy, Karen D., Ph.D. .......... Kentucky
Rivera-Rodas, Oscar, Ph.D. .......... California

Assistant Professors:

Birno, Flavia, Ph.D. .......... Washington
Cazenave, Oide, Ph.D. .......... Penn State
Holmlund, Christine, Ph.D. .......... Wisconsin
Milleret, Margo, Ph.D. .......... Texas
Rodriguez, Alberto, Ph.D. .......... Brown
Young, Dolly, Ph.D. .......... Texas

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 requirements, regulations, and materials not listed below.

**THE MASTER'S PROGRAM**

**Thesis Option**

1. Completion of a minimum of 24 semester hours in coursework 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 coursework 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 committee.

3. A written examination covering the coursework 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 Germanic 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 equivalent of an undergraduate major in one of them.

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 consists of a first concentration, a second concentration, and a cognate field.

1. First Concentration: French, German, or Spanish. It consists of a minimum of 39 semester hours beyond the Bachelor's degree, distributed as follows:

A. At least 21 hours at the 500 level (exclusive of thesis hours) including French 584 (3), German 560 (3), or Spanish 550 (3); German 512 (3), French 512 (3), or Spanish 512 (3); French 515-16 (2,2) or German 520 (3).

B. At least 12 hours at the 600 level (exclusive of sive of dissertation hours).

2. Second Concentration: French, German, Italian, Russian, or Spanish (different from the first concentration). It consists 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 graduate courses numbered 400 and above in a field outside of the department of the first concentration but related to the student's principal area of research. If the cognate field is yet a third foreign language, a reading proficiency exam may be added after completion of the 6 cognate hours by the language section concerned.

4. Additional Requirements: A student must demonstrate competence in languages of both his/her first and second concentrations by taking a test in each language. The test will include reading, writing, listening, and speaking, and should be completed by the time the student reaches 40 hours of study beyond the Bachelor's degree. Standardized measures that may be used for this purpose include applicable portions of either the National Teachers Examination, the MLA Examination for Teachers and Advanced Students, or the proficiency standards of the United States Foreign Service Institute (FSI).

If the student has not chosen a third language as his or her cognate area, basic competence (determined by a reading examination with translation into English administered by the department concerned) in a third language is required. If the student's first and second languages are Romance languages, the third language should be chosen from another language family.

A comprehensive examination on the language and literature of the first and second concentrations must be passed before the student may be admitted to candidacy. The candidate is required to defend his/her dissertation in an oral examination. Central emphasis is put on the doctoral dissertation as a final test of the candidate's scholarly qualifications.

Graduate Teaching Assistants in the program should have the opportunity and will be strongly encouraged to instruct at least two foreign languages, subject to staffing needs.

Doctoral students are strongly encouraged to reside and study abroad and will be assisted in identifying potential sources of financial support (e.g. Fulbright, McClure, Rotary fellowships).

For additional courses, see Germanic and Slavic Languages.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The Ph.D. program in Modern Foreign Languages is available to residents of the state of Alabama. Additional information may be obtained from the Residence Assistant in the Office of Graduate Admissions and Records.

French

GRADUATE COURSES


411 French Literature of the 16th Century (3) Highlights of 16th-century French literature. Excerpts from Rabelais and Montaigne; readings of poems from Lyot and members of Pileade. Prereq: 212, 218 or equivalent.


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 directors. Prereq: 212, 218 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-class contact rather than outside preparation. Prereq: 350, 351, 353, 354, 356 or 357. 6 hrs weekly. (Same as 226.)

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, dialectal 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 301-02, courses in literature abroad, and general courses in Latin and Greek required no knowledge of these languages), or consent of department. (Same as German 425, Russian 425, Spanish 425, and Linguistics 425.)

426 Methods of Historical Linguistics (3) (Same as German 426, Russian 426, Spanish 426 and Linguistics 426.)

429 Romance Linguistics (3) Development of Classi- cal 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 Gaule to World War II. Historical events, daily life, all forms of arts. Prereq: 212, 218 or equivalent.

432 Contemporary French Culture (3) French con- temporary 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 explication 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 department facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N only. E

512 Teaching a Foreign Language (3) Practical appli- cation of methods for teaching and evaluating basic language skills and foreign language skills, and cultural aspects through seminars, demonstrations, peer teach- ing, and observation of foreign language classes. Re- quired of all M.A. and Ph.D. students holding Graduate Teaching Assistantships, except those whose previous training or experience warrants their being excused by department.

515-16 Bibliography and Methods of Research (2,2) Survey of critical research tools and scholarly contribu- tions in French literature and language. Practical exer- cises on compiling of scholarly data.


531 French Literature of the 16th Century (3) Literature of first half of 16th century, Rabelais and other prose writers, humanists, and poetry of Mard, Lyonnais group, and young Pleiad poets.

532 French Literature of the 16th Century II (3) Literature of second half of 16th century, mature works of Pleiad writers and such poets, as d'Aubigné and Sponde; Montaigne; writers of scientific works and memoirs, drama.

541 French Literature of the 17th Century (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 Voltaire, Diderot, Rousseau, and other major French 18th-cen- tury writers.

559 Problems in Linguistics: Romance Languages (3) Maximum 6 hrs with consent of department. (Same as Spanish 559 and Linguistics 559.)


571-72 Trends in Modern French Literature (3,3) In- depth study of some of most revolutionary, challenging 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 improvement of one’s written French.

584 Literary Criticism: the Foundations of Romance Criticism (3) Survey of critical ideas utilized over centuries 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 Seminar in French Literature (3,3,3) 621—Middle Ages; 622—16th Century; 623—17th Century. May be repeated with consent of department. Maximum 6 hrs each.

631-32-33 Seminar in French Literature (3,3,3,3) 631-18th Century; 632—19th Century; 633-20th Century. May be repeated with consent of department. Maximum 6 hrs each.

423-24 Advanced Conversation and Composition (3,3) Advanced conversational and written skills in Spanish for professionals.

426 Introduction to Descriptive Linguistics (3) (Same as French 426, German 425, Russian 426, and Linguistics 425.)

426 Methods of Historical Linguistics (3) (Same as German 426, French 426, Russian 426, and Linguistics 425.)

429 Romance Linguistics (3) (Same as French 429 and Linguistics 429.)

431 Spanish Civilization (3) Major social, political, and cultural achievements of Spanish people from origins of their civilization until today. Prereq: 311, 312 or equivalent.

432 Cervantes (3) Selections from Don Quijote and study of shorter Novelas ejemplares. Prereq: 311, 312 or equivalent.

433 Masterpieces of Spanish Literature (3) Selections from both Golden Age and modern period of outstanding works of all genres. Prereq: 311, 312 or equivalent.

435-36 Survey of Spanish Literature (3,3) 435—Spanish literature through Golden Age. 436—Spanish literature since 1700. Prereq: 311, 312.

450 20th-Century Spanish Theatre (3) Major 20th-century Spanish American dramatists. Prereq: 311, 312 or equivalent.

450 Capstone Colloquium in Spanish (3) Integrative experience. Breadth of range of issues and topics that affect much of Spanish-speaking world and also involve those who specialize in Hispanic studies. Prereq: 311, 312 or equivalent.

460 Capstone Tutorial in Spanish (1) Independent study project supervised closely by faculty member. Prereq: 311, 312, 459 or equivalent.

471 Latin American Civilization (3) Latin America’s diverse heritage and major social and political institutions. Prereq: 311, 312 or equivalent.

472 Masterpieces of Spanish American Literature (3) Close reading of selected works by major Spanish American writers. Dario, Paz, Borges, Fuentes and others: Genres and periods vary. Prereq: 311, 312 or equivalent.

473-74 Survey of Spanish American Literature (3,3) 473—Historical survey from Conquest to late 19th century. 474—Major literary movements, writers and works of 20th century. Prereq: 311, 312 or equivalent.

479 Social Protest Literature of Latin American (3) Analysis of literature as means of unmasking social ills and fostering greater social awareness and change. Prereq: 311, 312 or equivalent.

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

512 Teaching a Foreign Language (3) Practical application of methods for teaching and evaluating basic 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 or experience warrants their being excused by department.

522 Advanced Communication Skills for Teachers and Other Professionals (3) Advancement of oral and written proficiency in Spanish through extensive use of authentic conversational materials; class lectures and discussions; oral and written presentations and reports. Especially recommended for graduate students, teachers, and other professionals seeking to maintain or enhance high level communicative competency.

531 Old Spanish (3) Old Spanish language and medieval Spanish literature through 13th century.

532 Medieval Spanish Literature (3) Spanish literature of 14th and 15th centuries.

533 The Picarosque Novel (3) Lazarrillo de Trapos, Guzmán de Alfarache, and Buscón.

534 Don Quijote (3)

535 Golden Age Poetry (3) Garcilaso, Fray Luis de León, San Juan de la Cruz, Lope de Vega, Quevedo, and Góngora.

537 The Golden Age Theatre (3) Major dramatists of period: Lope de Vega, Tirso de Molina, Ruiz de Alarcon, Guillen de Castro, Calderón de la Barca, Moro, and Rojas Zorrilla.

541 Galdós and the 19th Century Spanish Novel (3) Analysis of works by Galdós and other major 19th-century novelists, Pardo Bazán, Valera, Clarín, and Pérez. 


543 The 20th-Century Spanish Novel (3) Baroja, Azorin, Villa-Íñiguez, Pérez de Ayala, Cela, Delibes, Gayo, Matute, and at least one present-day novelist.

545 Modern Spanish Poetry (3) From Becquer, Unamuno, A. Machado, Jimenez, Lorca, Guillén, Aleixandre, and a contemporary, Celaya.

547 Modern Spanish Drama (3) Major playwrights of 20th-century Spain.

550 Techniques of Literary Analysis and Research Methods (3) Theoretical and critical essays on various techniques of literary analysis. Exploration of bibliographical and research materials.

551 Special Topics in Spanish or Spanish American Literature (3) May be repeated. Maximum 6 hrs.

552 Directed Readings (3)

559 Problems in Linguistics: Romance Languages (3) (Same as French 559 and Linguistics 559.)


573 The Spanish American Novel: Chile and the River Plate Nations (3) Novels from Chile, Argentina, Uruguay and Paraguay. Modern world.


576 Contemporary Spanish American Poetry (3) Major poets in Spanish American from post modernismo to present day.

577 Spanish American Drama (3) Major playwrights of 20th-century Spanish America.


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.

594-95 French Directed Readings (3,3)

Portuguese

GRADUATE COURSES

431-32 Directed Readings in Brazilian and Portuguese Literature (3,3) May be repeated with 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.

Spanish

GRADUATE COURSES

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.
Social Work

(University of Tennessee College of Social Work)

MAJOR DEGREES
Social Work M.S.S.W., M.S.S.W.-M.Div., M.S.S.W.-M.P.A., Ph.D.

Eunice Shatz, Dean

Professors:
Beasley, Lou M. (On Leave), Ph.D. ..... Denver
Bloch, M. H. (Emeritus), M.S. ..... Ohio State
Bonovich, Robert C. (Emeritus), D.S.W. ..... Washington (St. Louis)
Fryer, Gideon W. (Emeritus), Ed.D. ..... Columbia
Glinos, C. A., Ph.D. ..... Washington (St. Louis)
Granger, Ben P., Ph.D. ..... Brandeis
Hirayama, H., D.S.W. ..... Pennsylvania
Krinick, Jane, Ph.D. ..... Yosef
McLaran, G. (Emeritus), M.S.S.W.
Mullins, M. Kate, Ph.D. ..... Chicago
Nooe, Roger M., D.S.W. ..... Tulane
Orten, J. D., D.S.W. ..... Alabama
Rubenstein, H., Ph.D. ..... Chicago
Shatz, Eunice, Ph.D. ..... Brandeis
Wachter, Ann R. (Emeritus), M.S.S.W. ..... Tennessee

Associate Professors:
Avery, R. S., Ph.D. ..... Brandeis
Bell, W. J., D.S.W. ..... Tulane
Cetingok, M., Ph.D. ..... Washington (St. Louis)
Granger, Ben P., Ph.D. ..... Brandeis
Hirayama, H., D.S.W. ..... Pennsylvania
Krinick, Jane, Ph.D. ..... Yosef
McLaran, G. (Emeritus), M.S.S.W.
Mullins, M. Kate, Ph.D. ..... Chicago
Nooe, Roger M., D.S.W. ..... Tulane
Orten, J. D., D.S.W. ..... Alabama
Rubenstein, H., Ph.D. ..... Chicago
Shatz, Eunice, Ph.D. ..... Brandeis
Wachter, Ann R. (Emeritus), M.S.S.W. ..... Tennessee

Assistance Professors:
Avery, R. S., Ph.D. ..... Brandeis
Bell, W. J., D.S.W. ..... Tulane
Cetingok, M., Ph.D. ..... Washington (St. Louis)
Chapin, J. W., Ph.D. ..... Peabody
Cruthirds, C. Thomas, D.S.W. ..... Tulane
Faver, C., Ph.D. ..... Michigan
Jennings, J., Ph.D. ..... Michigan
Moses, A. E., D.S.W. ..... California
Rowen, R. B., Ph.D. ..... Arizona
Spicuzza, Frank, M.S.S.W. ..... Tennessee
Tate, Nellie P., Ph.D. ..... Brandeis
Vaughn, H. H., Ed.D. ..... Memphis State
Wilks, C., Ph.D. ..... St. Louis

Residents:
Lunn, Nina (Nashville), M.S.S.W. ..... Tennessee
Lunn, Nina (Nashville), M.S.S.W. ..... Tennessee
Pomerantz, Edward (Memphis), M.S.W. ..... Barry

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 services and 2) social welfare administration and planning. These objectives are met through a curriculum requiring all students a professional foundation and a concentration in either social work treatment or social welfare administration and planning.

Admission Requirements

Admission to the Master's program is based on the following requirements:
1. A Bachelor's degree from an accredited college or university with appropriate preparation in the social sciences. At least three-fourths of the student's undergraduate work should be in the social sciences, humanities, physical sciences, and other liberal arts subjects. Those with other academic backgrounds should request consultation regarding ways in which they might be admitted.
2. A grade-point average of 2.5 on a 4.0 scale, with preference given to applicants with 3.0 and above. Applicants with less than a 2.5 may be 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 B.S.W. from an accredited program, 2) an overall undergraduate GPA of 3.0 or greater, and 3) successful completion of all areas of an examination covering the five foundation areas. Students admitted into advanced standing are required to complete a minimum of 39 hours of study in either of the college's concentrations - social work treatment or social welfare administration and planning. These students will follow the curriculum plan and meet all requirements of the concentration during three semesters of study in the program.

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

Planed part-time programs are available in all three branches of the college. Admission requirements are the same as for full-time study. Coursework 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.

Financial Aid

Students may apply directly to the University's Financial Aid Office for assistance such as the National Direct Student Loan or the Work-Study Program. Other stipends are administered by the College and awarded on the basis of financial need. Applications for these funds must be made to the Branch of the College the student will attend. A student must first apply for University assistance, since College funds are considered supplementary to those of the University. Additional information about College stipends may be obtained from the College of Social Work.

General Requirements

1. A minimum of 54 semester credit hours including a) completion of 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 practice (16 hours) in the social work treatment concentration or at least four courses (12 hours) and three semesters of field practice (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.

3. Successful completion of a comprehensive exam or thesis defense.

4. An overall GPA of 3.0 or better on all graded courses and satisfactory performance in field.

The Professional Foundation Curriculum

The foundation curriculum is a 15-semester hour concentration 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 development by presenting comprehensive and broad knowledge areas from which to operate in the future as practitioners, supervisors, administrators, and planners.

Upon completion of the foundation curriculum, 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 concentration provides knowledge of theory and methodology basic to 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. The 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 programs. Through cooperation with a wide range of social agencies and human service programs throughout Tennessee, 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 insure that students have quality field practice experiences, meeting the objectives of the core curriculum and the concentration.

Field practice includes 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 practice 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 with the field practice coordinator and the educational committee in the 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 practice 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

Coursework 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 to 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. An S earned on an S/N/C system for the field practicum 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 coursework 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 statement describing the procedure for applying for examination.

DUAL M.S.S.W./M.P.A. PROGRAM

The Department of Political Science and the College of Social Work offer a dual degree program leading to the conferred degree of both the Master of Science in Social Work and the Master of Public Administration. In this program, the M.P.A. and M.S.S.W. degrees can be earned on a full-time basis in five consecutive terms rather than seven to eight terms.

Admission

Applicants for the M.S.S.W./M.P.A. program must be admitted to the College of Social Work and to the Department of Political Science. In addition, applications from dual degree students must be reviewed and approved by the dual degree committee that is responsible for overseeing the program. It is anticipated that some students may apply to the dual degree program before they matriculate in either the M.S.S.W. or the M.P.A. program. Students already enrolled in one program will also be permitted to apply, but must do so prior to the end of the first year of study.

Curriculum

Students in the dual degree program are required to take a set of core courses from each curriculum, but the program is designed to be flexible, providing students the opportunity to develop special areas of competence. For the dual degree program, a minimum of 65 hours are required (35 hours must be in social work and 30 hours must be in public administration). Admission to candidacy will be completed separately for each degree.

A comprehensive examination is required in each discipline for students receiving the dual degrees. A faculty committee from Public Administration and one from Social Work will write and grade the respective examination.

Dual degree students who withdraw from the program before completion of the requirements for both degrees will not receive credit toward either the M.P.A. or the M.S.S.W. degree for courses taken in the other program, except as such courses qualify for credit toward a degree independent of the dual degree program.

Financial Aid

Students may apply or financial aid to both the College of Social Work and the Department of Political Science. Normally, students will not receive funding from both programs concurrently.

DUAL M.S.S.W./M.DIV. PROGRAM

Vanderbilt University Divinity School and the College of Social Work, Nashville Branch, offer a dual degree program leading the both the Master of Science in Social Work and the Master of Divinity degrees. Both degrees can be earned on a full-time basis in eight consecutive semesters rather than ten if completed separately.

Admission

Students interested in the dual degree must apply and be admitted to each university, giving notice on both applications of their interest in the joint program. Students already enrolled in one of the schools may apply to the joint degree program if they are in their first year of study. All dual degree applicants will be reviewed and approved by a dual degree committee that is responsible for overseeing the program.

Curriculum

Students take 72 semester hours at the Divinity School and 48 semester hours at the College of Social Work. In the first two years, students are required to take one full year of coursework (27 to 30 hours) at each school. The first year can be taken at either school. In the third year students are enrolled in both institutions and take twelve hours of coursework at the Divinity School and 12 hours of field practicum at the College of Social Work. In the Spring semester of the third year, students take a comprehensive examination at the College of Social Work. The M.S.S.W. degree is awarded at the end of the third year. Students spend the entire fourth year at the Divinity School completing requirements for the M.Div. degree.

Tuition and Financial Aid

Students pay to each institution the tuition charges and fees appropriate to their registration. Financial aid, if awarded, will be handled