This Catalog offers information about the academic programs and support services of the University. This Catalog is as accurate as possible, but the information may not remain current for all of the academic year. Circumstances may prompt changes in courses, course content, credit, fees, regulations, semester calendar, curriculum, degrees offered, and other University matters. Such changes authorized by the University apply both to prospective students and to those previously enrolled, unless the latter are specifically exempted.

Not all courses are offered each semester or session. Students should consult the current class schedule book and the departmental office for specific details regarding frequency of offerings in specific courses.

Course descriptions are listed alphabetically by fields. (See the BIOM prefix and the College of Osteopathic Medicine of OSU College Catalog for osteopathic medicine course descriptions.)

Explanation of Course Listings

A course listing is comprised of the following elements, in order:

Course Number. All courses are identified by numbers composed of four digits. The first digit indicates the class year in which the subject is ordinarily taken, although enrollment is not exclusive as to student classification, the second and third digits identify the course within the field and the last digit identifies the number of semester credit hours the course carries. A course number beginning with 0 indicates that the course does not carry University credit. A course number ending in 0 indicates that the course carries variable credit. An asterisk (*) following the four-digit number indicates the course is approved for graduate credit.

Those numbered 5000 and above are primarily for graduate students, and only graduate students and selected seniors with consent of the instructor may enroll in them. Courses numbered 3000 and 4000 may be taken for graduate credit if the course number is labeled with an asterisk. Extra work may be required of a graduate student in a 3000- or 4000-level course.

General Education Requirement Codes. The capital letters in parentheses preceding some course titles designate courses fulfilling various undergraduate general education requirements. (See "Academic Regulations").

Course Title. The title of the course is printed in boldface letters.

Statement of Variable Credit. Each course number ending in zero is followed by a statement of the maximum credit that may be earned. Typical entries are 1-6 credits, maximum 12, the first part of the entry indicating the permissible credit per enrollment, followed by a statement of the maximum credit which may be earned in the course through repeated enrollment.

Laboratory Hours. If a course contains a laboratory, the number per week of laboratory hours are stated, e.g., Lab 3.

Prerequisite(s). Prerequisites from the same department as the course being described are listed first, with no departmental abbreviation and in increasing numerical order. If from another department, then departmental abbreviation must precede the number of the prerequisite course. Those courses having prerequisites from both within and from outside the department bear combination entries such as BIS 3303 and STAT 2012. Prerequisites are listed in the following manner:

Prerequisites: A, B or C
A or B or C is acceptable

Prerequisites: A, B and C
A and B and C are required

Prerequisites: A, and B or C
A and either B or C

Prerequisites: A and B, or C
Both A and B, or C required

Prerequisites: A, or B and C
Either A or both B and C required

Prerequisites: A or equivalent and B
Both A, or the equivalent of A, and B are required

Prerequisites: A, and B or equivalent
Both A and B, or the equivalent of B, are required

Prerequisites: A and B, or equivalents
Equivalents of both A and B are acceptable.

Where no prerequisites are listed for a course, it is understood that the prerequisite is 60 credit hours completed, or 45 credit hours completed with an overall grade-point average of 3.25. The prerequisite for courses numbered 5000 or 6000 level is graduate standing in addition to any other prerequisites listed. Instructors may waive prerequisites when student background justifies. Prior approval of instructor may be required in problems courses, independent study, internships, thesis and dissertation courses, and courses taught in a professional school.

Description of Course Content. The content of the course and its major emphases are described. Courses which are taught under another name and number are indicated by the statement Same course as 0000. Credit may not be earned in both courses so cross-referenced.
Abreviations Used

A&S  Arts and Sciences
ABSE  Applied Behavioral Studies
ACCT  Accounting
AERO  Aerospace Studies--Air Force
AG  Agriculture
AGCM  Agricultural Communications
AGEC  Agricultural Economics
AGED  Agricultural Education
AM  Arts Management
AMST  American Studies
ANSI  Animal Science
ANTH  Anthropology
ARCH  Architecture
ART  Art
ASTR  Astronomy
AVED  Aviation Education
BAE  Biosystems Engineering
BCOM  Business Communications
BHON  Business Honors
BIOC  Biochemistry
BIOI  Biological Science
BIOM  Biomedical Sciences
BOT  Botany
BSPR  Business Professions
BUSE  Business Education
CHEM  Chemistry
CIED  Curriculum and Instruction Education
CIVE  Civil Engineering
CLML  Cell and Molecular Biology
CMT  Construction Management Technology
CS  Computer Science
DHM  Design, Housing and Merchandising
ECEN  Electrical and Computer Engineering
ECON  Economics
EDLE  Educational Leadership
EDTC  Educational Technology
EDUC  Education
EET  Electrical Engineering Technology
ENGL  English
ENGH  Engineering
ENSC  Engineering Science
ENTO  Entomology
ENV  Environmental Science
EPSY  Educational Psychology
ETM  Engineering and Technology Management
FIN  Finance
FLL  Foreign Languages and Literatures
FOR  Forestry
FPST  Fire Protection and Safety Technology
FRCD  Family Relations and Child Development
FREN  French
GENE  Genetics
GENG  General Engineering
GENT  General Technology
GEOG  Geography
GEOI  Geology
GRAD  Graduate
GREK  Greek
GRMN  German
HES  Human Environmental Sciences
HHP  Health and Human Performance
HIST  History
HONR  Honors
HORT  Horticulture
HRAD  Hotel and Restaurant Administration
HRAE  Human Resources and Adult Education
IEM  Industrial Engineering and Management
INTL  International Studies
JAPN  Japanese
JB  Journalism and Broadcasting
LA  Landscape Architecture
LAIN  Latin
LBSC  Library Science
LEIS  Leisure
LSB  Legal Studies in Business
MAE  Mechanical and Aerospace Engineering
MATH  Mathematics
MBA  Master of Business Administration
MC  Mass Communications
MCAG  Mechanized Agriculture
MET  Mechanical Engineering Technology
MGMT  Management
MICR  Microbiology
MKTG  Marketing
MLSC  Military Science
MSIS  Management Science and Information Systems
MTCL  Medical Technology
MUSI  Music
NATS  Natural Science
NSCI  Nutritional Sciences
OCED  Occupational Education
PET  Petroleum Technology
PHIL  Philosophy
PHYS  Physics
PLNT  Plant Science
PLP  Plant Pathology
POLS  Political Science
PSYC  Psychology
REL  Religious Studies
REMS  Research, Evaluation, Measurement, and Statistics
RLEM  Rangeland Ecology and Management
RUSS  Russian
SCFD  Social Foundations
SDEV  Student Development
SOC  Sociology
SOIL  Soil Science
SPAN  Spanish
SPCH  Speech Communication
SPED  Special Education
STAT  Statistics
ICED  Technology Education
TCOM  Telecommunications Management
TE  Technology Education
TH  Theater
TIED  Technical and Industrial Education
UNIV  University
VAPP  Veterinary Anatomy, Pathology and Pharmacology
VCS  Veterinary Clinical Sciences
VIDP  Veterinary Infectious Diseases and Physiology
VMED  Veterinary Medicine
VMS  Veterinary Medicine and Surgery
ZOOL  Zoology
2000 Financial Accounting. Prerequisite: 24 semester credit hours, including ENGL 1113 and MATH 1483 or equivalent. Financial accounting concepts and the use of financial accounting information in decision making.

2203 Managerial Accounting. Prerequisite: 2103. Managerial accounting concepts and objectives, planning and control of sales and costs, analysis of costs and profits.

3013 Federal Income Taxation. Prerequisite: 2203. Federal income tax and its relationship to business decision-making; primary emphasis on recognition of the important tax consequences that attach to business transactions and the impact on business decision making.

3203 Cost Accounting. Prerequisites: 2203 with a grade of "C" or better and STAT 2023. Cost accumulation systems, allocating product costs, planning and controlling costs, standard costing, and profitability analysis.


3403 Financial Accounting II. Prerequisite: 3303 with a grade of "C" or better. Continuation of financial accounting theory and problems.

3433 Financial Accounting and Reporting Concepts. Prerequisite: 3403 with grade of "C" or better. Theory and concepts underlying financial accounting and reporting.

3603 Accounting Information Systems. Prerequisite: 2203 with a grade of "C" or better. Accounting system design and installation.

4010 Accounting Projects. 1-6 credits, maximum 6. Prerequisites: consent of instructor and 3203 and 3403. Special topical, projects and independent study in accounting.

4013* Advanced Federal Income Taxation. Prerequisite: 3013 with a grade of "B" or better. Federal income tax law applicable to individuals, corporations, partnerships, trusts and estates, and other specialized topics.

4020* Topics in Management Accounting. Prerequisites: 2203 with grade of "C" or better and MGMT 3223. Integrative course in cost and management accounting; use of accounting information for internal decision making.

403* Non-business, Fiduciary and Institutions Accounting. Prerequisite: 3403 with grade of "C" or better. Fund and governmental accounting, bankruptcies, receivables, estates and trusts.

4043 Financial Accounting III. Prerequisite: 3403 with grade of "C" or better. Consolidated statements and other financial accounting topics.

443 Financial Accounting and Reporting Applications and Research. Prerequisite: ACCT 3433 with a grade of "C" or better. Developing financial research skills and applying them to accounting and reporting issues.

4453* EDP Auditing. Prerequisite: 4503 or consent of instructor. EDP auditing as it applies to the business environment, Impact of computer-based systems on control and auditing, total systems control analysis, and specific EDP auditing techniques as they apply to computer-based systems.

3543* Auditing. Prerequisite: 3403, 3603. Auditing theory, procedures and practices.

5000* Thesis. 1-6 credits, maximum 6. For students writing reports and theses in accounting.

5013* Seminar in Tax Research. Prerequisite: 4013 or consent of instructor. Development and administration of federal tax law with emphasis on the development of tax research skills.

5023* Seminar in Estate and Gift Taxation. Prerequisite: 5013 or consent of instructor. Federal income tax applicable to estate and gift taxation and income taxation of estates and trusts.

5033* Seminar in Oil and Gas Taxation. Prerequisite: 5013 or consent of instructor. Federal income tax laws applicable to the petroleum and other extractive industries.

5043* Seminar in Partnership Taxation. Prerequisite: 5013 or consent of instructor. Federal income tax laws applicable to partners and partnerships.

5053* Seminar in Corporate Taxation. Prerequisites: graduate standing and 5013 or consent of instructor. Federal income tax law applicable to corporations and to other entities in their capacity as corporate shareholders.

5103* Financial Accounting and Analysis. Prerequisites: admission to MBA program or consent of MBA director. Development of the ability to read and to analyze financial statements and to use this information along with other types of information in decision making.

5110* Special Topics and Individual Work in Accounting. 1-10 credits, maximum 10. Prerequisite: consent of instructor. Individual work on special topics, projects or readings selected to acquaint students with significant accounting literature.

5113* Managerial Accounting. Prerequisite: 5103. Interpretation of accounting data in planning, controlling and decision making.

5123* Enterprise Resource Planning. Prerequisites: graduate standing and 5103, 5113, MIS 5643, or consent of director of MIS/AIS. Resource planning for global businesses. Integration of data flow and computer software for enterprise resource planning. Integration of transactional analysis, fundamental accounting practice, financial planning, and supply chain analysis forming the basis for study in this integrated approach to enterprise resource planning. Same course as MSIS 5123.

5133* International Oil and Gas Accounting. Prerequisite: graduate standing. Financial accounting and reporting for U.S. and international oil and gas operations. Domestic and international joint venture accounting. Accounting for international concession and profit sharing agreements.

5203* Seminar in Contemporary Accounting Theory I. Prerequisite: 3403. Origin and development of accounting and a critical study of modern accounting theory.

5303* Seminar in Contemporary Accounting Theory II. Prerequisite: 3403. Critical study of contemporary accounting theory.

5313* Financial Statement Analysis. Prerequisite: consent of graduate coordinator. A study of the demand and supply of financial data, properties of numbers derived from financial statements, the role of financial information in investment decisions, and features of the decision-making environment.

5400* Practicum in Professional Accounting. 1-6 credits, maximum 6. Prerequisite: 30 semester credit hours of accounting. An accounting course or internship involving auditing, tax, systems, internal and external reporting and international aspects of business cases.

5503* Advanced Auditing. Prerequisite: 4503. Emphasis on auditing aspects of EDP, use of statistical sampling techniques in connection with audits of financial data, filings with the SEC and other regulatory agencies and other public accounting related topics.

5603* Accounting-based Information Systems. Prerequisite: 18 credit hours of accounting including 4203. Concepts underlying the design and use of an effective accounting information system.

5613* Business Systems Controls and Risk Analysis. Controlling and auditing business systems including management and applications controls and internal controls, and evaluation of system performance through use of audit software.

5713* Seminar in International Accounting. Prerequisites: 3403 and consent of graduate coordinator. Accounting issues faced by multinational enterprises and internationally listed companies, including diversity in financial reporting and harmonization.

5803* Seminar in Cost-Managerial Accounting. Prerequisite: 18 credit hours of accounting. Intensive study of cost management accounting theory relating to problems of an advanced nature.

5900* Graduate Internship in Accounting. 1-3 credits, maximum 3. Prerequisites: admission to master's program; consent of graduate coordinator. Supervised internship in public accounting, industry, or not-for-profit organizations. May be counted as elective hours only.

5902* Research Report. Prerequisite: consent of supervising professor and coordinator of graduate programs in accounting. Methods used in research and report writing in accounting. In independent investigation and writing of an acceptable report on a topic approved by the student's supervising professor. Restricted to candidates seeking the M.S. in accounting and not available to students who have credit in 5000.
Aerospace Studies-Air Force (AERO)

1111 Foundations of the U.S. Air Force I. Lab 1. Doctrine, mission and organization of the United States Air Force through a study of the total force structure, strategic offensive and defensive forces, general purpose forces, and aerospace support forces.


2211 Evolution of U.S. Air Force Air and Space Power I. Lab 1. Growth and development of aerospace power through history beginning with first manned flights and continuing through World War II.

2212 The Development of Air Power II. Lab 1. Development and growth of aerospace power from the period following World War II through the Vietnam conflict; concepts of peaceful deployment of US air power.

3103 Air Force Leadership Studies I. Lab 2. The study of the fundamental leadership, management, and communication skills required of an Air Force junior officer. Basic managerial processes, management of forces in changing environments, organizational power, politics and managerial strategy and tactics.

3203 Air Force Leadership and Management II. Lab 1. The application of leadership, management, and communication skills required of an Air Force junior officer. The individual as a leader in the Air Force environment, individual motivations and behavioral processes, group dynamics, leader and management ethics, counseling and evaluating are discussed.

3504 Field Training Encampment Program. Prerequisite: consent of professor of aerospace studies. Practical training on an Air Force base. Junior officer training, familiarization training in most functional aspects of a typical Air Force base. Includes career orientation, small arms firing, flight orientation rides, and survival training.

4103 (S)National Security Affairs I. Lab 2. The formation, organization and context of national security; civil-military interaction and the evolution of strategy. Review of the military profession and officership.

Agricultural Economics (AGEC)

1114 (S)Introduction to Agricultural Economics. Economic theory of production, marketing and consumption of agricultural products. The role and structure of agriculture in the American economy. Policies to achieve efficiency and welfare goals in agriculture. No general education credit for students also taking ECON 1113 or ECON 2013.

3010 Internship in Agricultural Economics. 1-6 credits. Prerequisite: approval of internship committee and adviser. Supervised work experience with approved public and private employers in agricultural economics including banks, farm credit services, agricultural chemical firms, Soil Conservation Service, congressional offices and other opportunities. Credit will not substitute for required courses. Graded on pass-fail basis.

3203 Agricultural Price Analysis. Prerequisites: 1114, 3213 or AG 2112, MATH 1513. Economic theory, statistics and data combined to describe, understand and forecast agricultural price relationships and variation. Quantitative techniques developed to determine the factors causing price variation and to measure trend, cyclical, seasonal and random price variation.

3213 (A)Quantitative Methods in Agricultural Economics. Lab 2. Prerequisites: 1114, MATH 1513, and MISIS 2103, AG 2112 or equivalent. Indicies, graphics, budgeting, discounting, basic statistical measures, use of microcomputers, and price analysis. Basic background methods for some courses involving analysis.

3303 (S)Agricultural Marketing. Prerequisites: 1114, MATH 1513. The agricultural marketing system, its importance to the economy and the role of the individual firm manager. Futures markets, hedging, and the use of decision aids.

3313Agribusiness Management. Prerequisites: 1114, ACCTG 2103. Managerial functions and applications to nonfarm agribusiness firms. Alternative forms of ownership and principles of agribusiness cooperation. Financial management, organization and management of human, financial, and physical assets for nonfarm agribusiness firms.

3403 Agricultural Business Records and Analysis. Lab 2. Prerequisites: 3413 and ACCTG 2103. Financial accounts, production and statistical records and their practical application to the successful management of the farm or ranch and other agricultural businesses.

3413 Farm and Ranch Management I. Lab 2. Prerequisites: 1114, MATH 1513, and MISIS 2103, AG 2112 or equivalent. Production planning with budgeting, financial records and income tax management for the individual farm-ranch business.

3590 (S)Natural Resource Economics. Prerequisite: 1114 or ECON 2123. Framework for analyzing natural resource management decisions. Applications of microeconomic theory to the management of soil, water and other resources, with special emphasis on the institutions having an impact on management opportunities. Supply of and demand for natural resources, resource allocation over time, rights of ownership, and public issues of taxation, police power and eminent domain.
Agricultural Finance. Prerequisites: 3313 or 3413, ACCTG 2103. Farm financial management; preparation and analysis of net worth, cash flow and income statements, including computer applications; financial intermediaries; serving agriculture; procedures for evaluating investments; alternative means of acquiring control of farm resources.

Special Problems in Agricultural Economics. 1-3 credits, maximum 3. Directed study of selected agricultural economics topics.

Agricultural Marketing and Prices. Prerequisites: 3203, 3213 and 3303. Agricultural marketing, with emphasis on system-wide approaches. Economic tools and techniques for making decisions.

Applied Agribusiness Management. Prerequisites: 3313 or 3413, 3603 or FIN 3113; 3303 or MKTG 3213; 4413 or LSB 3213; ECON 3023 or 3113. Applications of modern decision theory and the mechanics of trading. Fundamentals and technical aspects of commodity prices. The application of concepts and principles of economic theory and economic instruments of national food and agricultural trade.

Agricultural Economics Seminar. Prerequisite: senior standing in agricultural economics. Contemporary problems in agricultural economics; career exploration; agriculture in the economics of the nation and the world.

Agricultural Economics Seminar. Prerequisite: senior standing in agricultural economics. Contemporary problems in agricultural economics; agriculture in the economics of the nation and the world. Individual seminar reports and group discussion of reports.

Agricultural Marketing and Prices. Prerequisites: 3313 or 3413, 3603 or FIN 3113; 3303 or MKTG 3213; 4413 or LSB 3213; ECON 3023 or 3113. Applications of modern decision theory and the mechanics of trading. Fundamentals and technical aspects of commodity prices. The application of concepts and principles of economic theory and economic instruments of national food and agricultural trade.

Agricultural Economics Seminar. Prerequisite: senior standing in agricultural economics. Contemporary problems in agricultural economics; career exploration; agriculture in the economics of the nation and the world. Individual seminar reports and group discussion of reports.


Advanced Agricultural Finance. Prerequisite: 3603. Financial structure of agriculture, firm financial planning and management, financial intermediation in agriculture and agricultural finance in developing countries.

Economics of Agriculture and Food Policy. Prerequisites: 4703 and 5103. Application of welfare criteria and economic analysis to agricultural, food and rural development problems and policies.

Rural Regional Analysis. Prerequisite: 5103. Concepts of market and nonmarket based rural welfare; theories of regional growth as applied to rural areas; methods of regional analysis, including computable general equilibrium; analysis of policies and programs for improving welfare of rural population groups.

Rural Development Planning. Economics of market based planning for developing and developed countries; methods of incentive planning with emphasis on agricultural and rural project analysis; methods of agricultural and rural sector incentive planning with emphasis on general equilibrium results.

International Agricultural Policy and Development. Review and evaluation of agricultural trade and development policies emphasized in developing countries. Objectives, constraints and instruments of national food and agricultural trade policy in an interdependent world. Efficiency, stability, distribution, equity and market structure in commodity trade.

Advanced Studies. 1-6 credits, maximum 6. Open to graduate students with consent of instructor only. Investigation in designated areas of agricultural economics.

Research Problems. 1-15 credits, maximum 15. Open to graduate students. Independent study to solve problems in agricultural economics. Thesis or Report in Agricultural Economics.

Research Problems. 1-15 credits, maximum 15. Open to graduate students. Independent study to solve problems in agricultural economics. Thesis or Report in Agricultural Economics.

Teaching Practicum in Agricultural Economics. Lab 4. Prerequisites: two semesters of graduate study in agricultural economics. Phi losophy of resident and nonresident teaching, general tasks performed, review, evaluation and lecture organization, preparation and presentation.
Agricultural Education (AGED)

2303 Personal Leadership Skills in Agriculture. Self-awareness and understanding of behavior preferences. Recognition and development of opportunities for self-improvement. Personal values and use of those values to guide goals and decisions. Effective use of interpersonal skills to improve quality of relationships and service to others. Awareness of and the ability to present information about issues related to agriculture. Improvement of personal effectiveness.

3010 Laboratory and Clinical Experiences in Agricultural Education. Prerequisites: 5103, 5113. General presentation of nonlinear optimization theory and methods followed by applications of nonlinear programming. Use of GAMS/MINOS optimization software package.

4000 Student Teaching in Agricultural Education. 10 credits. Lab 30. Prerequisites: 3203, junior standing in the College of Agriculture, full admission to the University Teacher Education Program and concurrent enrollment in 4103. Full-time directed experience in an approved agricultural education department. Applications of methods and skills in agricultural education as related to selecting, adapting, utilizing, evaluating, and integrating classroom and experiences to meet educational goals and facilitate learning for individual students. Roles, responsibilities, interactions, of school personnel and parents. Study of professional education groups and organization and operation of school systems. Graded on a pass-fail basis.

4103 Laboratory Instruction in Agricultural Education. Prerequisites: 3103, 3203; concurrent enrollment in 4103 and 4200. Methods of teaching agricultural education in a laboratory setting. A study of laboratory safety instruction, methods of teaching, and application of technical agricultural skills to the secondary program.

5123 Adult Programs in Agricultural and Extension Education. Determining adult needs, priorities, participation in educational activities and adoption of new ideas and practices. Designing, programming, conducting, and evaluating adult education programs in agricultural and extension education.
500* Directing Programs of Supervised Experience. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Determining the supervised training needs and opportunities of individual students. Planning for supervision of agricultural education training programs and 4-H club projects. Analysis of training opportunities in production agriculture, agricultural businesses and individual career development.

575* Leadership in Agriculture. Lab 2. Concepts, principles and philosophies of leadership applied to agricultural contexts. Importance of traits, perceptions and behaviors to success of agricultural professionals in leadership roles. Dimensions and style of leadership for varying situations.

582* Advanced Methods of Teaching Agriculture. Advanced concepts and methods relevant for both formal and informal presentations. Effects methods may have on individuals involved in the learning experience. Demonstrations of proficiency in use of various advanced methodologies, technologies and concepts.

586* Methods of Technological Change. Processes by which professional change agents influence the introduction, adoption, and diffusion of technological change. Applicable to persons who work closely with people in formal and non-formal educational settings.

590* Graduate Internship in Agriculture. 1-6 credits, maximum 6. Prerequisite: admission to Master of Agriculture program; consent of graduate coordinator. Supervised internship in agricultural education, government agency, industry, Cooperative Extension, or not-for-profit organizations.

594* Styles of Leadership for Agricultural Education. 1-3 credits, maximum 8. Study of what leadership is and how current leadership styles have an impact on the success of present day agricultural organizations. Utilization of extensive bank of videotapes of current leaders as reference base for study.

598* Research Design in Occupational Education. 1-3 credits, maximum 6. Research tools as aids in decision making. Literature, logic, survey techniques, research design, statistics and the computer are emphasized. Studies in vocational and technical education are reviewed and proposals for graduate research papers prepared.

599* Problems in Agricultural and Extension Education. 1-3 credits, maximum 8. Securing and analyzing data related to special problems or investigation in designated areas of agricultural education.

600* Research in Agricultural Education. 1-16 credits, maximum 16. Prerequisite: approval of major advisor. Open to students pursuing graduate study beyond the requirements for a master’s degree. Independent research and thesis under the direction and supervision of a major professor.

610* Developments in Agriculture and Extension Education. 1-3 credits, maximum 6. Developing trends in agricultural and extension education. Pending and anticipated organizational and structural changes and changing emphases in goals and objectives. Functional relationships with other agencies.

6103 History and Philosophical Foundations of Agricultural and Extension Education. Prerequisite: graduate standing. History and philosophical foundations of agricultural and extension education. Philosophy and its role in life, rise of education in America, philosophical foundations of education in America. Legislation having an impact on agricultural and extension education, education in agriculture, and current issues in agricultural extension education.

6120 Teaching Agriculture in Higher Education. 1-3 credits, maximum 6. The teaching-learning matrix functioning in both undergraduate and advanced study in the field of agriculture. Discriminate review and assessment of recently developed instructional methods and trends.

6200 County Extension Program Development. 1-3 credits, maximum 6. A systematic study and use of methods of developing county extension programs. giving attention to sources of essential basic information, determination of problems and needs of people, functions of lay people and the various groups of extension workers. Uses of committees, step-by-step procedures, coordinated county and state plans and characteristics of effective programs.

6223 Educational Program Planning and Evaluation. Prerequisite: graduate standing. Planning and development of educational programs including needs assessment, objectives, development and content and materials selection. Evaluation of instructional extension and other educational programs; formative for program improvement and summative for outcomes accountability.

1124 Introduction to the Animal Sciences. Lab 2. Species adaptability, product standards and requirements, areas and types of production, processing and distribution of products, includes meat animals, dairy and poultry.

1133 Fundamentals of Food Science. Food industry from producer to consumer and the current U.S. and world food situations.

1223 Exploring the Science of Animal Agriculture. Lab 2. An introductory course describing the principles, methods, applications and value of biological research with farm animals. Course also offered for honors credit.


3012 Beef Production. Lab 2. Prerequisites: 1124 and 2123. Modern production and management practices for beef cattle operations. No credit for animal science students with credit in 4612, 4621, 4631 or 4641.

3021 Sheep Production. Lab 2. Prerequisites: 1124 and 2123. Modern production and management practices for sheep operations. No credit for animal science students with credit in 4542.

3031 Swine Production. Lab 2. Prerequisites: 1124 and 2123. Modern production and management practices for swine operations. No credit for animal science students with credit in 4643.
Meat Technology. Lab 3. The basic characteristics of meat and meat products as they relate to quality. Product identification, economy, nutritious value, preservation and utilization. No credit for students with credit in ANSI 2253 or 3333.

3101 Undergraduate Seminar. Prerequisites: 60 credit hours and animal science major status. An in-depth consideration of the various areas of specialization in the field of animal science and their associated career opportunities and obligations.

3113 Quality Control. Lab 2. Prerequisites: organic chemistry and MICRO 2124 or equivalent. Application of the principles of quality control in food processing operations to maintain the desired level of quality.

3154 Food Microbiology. Lab 2. Prerequisites: MICRO 2124 and organic chemistry. Relationship of microorganisms to food manufacture and distribution. Growth and death of both beneficial and harmful microorganisms. Focus on control and prevention of food poisoning and to various aspects of primary food production. Same course as MICRO 3154.

3182 Meat Grading and Selection. Lab 4. Prerequisites: 2253. Classifying and grading carcasses and wholesale cuts of beef, pork and lamb; factors influencing quality and value.

3210 Animal and Product Evaluation. 1-2 credits, maximum 4. Prerequisite: consent of instructor. A project in evaluating slaughter and breeding animals, and grading and evaluating meat, poultry and dairy products.


3270 Food Sanitation Laboratory. Lab 2. Prerequisites: 3302 or concurrent enrollment, and MICRO 2124. Exercises to illustrate qualitative and quantitative methods of analysis in food preservation, food formulation and food processing, food spoilage and to various aspects of primary food production. Same course as MICRO 3302.

3292 Food Sanitation. Prerequisite: organic chemistry. Principles of sanitation in food processing, distribution, preparation and service. Emphasis on control of food spoilage and food-borne illnesses.

3330 Meat Science. Lab 3. Prerequisites: 2253, CHEM 1215 or equivalent. Anatomical and basic chemical and physical characteristics of meat animals studied. The application of scientific principles to the processing and economical utilization of meat animals, as well as in the manufacture of meat products, emphasized in the laboratory.

3373 Food Chemistry. Lab 2. Prerequisite: 3543 or organic chemistry. Basic composition, structure and properties of foods and the chemical changes or interactions that occur during processing and handling.

3422 Horse Management and Production. Nutrition, reproduction, genetics and physical conformation of horses. Current management concepts as they apply to the health and well being of horses.

3432 (N) Animal Genetics. Prerequisite: introductory biology. The basic principles of heredity including: kinds of gene action, random segregation, independent assortment, physical and chemical basis of heredity, mutations, sex linkage, chromosome mapping, multiple alleles and chromosomal abnormalities. Also a brief introduction to quantitative inheritance and population genetics.

3433 Animal Breeding. Lab 2. Prerequisite: 3423. The application of genetic principles to live stock improvement; study of the genetic basis of selection and systems of mating; and the development of breeding programs based on principles of population genetics.


3493 Marketing and Utilization of Milk. Lab 2. Prerequisites: 1124 and AGEC 1114. Marketing and utilization of milk, pricing, quality controls, procurement, processing and utilization, product distribution and factors affecting consumption.

3523 Pet and Companion Animal Management. Current concepts and management principles related to pet and companion animal species and their roles in society. Discussion of the husbandry of animal bond, service animals, kennel and cattery management, anatomy, internal and external parasites, toxins, restraint and handling, training, reproduction, nutrition, genetics and breeding.

3543 (N) Principles of Animal Nutrition. Prerequisite: CHEM 1215 or equivalent. Basic principles of animal nutrition including digestion, absorption and metabolism of the various food nutrients; characteristics of the nutrients; measures of body needs; ration formulation.

3603 Processing Dairy Foods. Lab 3. Prerequisites: MICRO 2124 and organic chemistry. Theory and practice in formulation and processing: butter and margarine, cottage cheese, blue and processed cheeses; evaporated and sweetened condensed milk; ice cream; ice milk and other frozen desserts.

3612 Rangeland and Pasture Utilization. Lab 2. Prerequisite: AGRON 3213 or 3913. Integration of livestock production with rangeland and pasture management practices.

3653 Applied Animal Nutrition. Lab 2. Prerequisite: 3543. Composition, characteristics and nutritive value of feeds and ration additives; quantitative and quantitative nutrient requirements of each of the classes of livestock; formulation of rations for each of the classes of livestock.

3753 Basic Nutrition for Pets. Nutrients, nutrient requirements, feeding practices, food sources and diet management for pets and companion animals as well as exotic animals and birds.

3763 Analysis of Food Products. Lab 2. Prerequisite: organic chemistry. Application of quantitative chemical and physical methods of analysis to the examination of foods.

3903 (I) Agricultural Animals of the World. The production and utilization of agricultural animals by human societies.

4023 Poultry Science. Lab 2. Prerequisites: 1124, and 2123 or 3543. The relationship of the biological concepts and functions of poultry to management practices, incubation procedures, and economic factors utilized by poultrymen in the intensive production of table and hatching eggs, broilers, turkeys and other poultry meat.

4333 Processed Meat. Lab 3. Prerequisites: 3033 or 3333. Meat and meat product composition. Techniques in the molding and forming of meat sausage formulation; curing; quality control; and cost analysis.

4423 Horse Science. Lab 2. Prerequisites: 3433, 3443 and 3653. Current concepts and production principles related to the horse industry including nutrition, reproduction, herd health, functional anatomy and implications, social behavior, and applying principles of psychology in horse management and training.


4553* Sheep Science. Lab 2. Prerequisites: 3433, 3443 and 3653. Breeding, feeding, management and marketing of commercial and purebred sheep.

4613* Cow-Calf and Purebred Beef Cattle Management. Lab 2. Prerequisites: 3433, 3443 and 3653. Application of scientific knowledge, management principles and research advances to modern commercial cow-calf and purebred beef cattle production.

4632* Stocker and Feedlot Cattle Management. Lab 2. Prerequisites: 3612, 3653. Application of scientific knowledge, management principles and research advances to modern stocker and feedlot cattle operations.

4643* Horse Science. Lab 2. Prerequisites: 3433, 3443 and 3653. Application of genetic, physiological, microbiological, nutritional and engineering principles to the efficient production of swine.

4712 Livestock Sales Management. Lab 2. Prerequisite: 3433. Advertising of purebred livestock; performance data and breeding values in the merchandising of purebred livestock; photography and ad copy layout; conduct of an actual livestock auction, including animal selection, advertising, catalog and animal preparation, clerking, receipt of payments, sales budgets and transfer of registration papers.

4803* Animal Growth and Performance. Prerequisite: an upper-division course in animal science. Physiological and endocrine factors affecting growth and performance of domestic animals.

4843 Applications of Biotechnology in Animal Science. Lab 3. Prerequisites: 3423 and BIOCH 3312. Utilization in the current biotechniques used in protein, hormone and molecular genetic research in food and animal science. Theory and applications of the various techniques.
Capstone for Animal Agriculture. Lab 2. Prerequisite: senior standing. Examination of the role of animal agriculture in society, the importance of research and current issues. Oral and written reports.

4900 Special Problems. 1-6 credits, maximum 6. Prerequisite: consent of instructor. A detailed study of an assigned problem by a student wishing additional information on a special topic.

4910 Animal or Food Industry Internship. 3-12 credits. maximum 12. Prerequisite: consent of instructor. Full-time internship at an approved production, processing or agribusiness unit or other agency serving animal agriculture. Maximum credit requires a six-month internship in addition to a report and final examination. Graded on a pass-fail basis.

4973 Rangeland Resources Planning. Lab 3. Prerequisite: 3612 and AGRON 4954. Inventory of ranch resources, survey and evaluation of ranch practices, and economic analysis. Development of a comprehensive ranch management plan. Managing rangeland and ranch resources in a social context. Written and oral reports. Field trips required. Same course as AGRON 4973.

5000 Research and Thesis. 1-6 credits, maximum 6. Independent research planned, conducted and reported in consultation with a major professor.

5010 Special Problems. 1-3 credits, maximum 6. Special problems in areas of animal science other than those covered by the individual graduate student as a part of his research and thesis program.

5110 Seminar. 1 credit, maximum 3. A critical review and study of the literature; written and oral reports and discussion on select subjects.

5113 Basic Reproductive Physiology. Prerequisite: ZOOL 3204. Female and male reproductive processes, the influences of environmental factors upon these processes and the application of reproductive physiology to animal production. Same course as VIDE 5413.

5120 Special Topics in Food Science. 1-4 credits, maximum 4. Prerequisites: graduate standing and/or consent of instructor. Advanced topics and new developments in food science especially with reference to foods of animal origin.

5213 Advances in Meat Science. Prerequisites: BIOC 4113 and ZOOL 3204 or equivalent. Development of muscle and its transformation to meat. Properties of meat and their influence on intramuscular fat, myofibrillar-bonding, pigment formation, texture and fiber characteristics.

5303 Advanced Animal Breeding. Prerequisites: 3433 or equivalent and STAT 4013. Basic concepts of population genetics as related to theoretical animal breeding including heritability, genetic correlations, selection methods, in-breeding and heterosis.

5733 Advanced Ruminant Nutrition. Lab 2. Prerequisite: 3653. Factors influencing nutrient requirements of ruminants for maintenance, growth, reproduction, and lactation, and their implications with regard to husbandry practices and nutritional management of livestock; application of current concepts of ruminant livestock nutrition; use of microcomputer programs in diet evaluation and formulation, beef gain simulation, and problem solving.

5742 Rumenology. Prerequisite: 3653 or equivalent. Physiology of development of the ruminant digestive tract; the nature of, and factors controlling, digestion and absorption from the tract to include the relative nature and roles of the rumen bacteria and protozoa.

5751 Rumenology Laboratory. Lab 3. Prerequisite: 5742 or concurrent enrollment. Demonstrations and practice of basic techniques used in nutritional and physiological research investigations with the ruminant animal including cannulations, passage measurements, microbiology and in vitro rumen fermentation.


5792 Vitamin and Mineral Nutrition. Prerequisite: BIOC 5753. Nutritional, biochemical and clinical aspects of protein metabolism as it relates to nutritional status.

5793 Advanced Nonruminant Nutrition. Prerequisite: 5303 or STAT 4013. An in-depth study of the nutritional, biochemical and clinical aspects of protein metabolism as it relates to nutritional status.

7353 Anthropology. Introduction to culture, various subdisciplines of cultural anthropology, anthropological concepts and capsule ethnographies of assorted ethnic groups.
Architecture (ARCH)

1111 Introduction to Architecture. Lab 2. An introduction to the School of Architecture and OSU resources and how to use them. Introduction to the professions of architecture and architectural engineering and the issues facing these professions in the next century. Introduction to the educational processes and objectives required for becoming a professional architect or architectural engineer.


2003 (H) Architecture and Society. Design, planning and building considered in their social and aesthetic contexts.

2024 Statics and Strength of Materials. Lab 2. Prerequisites: grade of "C" or better in PHYS 1114 or PHYS 2144 and MATH 2145. Resultants of force systems, static equilibrium of rigid bodies and statics of structures. Shear and bending moments, deformation and displacements in deformable bodies.

2100 Architectural Studies. 2-4 credits, maximum 4. Lab 6-12. Beginning studies in graphics and design in architecture.

2116 Architectural Design Studio II. Lab 16. Prerequisite: grade of "C" or better in 1216. Problems in architectural design.

2216 Architectural Design. Studio III. Lab 16. Prerequisite: grade of "C" or better in 2116. Problems in architectural design.

2263 Building Systems and Materials. Prerequisite: grade of "C" or better in 2116. Architectural, structural, environmental control systems and materials in architecture.

3073 (H) History and Theory of Greek and Roman Architecture. Prerequisite: 2003. History and theory of the ancient Greek and Roman periods of architecture.

3083 (H) History and Theory of Baroque Architecture. Prerequisite: 2003. History and theory of Baroque architecture in the western world in particular the later, baroque period.

3100 Special Topics in Architecture. 2-6 credits, maximum 12. Subjects to be selected by the faculty in architecture from advances in estate-of-the-art areas.

3116 Architectural Design Studio IV. Lab 16. Prerequisite: grade of "C" or better in 2216 and admission to third year. Problems in architectural design.

3134 Environmental Control: Thermal Systems and Life Safety. Prerequisite: MATH 1715 fundamentals of thermal comfort, energy concerns and mechanical systems for buildings as well as the basic principles of life safety.

3216 Architectural Design Studio V. Lab 16. Prerequisite: grade of "C" or better in 3116. Problems in architectural design.

3223 Structures: Timbers. Lab 2. Prerequisite: grade of "C" or better in 3223. Analysis and design of timber structures used in architecture.

3243 Structures: Analysis I. Prerequisite: grade of "C" or better in ENSC 2143. Structural theory for applications in architecture.

3253 Computer Applications in Architecture I. Prerequisite: concurrent enrollment in ARCH 3216. Introduction to 2-D and 3-D AUTOCAAD and plotting and their application in the design process.

3323 Structures: Steel I. Lab 2. Prerequisite: grade of "C" or better in 2113. Analysis and design of steel structures used in architecture.

3433 Environmental Control: Acoustics and Lighting. Prerequisite: MATH 1715 or 1717. A survey of architectural acoustics, electrical and lighting systems for buildings.

3453 Computer Applications in Architectural Engineering. Prerequisite: admission to the professional school or consent of instructor. Computer applications in architectural engineering introducing AUTOCAAD; computer programming; and the use of commercial analytical software.

4033 Advanced Architectural Acoustics Design. Prerequisite: 3433. The analysis and design of acoustical spaces, including open-plan offices, music facilities, studios, theaters, etc. The course includes a design project of the student's choice.

4073 (H) History and Theory of Early Modern Architecture. Prerequisite: 2003. History and theory of modern architecture in the western world from the Industrial Revolution to the early twentieth century.


4117 Architectural Design Studio VI. Lab 20. Prerequisite: grade of "C" or better in 3216. Problems in architectural design.

4123 Structures: Concrete I. Lab 2. Prerequisite: grade of "C" or better in 3223. Analysis and design applications in architectural problems using concrete structures.

4144 Structures: Steel II. Lab 2. Prerequisites: grades of "C" or better in 3923 and 3243. Design and analysis of multi-story steel frames, trusses, arches and other architectural structural components.


4193 Marketing Professional Services. Prerequisite: 3115. Business development aspects of design firm management, including: marketing plan development; marketing organization; strategies and tools; selling techniques and contracts negotiating.

4217 Architectural Design Studio VII. Lab 20. Prerequisite: grade of "C" or better in 4117. Problems in architectural design.

4243 Structures: Foundations for Buildings. Prerequisite: 4123 or concurrent enrollment. Interaction of frames and supports for structures used in architecture. Subsurface conditions and design of foundation systems and retaining walls for buildings.

4373 Field Study in Europe. I. Prerequisite: senior standing in architecture or consent of instructor. On-site analysis and study of European architecture, culture and urban design.

4443* Structures: Analysis II. Lab 2. Prerequisites: grades of "C" or better in 3243 and 3453. Mathematical formulation of architectural structural behavior. Matrix applications, finite element, finite differences, stability considerations and three-dimensional structural modeling.

5000* Special Problems. 1-6 credits, maximum 6. Lab 3-18. Prerequisite: consent of instructor and head of the School. Theory, research or design in related disciplines. Plan of study to be determined jointly by student and graduate faculty.

5023* Masonry Design and Analysis. Prerequisite: grade of "C" or better in 4123. Analysis and design of low-rise masonry structures and multi-story masonry shear walls including code requirements, analysis techniques, design of components and detailing of architectural engineering contract documents, conforming to the relevant codes.

5073* History and Theory of the Architecture of Frank Lloyd Wright and His Contemporaries. Prerequisite: 4073. A study of the architecture of Frank Lloyd Wright and his contemporaries in the late 19th and early 20th centuries.

5083* History and Theory of Japanese Architecture. Prerequisite: admission to the professional school or consent of instructor. Historical Japanese architecture from 200 BC to 1980; Shinto, Buddhist, Zen, Sukiyi, Zukuri, Minka and contemporary subjects.

5100* Special Topics. 3-6 credits, maximum 15. Subjects to be selected by the graduate faculty in architecture to cover state-of-the-art advancements.

5119* Architectural Design and Development. Lab 24. Prerequisites: for architecture majors: grade of "C" or better in 3134, 3433, 4123, 4217; for architectural engineering majors: grade of "C" or better in 3116, 3134, 3433, 4123. Design and detailed development of a major architectural project integrating all aspects of architecture and related disciplines in a professional manner and milieu.


5193* Management of Architectural Practice. Prerequisite: fifth-year standing in architecture or architectural engineering or consent of instructor. Principles of management as applied to the private practice of architecture and architectural engineering.

5216* Architectural Design Studio: Competitions. Lab 18. Prerequisite: grade of "C" or better in 5119 or consent of instructor. Problems in architectural design through national and international student design competitions.

5237* Advanced Architectural Lighting Design. Prerequisite: 3433. Lighting applications in contemporary architectural design, including offices, schools, churches and health care facilities. Applications of the principles learned to a design of the student's choice.

5243* Structures: Special Loadings. Prerequisites: MATH 3013 and grade of "C" or better in 4443 and ENSC 2123. Mathematical formulations and modeling in architectural structures. Human response to vibrations. Seismic design in building. Design for extreme winds on buildings. Approximate methods for preliminary design of architectural structures.

5244* Structures: Concrete II. Lab 2. Prerequisite: grade of "C" or better in 4123 and 4144. Design and analysis of multi-story reinforced concrete frames and prestressed and post-stressed concrete structural components used in architecture applications.

5256* Architectural Project Management. Prerequisite: fifth-year standing in architecture or consent of instructor. Principles of management as applied to architectural and architectural engineering projects.

5373* Field Study in Europe II. Prerequisite: senior standing in architecture or consent of instructor. On-site analysis and study of European architecture, culture and urban design.

6000* Special Problems. 1-15 credits, maximum 15. Lab 3-18. Prerequisite: consent of instructor and head of School. Theory, research or design investigation in specific areas of study in the field of architecture and its related disciplines. Plan of study determined jointly by student and graduate faculty.

6053* Computer Applications in Architecture. Lab 3. Prerequisite: MECDT 4013 or equivalent or consent of instructor. State-of-the-art applications of computers to the practice of architectural and architectural engineering.

6073* History and Theory of Non-Western Architecture. Prerequisite: graduate standing or consent of instructor. Architecture in the non-Western and pre-Columbian world.

6083* History and Theory of Contemporary Architecture. Prerequisite: graduate standing or consent of instructor. American architecture beginning in the 16th century through the 20th century.

6100* Special Topics. 3-6 credits, maximum 15. Subjects selected by the graduate faculty in architecture to cover state-of-the-art advances.

6113* Creative Component Research. Prerequisite: admission to graduate program. Data gathering, analysis and program formulation related to creative component.

6117* Graduate Design Studio I. Lab 20. Prerequisite: admission to graduate program. Problems in architectural design.

6183* Architecture Seminar I. Prerequisite: admission to graduate program or consent of instructor. Architectural criticism.

6193* Financial Management for Architects and Engineers. Prerequisite: 3116. Financial aspects of design firm management, including fundamentals of finance, profit planning and control, cash management and analysis of financial statements.

6206* Creative Component in Architectural Engineering. Lab 18. A design project based on a program previously developed by the student, to include a written report and supporting documents when appropriate. Must be approved by the project adviser and completed in the final semester of the graduate program.

6207* Creative Component in Architecture. Lab 20. Prerequisite: 6117. A design project based on a program previously developed by the student, to include a written report and supporting documents when appropriate. Must be approved by the project adviser and completed in the final semester of the graduate program.

6214* Graduate Design Studio. Lab 12. Prerequisite: independent projects or competitions. May be combined with 6206 with approval of adviser.

6244* Structures: Analysis III. Prerequisite: grade of "C" or better in 4443. Analysis techniques for architectural structures including stability, space frames, computer applications, guyed towers and project research.

6283* Architecture Seminar II. Seminar for graduate students only. Architectural criticism.

6343* Structures: Steel III. Prerequisite: grade of "C" or better in 4144. Plastic analysis and design of structural steel frames utilizing load and resistance factor design.

6543* Structures: Concrete III. Prerequisite: grade of "C" or better in 5244. Design of prestressed concrete structures, including pre- and post-tensioning.

Art (ART)

1103 Drawing I. Lab 6. A freehand drawing experience designed to build basic skills and awareness of visual relationships. A sequence of problems dealing with position, shape, volume, value, line, gesture, texture and perspective. A variety of media explored.

1113 Drawing II. Lab 6. Prerequisite: 1103. Objective and subjective approaches to visual problem solving in a variety of black and white and color media. The analysis and manipulation of form, light, space, volume, and the formal aspects of perspective.

1203 Color and Design. Lab 6. Introduction to visual problem-solving. Organization of the two-dimensional plane; line, shape, value, texture, and color theory dealing with its visual and psychological aspects.

1803 (H) Introduction to Art. An introduction to the history and interpretation of art. Visual, emotional and intellectual aspects of art in painting, sculpture, printmaking and architecture.

2113 Life Drawing. Lab 6. Prerequisite: 1113. Introduction to life drawing with emphasis on preliminary linear construction and structural aspects of the figure, including the study of general body proportions, rapid visualization and figure-ground relationships.

2203 Three-Dimensional Design. Lab 6. Prerequisite: 1103. Exploration of three-dimensional form and space stressing organization of design elements, development of concepts and manipulation of materials. Layout alternatives, near space, modular ordering, mass, volume and color through projects of a conceptual and applied nature.

2213 Color Theory. Lab 6. Prerequisite: 1103. Intensive, structured investigation into the nature and properties of color. Hue, value, chroma, and additive color mixing theory as well as the expressive qualities, symbolic potential, and psychological impact of pigment color.

2403 Illustration I. Lab 6. Prerequisite: 2113. Introduction to historic and contemporary illustration and consideration of a wide range of illustrative styles. Required experiments with medi and consideration of alternate ways of illustrating a message through conceptual and compositional variations.

2413 Typography I. Lab 6. Prerequisite: 1103, 1113, 1803. An investigation of letter form and their characteristics and a study of spacing, legibility, type spacing, typographic style, typographic specification and copy fitting. Preliminary introduction to typography as a communication medium. An understanding of typographic terminology and measuring systems while developing hand skills and introducing computer technology.

2423 Graphic Design I. Lab 6. Prerequisite: 1113. Exploration of basic design principles-line, form and color, as visual communication. Problem solving, generation of ideas, development of concepts and the integration of word and image. Technical and presentation skills.

2603 Art History Survey I. A study of the arts, artists, and their cultures from prehistoric time through the Early Renaissance.

2613 Art History Survey II. A study of the arts, artists, and their cultures from the Early Renaissance to the present.

2623 Research Methods for Art History. Prerequisite: 1803. An introduction to research methodology and writing art history. Require of art history majors.

3110 Life Drawing Studio. 3 credits, maximum 9. Lab 6. Prerequisite: 2113 or consent of instructor. The development of formal and expressive aspects of drawing by direct observation of the figure and its environment. Emphasis on medi experimentation, aesthetic considerations, personal concepts, and anatomy.
3123 Oil Painting. Lab 6. Prerequisites: 1113, 2203, or consent of instructor. The development of skills in oil painting stressing form and content, visual perception and individual expression. Technical instruction applicable to individual problems and needs.

3133 Watercolor Painting. Lab 6. Prerequisites: 1103, 2203, or consent of instructor. The development of skills in watercolor painting stressing form and content, visual perception and individual expression. Structured assignments in color mixing, wet-on-dry techniques, wet-into-wet techniques, brush handling, paper supports and surface manipulation.


3343 Jewelry and Metals. Lab 6. Prerequisites: 1113, 2203, or consent of instructor. Fabrication and forming techniques for non-ferrous metals. Cold joinery, silver soldering, surface treatment and elementary stone setting. Applications toward either wearable or small scale sculptural format.

3403 Illustration II. Lab 6. Prerequisite: 2403, 3123 or 3133, or consent of instructor. Exploration of illustrative solutions to maximize visual interest via varied viewpoints, concepts and altered reality. Projects involving different career areas within the field of illustration. Requirements and advantages of each area.

3413 Typography II. Lab 6. Prerequisite: 3423. Exploration of typographic communication through a variety of problems. Type as the visual solution with emphasis on its functional, decorative and creative applications. Solution of more complex typographic problems, dealing with a larger information via the development of grid systems.

3423 Graphic Design II. Lab 6. Prerequisites: 2413, 2423. Use of computer and traditional methods to enhance production skills and solution of design projects from concept to the comprehensive. Evaluation and design of symbols and logos and their various applications, leading to an understanding of system design. Introduction to graphic design production and the preparation of art for reproduction.

3433 Applied Graphic Design. Lab 6. Prerequisite: 3423. Design problems with special attention to signage, exhibition design, packaging, display, and point of purchase. Use of model-building tools and study of structure and form to introduce the student to problem-solving and finishing techniques. Development of concepts into models.

3503 Ceramics. Lab 6. Prerequisites: 1113, 2203 or Consent of instructor. Methods of clay preparation, hand-building, wheel forming methods, methods of decoration and glazing, firing and kiln construction. Involvement with ceramic materials and processes.

3603 (H) History of Classical Art. Stylistic, philosophical and formal qualities of art in the Classical world. The creation of the Greek ideal and its dissemination in the Roman world through architecture, sculpture, and painting.

3613 (H) History of Medieval Art. Architecture, sculpture, painting and mosaic in the Christian world, c. 400-1400. Early Christian and Byzantine periods in Southern Europe and concurrent developments in the North, including Carolingian, Romanesque and Gothic.

3623 (H) History of Italian Renaissance Art. Architecture, sculpture and painting in Italy. c.1300-1580. Major artists in their local contexts (e.g. Leonardo in Milan, Michelangelo in Florence, and Titian in Venice).

3633 (H) History of Baroque Art. Art in 17th century Europe. Architecture, sculpture and painting of the Catholic Reformation (e.g. Caravaggio and Bernini in Italy, Velasquez in Spain, Rubens in Flanders), concluding with painting in non-sectarian, Protestant Netherlands (Rembrandt and Vermeer).

3643 History of Graphic Design. Evolution of graphic communication from prehistoric times to the present. Investigation of the origins of printing and typography in Europe leading to the design of the printed page, the impact of industrial technology upon visual communication and the study of the growth and development of modern graphic design.

3653 (H) History of 19th Century Art. Art of 19th century Europe-ideals, conflicts and triumphs, beginning with the French Revolution and ending in 1900.

3663 (H) History of American Art. Visual arts in America from the Colonial period to the present. Major styles, ideas and uses of material in architecture, painting, sculpture and design.

3673 (H) History of Northern Renaissance Art. I in Northern Europe, c. 1200-1550. Panel painting in the Netherlands (e.g. Van Eyck, Bosch), and book illustration in Germany (Durer).


3693 (H) Survey of Asian Art. Arts of India, China, Japan and related countries in their historical and cultural settings. Traditions of painting, sculpture and architecture from their beginnings to the modern period.

3700 Printmaking: Relief. 3 credits, maximum 9. Lab 6. Prerequisites: 1113 or consent of instructor. Understanding and control of carving, processing and creating prints from wood, linoleum and plastic. Development of images utilizing both traditional and contemporary approaches to relief printmaking.

3720 Printmaking: Intaglio. 3 credits, maximum 9. Lab 6. Prerequisites: 1113 or consent of instructor. Understanding and control of intaglio techniques; preparation, processing, and etching of images from metal plates. Development of concepts and images through traditional and contemporary approaches to the intaglio process.

3730 Printmaking: Lithography. 3 credits, maximum 9. Lab 6. Prerequisites: 1113 or consent of instructor. Understanding and control of graphic design production and the prepa-
expressionism, pop art, minimalism, photorealism

from Pre-dynastic to the beginning of the Chris-

and individual expressive concepts as these
of ceramic arts: glazes, clay bodies, methods

or project under the direction of a faculty mem-
research program ending with an honors thesis

Prerequisites: de-

Visual arts in their historical, social and cultural

context and in comparison to other disciplines

sual arts in their historical, social and cultural

sional Programs and the student's college. Par-

Prerequisites: consent of the Office of Interna-

Study Abroad. 1-18 credits maximum 36. Prere-

mam, minimalism, photorealism and conceptual art. Theories and intellectual bases of each movement as well as major critical responses.

(H)History of Prints and Printmaking. A survey of graphic art in Europe and the United States, c. 1450-1950. Woodcut, intaglio and lithography by major masters (e.g. DOrer, Rembrandt, Goya, Picasso). Print as a document of social history in the West.

(H)History of Indian Art. The history and culture of South Asia (India and Pakistan) are explored through its arts-architecture, sculpture, painting and design.

(H)History of Chinese Art. The arts of China in their historical, cultural, religious and social context. Painting, sculpture, architecture, porcelain, furniture and decorative arts.

(H)History of Japanese Art. The arts of Japan from the beginning to the modern period in their historical and cultural setting. Cross-cultural contacts with China and the West. Architecture, sculpture, painting, landscape architecture, prints and decorative arts.

Special Studies in Art. 1-3 credits, maximum 3. Prerequisites: junior standing and consent of instructor. Courses in media exploration, special subjects and current issues. Offered on campus or through extension workshops.

Directed Study in Art. 1-3 credits, maximum 9. Lab 1-6. Prerequisites: junior standing and written permission of department head. Self-designed special topics in studio art or graphic design. By contract only.

Directed Study in Art History. 1-3 credits, maximum 9. Lab 1-6. Prerequisites: junior standing and written consent of department head. Prerequisites: self-designed special topics in art history. By contract only.

Art in Context. Prerequisites: senior standing. Capstone course studying the role of visual arts in their historical, social and cultural context and in comparison to other disciplines of creative or performing arts, humanities and science.

Senior Honors Project. Prerequisites: departmental invitation, senior standing. Honors Program participation. A guided reading and research program ending with an honors thesis or project under the direction of a faculty member. Required for graduation with departmental honors in art.

Graduate Studies in Art. 1-6 credits, maximum 12. Prerequisite: B.A., B.F.A., or 15 upper-division hours in a discipline; consent of instructor. Projects in art with emphasis on portfolio preparation.

Graduate Studies in Art History. 1-6 credits, maximum 12. Prerequisite: B.A., B.F.A., or 15 upper-division hours in art history; consent of instructor. Advanced research in art history.

Arts Management (AM)

Principles of Arts Management. Basic principles of managing performing arts and art museum organizations. Relationships of arts organizations to the community, budgeting, structure, income sources.

Arts Marketing and Audience Development. An examination of marketing arts events. Public relations and promotions, subscription sales, event sales and box office management, and developing new audiences.

Fundraising and the Arts. Basic charitable fundraising strategies including development of ongoing donor programs, fundraising events, planned giving, corporate and business sponsorships and grantwriting.

Law and the Arts. Legal and contractual issues specific to fine and performing arts organizations. Establishment and maintenance of 501c not-for-profit organizations, unions and contracts, ADA compliance and OSHA.

Arts Management Creative Project. 1-3 credits, maximum 6. Creative project.

Arts Management Internship. 1 credit. Fifteen week management internship with professional arts organization. Must repeat four times. A minimum of one internship taken with a gallery or museum and one internship with a performing arts organization.

Arts and Sciences (A&S)

An Introduction to the Arts. 1-3 credits, maximum 36. Prerequisites: participation in the Oklahoma Summer Arts Institute and consent of department head. Workshop experience in creative writing, dramatic performance, studio arts or music performance. Enrollment restricted to Oklahoma Summer Arts Institute participants.

Freshman Orientation. Orientation for freshmen. Study techniques, evaluation of one's abilities and the making of proper educational and vocational choices.

Honors Freshman Orientation. Prerequisite: Honors Program participation. Orientation for freshmen to Arts and Sciences Honors program, introduction to University academic expectations, techniques for achieving academic success, and substantive introduction to material in selected academic disciplines. No credit for students with credit in A&S 1111.

Freshman Orientation. Orientation for freshmen. Study techniques, evaluation of one's abilities and the making of proper educational and vocational choices.

Honors Freshman Orientation. Prerequisite: Honors Program participation. Orientation for freshmen to Arts and Sciences Honors program, introduction to University academic expectations, techniques for achieving academic success, and substantive introduction to material in selected academic disciplines. No credit for students with credit in A&S 1111.

Special Topics. 1-3 credits, maximum 6. Selected interdisciplinary topics presented in lecture or seminar format.

Arts and Sciences Upper-Division Honors Independent Study. 1-3 credit, maximum 3. Prerequisite: participation in the Arts and Sciences Honors Program. Independent study by individual contract only. Before enrollment, student must have contract approved by the sponsoring professor and the director of Arts and Sciences Honors program.

Honors Senior Thesis or Creative Activity. 1-3 credits, maximum 6. Undergraduate honors thesis, research and report, or other creative activity undertaken to satisfy the requirements for Departmental Honors in the College of Arts and Sciences. Restricted to Arts and Sciences Honors students.

Developmental Workshop in Selected Academic Fields. 1-3 credits, maximum 9. Arts and Sciences discipline-based material. Study groups, lectures and seminars.


Astronomy (ASTR)

(N)The Solar System. Recent discoveries about the sun, planets, moons, asteroids, meteors, small comets; formation and future of the solar system; interplanetary travel, coloni-

(N)Stars, Galaxies and the Universe. Recent discoveries about the structure and life cycling of stars, galaxies and the universe; the search for extraterrestrial intelligence; interstellar travel, black holes, wormholes, and tachy-

1014

1024

210 Art

210 Art
Aviation Education (AVED)

1113 Theory of Flight. A ground school course covering Federal Aviation Regulations, theory of flight, power plant operation, service of aircraft, principles of navigation and meteorology. Fulfills the ground school training needed for a Private Pilot Certificate.

1222 Primary Flight Laboratory. Lab 4. Meets the flight requirements for the FAA Private Pilot Certificate. Flight instruction conducted under FAR Part 61. Special fee required. Graded on a pass-fail basis.


1503 Operations of Manned Space Flight. Significant historical concepts and events leading to current status of space exploration.

2113 History of Aviation. History of aviation from its early developments to the present. Historic events and the role of government as they relate to the evolution of the regulatory infrastructure of the aviation industry.

2122 Commercial Flight Laboratory I. Lab 4. Prerequisite: 1222. First of three flight laboratories required for FAA commercial flight certificate. Flight instruction conducted under FAR Part 141. Special fee required.

2132 Commercial Flight Laboratory II. Lab 4. Prerequisite: 2122. Dual instrument flight instruction to meet requirements for FAA instrument rating. Flight instruction conducted under FAR Part 141. Special fee required.

2142 Commercial Flight Laboratory III. Lab 4. Prerequisite: 2132. Final flight lab to meet requirements for the FAA commercial pilot certificate. Flight instruction conducted under FAR Part 141. Special fee required.


2203 Impact of Aviation and Space Exploration on Society. Survey of significant events and ideas and their economic and social impact on society.

2213 Theory of Instrument Flight. Prerequisite: 2113. Principles of the flight control system and procedures, the elements of forecasting weather trends. Preparation for FAA instrument computer-based knowledge exam.


2633 Air Traffic Control and the National Airspace System. Prerequisite: 1113. In-depth knowledge in the subject of air traffic control and the national airspace system facilities, equipment and associated development. Enroute and terminal control areas, computerization and automation, flight service systems, ground-to-air systems and integrated telecommunications networks.


3243 Human Factors in Aviation. Prerequisite: PSYC 1113. The study of people interacting with the aviation environment. Individual and group performance, equipment design, physical environment, and procedure development.

3333 Advanced Aircraft Systems. Prerequisite: 2313. Study of complex aircraft systems. Electronic flight instruments, inertial navigation, and aircraft monitoring systems.

3341 Multi-engine Flight Laboratory. Lab 2. Prerequisites: Private Pilot Certificate and FAA Third class Medical Certificate. Dual flight instruction to meet requirements for the FAA multi-engine rating. Flight instruction conducted under FAR Part 141. Special fee required.

3441 Aerobatic Flight. Lab 2. A minimum of ten hours dual flight training. Basic, intermediate and advanced aerobatic flight maneuvers including sequencing and dimensional box spacing. Special fee required.

3443* Aviation Law. Prerequisite: LSB 3213. Insight pertinent to federal governing bodies in aviation and the present structure of aviation law. Practices and pitfalls in aviation activities and a basic legal research capability.

3513 Aviation Management. Prerequisite: 50 credit hours. Managing the major elements of the aviation industry including aircraft manufacturing and air transportation system.

3523 Airport Planning and Management. Prerequisite: 50 credit hours. Overview of the major functions of airport management including master planning. Study of the socio-economic effects of airports on the communities they serve.

3533 Aircraft Turbine Engine Operation. Principles of physics and gas laws pertaining to turbine powered aircraft operation. Turbine propulsion systems theories with emphasis on safe and efficient operation of turbine powered aircraft.

3553* General Aviation Management. Prerequisite: 50 credit hours. Functions of management in general aviation and airport operations including information systems, maintenance, regulatory impact, physical facilities, flight operations, political forces and administration.

3563 Aviation Marketing. Prerequisite: 50 credit hours. Marketing aviation products for the major elements of the aviation industry.

3573* Aviation Finance. Prerequisite: 50 credit hours. Financing the major elements of the aviation industry including general aviation, aircraft manufacturing and airports.

3663* Air Transportation: The Industry. Prerequisite: 50 credit hours. Broad understanding of the air transportation industry and an in-depth knowledge of the organizational, managerial functions and operational aspects of today’s major, national and regional air carriers. Historical perspectives, regulators and associations, economic characteristics, labor relations and marketing of modern air carriers.

4100* Specialized Studies in Aviation. 1-3 credits, maximum 6. Prerequisite: 55 credit hours. Independent studies, seminars, and training within selected areas of aviation.

4113* Aviation Safety. Prerequisite: 55 credit hours. Overview of flight safety including studies in human factors, weather, aircraft crashworthiness, accident investigation, and aviation safety programs. Students will be introduced to elements of aviation safety in ground and flight operations.


4200* Internship in Aviation. 1-12 credits, maximum 12. Prerequisite: 55 credit hours. Individually supervised internship in aviation career areas. Directed field experience related to the participant’s area of concentration.

4213* Current Trends and Issues in Aviation. Prerequisite: 3663. Analysis of current issues facing management in various segments of the aviation industry. Specific areas include issues affecting the airline industry and general aviation. Application of previously learned concepts to case studies of practical problems to develop deeper understanding of the subject.

4231 Flight Instructor: Airplane Flight Laboratory. Lab 2. Prerequisites: 2142, 4133. Dual flight instruction to meet the requirements for the FAA flight instructor: airplane certificate. Flight instruction conducted under FAR Part 141. Special fee required.

4303* Aviation Weather. Prerequisite: GEOG 3033. Familiarization with weather products needed to enhance flight safety.

4331 Flight Instructor: Instrument Flight Laboratory. Lab 2. Prerequisite: 4231. Dual flight instruction to meet the requirements of adding an Instrument Flight Instructor rating to the flight instructor certificate. Flight instruction conducted under FAR Part 141. Special fee required.

4333* Advanced Aircraft Performance. Prerequisite: 50 hours. A study of advanced aircraft performance including appropriate physical laws, atmospheric properties and power plant technology.
Lab 2. Prerequisite: 4231. Dual flight laboratory. Ten hours in a dual flight control to improve effective crew management issues.

Crew Resource Management. Prerequisites: 2142, 3243. Decision making and communication to improve effective crew management. Special fee required.

Flight Instructor: Multi-engine Flight Laboratory. Lab 2. Prerequisite: 4231. Dual flight instruction to meet the requirement for adding a multi-engine flight instructor rating to the flight instructor certificate. Flight instruction conducted under FAR Part 141. Special fee required.

Basic Aircraft Accident Investigation. Prerequisite: 50 hours. A study of statutes, regulations and regulatory agency requirements that influence aircraft accident investigation.

Corporate Aviation Management. Prerequisites: 2142 and 3341. Study of management principles and practices of corporate aviation. Equipment acquisition, legal requirements, government regulations, aircraft maintenance management, and investment decision-making.

Air Transport Law. Study of the legal system as it relates to air transport law and governance of the air transportation industry.

Pilot Proficiency Flight. 1-2 credits, maximum 4. Lab 2. Required for students entering the aviation education program who possess all FAA certificates/ratings required for the aviation sciences degree.

Master's Report or Thesis. 1-3 credits, maximum 3. Master’s degree of instructor. Directed research and writing of a total of two credit hours if writing a report or three hours if writing a thesis.

Seminar in Aerospace Education. 1-3 credits. Prerequisite: consent of instructor. Individual research problems in aerospace education.

Guided Reading and Research. Prerequisite: consent of instructor. Guidance in reading and research required for completing the report for the M.S. in aviation and space science program.

Aviation Career Development. Aviation career development in private and public aviation organizations.

Aviation Safety Program Development. Prerequisite: 4113. A detailed examination of risk management and accident prevention in the aviation industry. Organization and operation of safety programs including OSHA requirements, performance measurements, cost analysis, and systems safety analysis.

Graduate Internship in Aviation and Space. 1-6 credits, maximum 6. Directed field experiences in aerospace education for master's students.

Aeromedical Factors. Prerequisite: 3243. The study of aeromedical factors that influence pilot performance. The study of life support equipment designed to increase aviation safety.

Aviation and Space Quality Issues. A study of the practices and research involved in implementing aviation and space quality issues.

Simulation in Aviation. Prerequisite: 3341. Preparation for the practical skills required for a career as a professional pilot. Skill areas comparable to those required for the FAA Airline Transport Pilot rating.

Airline Transport Pilot. Prerequisite: 3341. Designed for the professional pilot. Completion of the course assists in preparation for the FAA Airline Transport Pilot written examination.

Current Issues in Aerospace Education. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Current issues in aerospace education.

Earth Observation Systems. Study of earth orbiting systems that collect data on the earth’s water, land and atmosphere.

Space Science: Sun, Inner Planets and Asteroid Belt. A study of the sun, inner planets and asteroid belt.


Directed Readings in Aerospace Education. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Directed studies in aerospace education.

Practicum in Aerospace Education. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Directed observation and supervised clinical experiences in aerospace education.


Aviation Physiology. Prerequisite: 5203 or equivalent. The study of the complexities of pilot performance as it relates to human physiology, human factors and aviation safety.

Aviation and Space Safety Data Analysis. Practical application and research of aviation and space safety data bases.

Administration of Aviation Institutions. A study of the organization and administration of public and private aviation institutions. Study of the impact of economic and governmental system on these institutions.

Development of Air and Space Flight. Specific air and space missions with emphasis on contributions to humankind.

Certification of Airplanes. A study of the practices and research involved in the certification of airplanes.

Certification of Rotorcraft. A study of the practices and research involved in the certification of rotorcraft.

Aviation Executive Development. A study of the styles of aviation executives in private and public aviation organizations.

Applied Aviation and Space Research. Prerequisites: consent of instructor and approval of student’s advisory committee. Action research topics in aviation and space identified by the aerospace industry with emphasis upon publications in aviation and space refereed journals and trade publications.

Doctoral Internship in Aviation and Space. 1-6 credits, maximum 6. Directed field experiences in aerospace education for doctoral students.

Aviation Regulatory Law. A study of the practical application and research of the FAA regulatory process and associated case law.

Advanced Aircraft Accident Investigation. Prerequisite: 4943. Application and practice of the different statutes, regulations, and regulatory agency requirements that influence aircraft accident investigations.

Biochemistry (BIOC)

Chemistry and Applications of Biomolecules. Lab 3. Prerequisite: CHEM 1225. A descriptive survey of organic functional groups and biomolecules. Mode of formation and function of these molecules in microorganisms, plants and animals as they relate to biotechnology, environmental sciences and health related issues. A terminal course for students in applied biological science education. Not recommended for prepro-fessional students or students planning graduate study in biologica sciences.

Survey of Biochemistry. Prerequisite: CHEM 3015 or 3053. An introduction to the chemistry of living systems. Chemical properties of the constituents of living organisms. Modes of formation, reactions and function of these compounds in microorganisms, plants and animals.
4224* Physical Chemistry for Biologists. Prerequisites: CHEM 1515, MATH 2133, PHYS 1214. Consent of instructor. Classical and statistical thermodynamics with applications to pure systems, solutions and electrochemistry; transport; chemical and enzyme kinetics, quantum chemistry of structure and chemical bond; and spectroscopy - all with emphasis on biological applications.

4590* Special Problems. 1-6 credits, maximum 10. Training in independent work, study of relevant literature and experimental investigation of an assigned problem.

5000* Research. 1-6 credits, maximum 6. For M.S. thesis.

5753* Biochemical Principles. Prerequisite: CHEM 3153 or equivalent. Chemistry of cellular constituents; introduction to the chemical processes in living systems. The first in a series of courses for graduate students in biochemistry and related fields.

5824* Biochemical Laboratory Methods. Lab 6. Prerequisites: 4113 or 5753, or concurrent enrollment in either, and CHEM 2113 and 2122, or 3524. Lecture and laboratory course in basic biochemistry and molecular biology methods or separation and analysis of biological materials, including chromatography, electrophoresis, centrifugation, use of radioisotopes, molecular cloning, and DNA sequencing.

5835* Metabolism. Prerequisite: 5753 or 4113. Reaction sequences and cycles in the enzymatic transformations of fats, proteins and carbohydrates; energy transfer, biosynthesis and integration in the metabolic pathways.

5930* Advanced Biochemical Techniques. 1-4 credits, maximum 10. Prerequisites: 5753, 5824 or concurrent registration, and consent of instructor. Lecture and laboratory course in advanced research techniques, designed to supplement 5824. In subsequent semesters, individual research problems pursued in laboratories of department faculty for six weeks and one credit hour each.

6000* Research. 1-15 credits, maximum 60. For Ph.D dissertation.

6110* Seminar. 1-2 credits, maximum 2 for Ph.D candidates or 1 for M.S. candidates. Prerequisite: 5853. Graded on pass-fail basis.

5740* Physical Biochemistry. 1-2 credits, maximum 2. Prerequisites: one semester each of organic chemistry, calculus and physical chemistry. Two independent modules dealing with applications of physical chemistry and math to biological phenomena: 1) numerical analyses and selected spectroscopic methods, and 2) thermodynamics and transport properties. Modules may be taken together as two credits or individually for one credit.

6763* Nucleic Acids and Protein Synthesis. Prerequisite: 4113 or 5753. Structure and biological function of nucleic acid containing structures with emphasis on recombinant DNA methodology, information content, nucleic acid-protein interaction, regulation and rearangement.

6773* Protein Structure and Enzyme Function. Prerequisite: 4113 or 5753. Theory of and methods for studying the physical and chemical basis of protein structure and function; and the enzymatic catalysis, including kinetics, chemical modification and model studies. Examples from current literature.

6783* Biomembranes and Bioenergetics. Prerequisite: 5853 or consent of instructor. Components, organization and biosynthesis of phospholipid and photosynthetic membranes, emphasizing structure-function relationships. Mechanism of metabolites, protons and electrons transport. Energy conservation in bioenergetic apparatus such as mitochondria, chloroplasts or bacterial chromatophores.

6792* Plant Biochemistry. Prerequisite: 4113 or 5753. Biochemistry of processes and structures of special importance to plants, such as photosynthesis, cell walls, nitrogen fixation, secondary metabolites and storage proteins.

6820* Selected Topics in Biochemistry. 1-3 credits, maximum 15. Prerequisite: 5853. Recent developments in biochemistry. Subject matter varies from semester to semester; students should inquire at the department office before enrolling.

Biological Science (BIOL)

1114 (L,N) Introductory Biology. Lab 3. Introduction to the integration between structure and function among all levels of biological organization. Emphasis on the range of normal for the function among different groups. Evolution of systems and mechanisms which have allowed animals to survive and adapt to diverse habitats.


1604 (N) Animal Biology. Lab 2. Prerequisite: 1114. Morphology, physiology, ecology, embryological development of behavior, life histories and importance to man of representatives of major groups. Application of principles of evolution, genetics, physiology and ecology to understanding the integrated and interdependent nature of living systems through discussions emphasizing the process of science. Current issues and local research and observation in both lecture and lab. Recommended for non-science and science majors.

Biomedical Sciences (BIOM)

5013* Medical Biostatistics. Prerequisite: graduate standing. Fundamentals of biostatistics including descriptive and inferential statistical methods with applications to biomedical research, clinical epidemiology and clinical medicine.

5020* Biomedical Sciences Seminar. Prerequisite: graduate standing. Literature and research problems in biomedical sciences.

5117* Gross and Developmental Anatomy. Lab 3. Prerequisite: graduate standing in the biomedical sciences program. General and specific concepts of regional morphology through didactic presentations and laboratory dissections. Emphasis on the range of normal for the various organ systems and their interrelationships. Application of anatomical knowledge in clinical situations.

5124* Histology. Lab 4. Normal microscopic tissue architecture. Lecture and laboratory presentations for the histologic concepts of the basic tissues and organ systems. Basis for pathological and physiological principles.
Medical Microbiology and Immunology. Lab 2. Prerequisite: 5215. Similarities and differences among pathogenic microorganisms. Functions and interrelationships of these processes in human metabolism to provide a foundation for understanding the chemistry of disease states when discussed in the second-year program.

5415* General Pathology I. Prerequisite: graduate standing. The reaction of the body to diseases and the description and identification of basic disease processes in terms of morphologic, physiologic, and chemical reactions. Major processes such as cell injury, cell death, healing, neoplasmia, inflammation, and diseases of development and aging. Basic disease processes and ability to recognize and describe basic disease processes from gross and microscopic specimens.

5425* General Pathology II. Prerequisite: graduate standing. Continuation of General Pathology I.

5513* Pharmacology. Prerequisite: 5215, 5616. General principles of drug action, drugs acting on the autonomic nervous system, and drugs used in treating infectious diseases and cancer. The mode of action, pharmacogenetics, physiologic effects, therapeutic indications, and adverse reactions to these drugs.

5523* Pharmacology II. Prerequisite: 5513. Continuation of Pharmacology I.

5616* Medical Physiology. Prerequisite: 5215. The integration of structure and function of the human body with a functional analysis of the organ systems. Comprehension of the physiologic principles and control mechanisms that maintain homeostasis. Discussion of all systems of the body, and analysis of various interrelationships. The fundamental dynamic view of physiology upon which subsequent clinical learning is dependent. Problem-solving techniques utilized to develop and examine student understanding.


6010 Topics in Biomedical Sciences. Prerequisite: consent of instructor. Tutorials in areas of biomedical sciences not addressed in other courses.

6113* Human Embryology. Lab 2. Prerequisite: graduate standing. Formation of the fetus from conception through development of the organism with discussions of congenital malformations.

6124* Advanced Histology. Lab 4. Prerequisite: 5124. Histochemical techniques used in the identification of cells or tissues based on the localization of cell organelles or cell products using staining. An introduction to the structural and functional abnormalities at the tissue level that manifest as disease states in organ systems, with emphasis on a patho-physiologic approach to etiology and pathogenesis of disease.


6233* Enzyme Analysis. Lab 2. Prerequisite: 6214. Characteristics, separation, detection, assays, kinetics, mechanisms of catalysis, inhibition or activation, and clinical applications of enzyme analysis.

6243* Human Nutrition. Prerequisite: 5215. Role of vitamins and minerals in maintaining normal metabolism, role of nutrients in providing athletic and immune system function, and pathophysiology associated with nutrient deficits and nutrient excesses. Role of drugs in inducing cancer and increasing nutrient requirements.

6253* Biochemistry of Hormone Action. Prerequisite: 6233. Biochemical mechanisms behind peptide and steroid hormone action.

6313* Diagnostic Parasitology. Lab 2. Prerequisite: 5316. Animal parasites of humans with a focus on the laboratory identification of the medically important protozoan and helminthic diseases.

6323* Diagnostic Virology. Lab 4. Prerequisites: 5215, 5316. Viruses causing disease in humans with emphasis on the laboratory diagnosis, prevention, and treatment of viral diseases.

6333* Immunology. Prerequisites: 5215, 5316. The experimental basis of immunology and immunopathology.

6343* Microbial Physiology. Prerequisites: 5215, 5316. The chemical composition, growth and metabolism of prokaryotic organisms including regulation and control of metabolic pathways with emphasis on metabolism unique to microbes.

6413* Graduate General Pathology and Laboratory Medicine. Lab 2. Prerequisite: graduate standing. Laboratory experiences in the study of morphologic and functional abnormalities at the tissue level that manifest as disease states in organ systems, with emphasis on a patho-physiologic approach to etiology and pathogenesis of disease.
216 Botany

Plant Diversity. Lab 4. Prerequisite: BIOL 1404. Forms and life histories of selected plants with emphasis on some of the less familiar forms. The analysis of plants as a basis for understanding similarities in life histories; importance of each form to man and his environment. Field trips required.


5533* Plant Anatomy. Lab 3. Prerequisite: BIOL 1404. Structure of cells, tissues and organs of plants. Consideration of structure as related to ontogeny, phylogeny and function.

3460* Plant Physiology Laboratory. 1-2 credits, maximum 2. Lab 2-4. Prerequisite: 3463 or concurrent enrollment. Skills in techniques for experimental work with plants, experiments involving nutrition, respiration, photosynthesis, water relations, translocation, hormones, growth and development. Students having credit in BIOL 3014 should enroll for one hour; all others enroll for 2 hours credit.

3463* Plant Physiology. Prerequisite: BIOL 1404. Plant subcellular structure, water relations, water absorption and ascent of sap, translocation, gaseous exchange, nutrition, enzymes, respiration, photosynthesis, growth, development, reproduction, tropisms, hormones, dormancy and seed germination.

3683* Plant Geography. Prerequisite: BIOL 1404. Discussion of the natural geography of the world’s plants and the factors controlling it, especially environmental and biological, with emphasis on evolutionary trends and events.

4023* Community Ecology. Prerequisite: BIOL 3034 or equivalent. Plant and animal communities, community theory, the role of competition, predation, and demography in structuring plant and animal communities, succession, current controversies in ecology, with emphasis on the primary literature.

4123* Ethnobotany. Prerequisite: one course from BIOL 1404 or 1604, HORT 1013, 3024, PLNT 1213, consent of instructor. Uses of plants by past and present cultures for food, fiber and medicinal purposes. The role of plants in traditional rituals and religious practice.

4213* Botanical Limnology. Lab 3. Prerequisite: BIOL 1404 or 1407. Grasping and the principles involved in their classification. Field trips required.

4374* Agrostology. Lab 4. Prerequisite: BIOL 1404. The analysis of grasses and the principles involved in their classification. Field trips required.

4400 Undergraduate Research. 1-2 credits, maximum 5. Prerequisite: consent of instructor. Undergraduate research problems in botany.

4993 Senior Honors Thesis. Prerequisites: departmental invitation, senior standing, Honors Program participation. A research project under the direction of a faculty member resulting in a written report to be judged by a second faculty member as well. An oral presentation made at a departmental seminar. Required for graduation with departmental honors in botany.

5000* Research. 1-6 credits, maximum 6. Research for the M.S. degree.

5104* Mycology. Lab 4. Prerequisite: BIOL 4374 or equivalent. A systematic study of the fungi, with emphasis on taxonomy, comparative morphology and fungal biology. Taught in the Department of Plant Pathology. Same course as PLP 5104.

5110* Problems in Botany. 1-5 credits, maximum 8. Prerequisite: consent of instructor. Special studies in any area of botany.

5153* Ecosystem Analysis. Prerequisite: BIOL 3034 or equivalents. Theory and principles of ecosystem ecology focusing on metabolism and biogeochemical cycles in terrestrial and aquatic systems. Application of principles to current issues of environmental change and management. Same course as ZOOL 5153.

5232* Cytogenetics Laboratory. Lab 4. Prerequisite: PLNT 5452 or current enrollment. Cytogenetic research techniques, especially karyotyping; observation and interpretation of cytogenetic phenomena including mitosis, meiosis and chromosomal aberrations.

5423* Plant Mineral Nutrition. Prerequisite: BIOL 3463 or equivalent. Uptake, translocation, metabolism, and biochemical function of mineral nutrients in higher plants.

5533* Advanced Ecology. Lab 3. Prerequisite: BIOL 3034 or BIOL 3034 or equivalent. Physiological and evolutionary aspects of plant ecology as revealed by recent research. Spring recess field trip required.

5753* Physiology of Plant Growth and Development. Prerequisite: BIOL 3463 or equivalent. Molecular mechanisms of growth and development, subcellular organization and function, plant hormones, morphogenesis, germiation and dormancy, senescence and abscission, plant rhythms. Application of physiological principles to agriculture.

5763* Plant Tissue Culture. Lab 3. Prerequisite: BIOL 3463 or BIOL 3014 or equivalent. Skills in sterile technique, media preparation, embryogenesis and organogenesis. Survey of the major types of tissue culture and their application to crop and horticultural species. Introduction to general principles of genetic engineering of plant cells.

5813* Plant Developmental Genetics. Prerequisite: BIOL 3024 or equivalent. Discussion of morphogenesis, embryogenesis, gametogenesis, and the regulation of gene expression during plant development. Emphasis on recent genetic, experimental, and molecular studies of development in higher plants.

5823* Plant Morphology. Lab 3. Prerequisite: 3024. Comparative study of the form and life cycle of representative genera of the major taxa of vascular plants. Field trips required.

5850* Botany Seminar. 1 credit, maximum 6. Required of senior and graduate majors.

5923* Environmental Plant Physiology. Prerequisite: BIOL 3463 or equivalent. Effects of light, temperature, water, soil and other environmental factors on physiological responses of plants; photosynthesis, water relations, water potential and temperature stress, flowering, dormancy and germination.


Business Administration (BADM)

1111 Business Freshman Orientation. Prerequisite: Freshman standing only. Required of all first semester freshmen in the College of Business Administration. An orientation to the CBA and OSU; survival skills; and a study of the career opportunities and curriculum in the various business departments.

2010 Special Topics. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Special topics and independent study in business.

3090 Study Abroad: Business. 1-18 credits, maximum 36. Prerequisites: OSU GPA of 3.00 or higher; consent of the Office of International Programs and associate dean of student’s college. Participation in a formal study abroad program spending a semester or year in full-time enrollment at a university outside of the U.S.

3513* Strategy and Integration in Organizations. Prerequisites: FIN 3113, MGMT 3123, MKTG 3213. Integration of concepts from the business core courses using tools such as simulation and case analysis. Planning model, policy models, and strategy development.


4010 Business Projects. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Special advanced topics, projects and independent study in business.

4050* Business Colloquium. 3-9 credits, maximum 9. Prerequisites: junior standing and consent of the instructor and the dean. Study of interdepartmental and interdisciplinary nature of various important issues and aspects of the business and economic environment. Provides an intellectual challenge for the able student with a strong interest in scholarship.

4113* New Venture Creation. Prerequisite: business core courses or consent of instructor. Steps involved in starting a new business. Development of a business plan for a venture of student’s choosing. Examination of franchising or acquisition of an existing business as alternative steps to business ownership.
Computer Applications in Business. Prerequisites: admission to MBA program or consent of MBA director; demonstrated personal computer usage proficiency. Introduction to management information systems, statistical and optimization packages, financial modeling languages and micro-computers. Algorithmic programming in FORTRAN/BASIC/COBOL.

5013 Research Methods for Business. Prerequisite: STAT 2023, admission to MBA program or approval from MBA director. Role of Bayesian and inferential statistics in business research and management decision making. Measurement, scaling, survey methods, and forecasting applications to marketing, managerial, human resource, financial, and production planning; and other related business topics. Use of computers in statistical analysis.

5113 Entrepreneurship and Venture Management. Prerequisite: admission to MBA program or consent of MBA director. Enterprise creation and problems faced by entrepreneurs in early growth stages of business ventures. An interdisciplinary problem-solving approach with emphasis on "live" case studies and plans for new business ventures. Emphasis is on entrepreneurship rather than problems faced by going concerns.

5200 Selected Master of Business Administration Topics. 3-6 credits, maximum 6. Prerequisite: admission to the Master of Business Administration program. Selected topics dealing with business decision making and contemporary business issues.

5513 The External Environment of Business. Prerequisite: admission to MBA program or approval from MBA director. Social, ethical, regulatory and political forces as they impact on the organization. Attention to organizational response to these forces through management policies and strategies.

5713 Analysis of the Multinational Firm. Prerequisite: admission to MBA program or consent of MBA director. Identification and analysis of the managerial, financial, marketing, and production problems facing a multinational firm. Focus on the searching and stressing application of ecological and quantitative tools to the study of the multidimensional nature of the international business environment.

6000 Research and Thesis. 1-9 credits, maximum 30. Prerequisite: approval of advisory committee.

6100 Seminar in Business Administration. 3-6 credits, maximum 6. Prerequisite: consent of instructor. Interdisciplinary in nature; focused on research methodology.

Business Professions (BSPR)

3223 Organizational Communication. Prerequisite: 50 credit hours. Communication theory and process; common and special problems associated with interpersonal and organizational communication affecting business decisions and operations. Principles and methods of basic and applied research in business and communication; practice in administrative report writing. Analysis of selected business cases.

3330 Business Report Writing. Prerequisite: six hours of English. Fundamentals of writing business reports, including coverage of mechanics, content, and structure of business reports. Practice in writing business reports as well as oral presentations of reports.

5113 Seminar in Administrative Communication. Understanding and application of valid and relevant communication principles and theories. Designed to develop management-level personnel who can effectively and efficiently use oral and written communications as administrative tools to organizational functioning.

5210 Business Communication Applications. 1-3 credits, maximum 3. Application of communication techniques to the business setting. Interpersonal communication skills necessary for the manager in a business organization. Problems and applications within the modern business setting.


4063 Topics in Contemporary Business. Prerequisites: Junior standing, admission to the Honors Program. Topics of interest in the contemporary business and economic environment. The social role of the corporation; U.S. competitiveness and business and environmental issues.

4073 Literature in Business. Prerequisites: Junior standing, admission to the Honors Program. Foundations of American business through selected literary masterpieces.

4083 Applied Research Processes. Prerequisites: Junior standing, admission to the Honors Program. The relevant aspects of the philosophical, historical and ethical issues in scientific inquiry and business research methods. Preparation for completion of senior honors thesis.

4980 Business Honors Thesis. 1-5 credits, maximum 5. Prerequisites: Honors Program participation, senior standing, college approval. A guided reading and research program ending with an honors thesis under the direction of a faculty member, with second faculty reader and oral examination. Required for graduation with college honors in business.

4990 Business Education (BUSE)

6000 Doctoral Thesis. 1-10 credits, maximum 10. Prerequisites: Advanced graduate standing and approval of department head. Independent research for the doctoral thesis. Credit is given upon completion of the thesis.


4063 Topics in Contemporary Business. Prerequisites: Junior standing, admission to the Honors Program. Topics of interest in the contemporary business and economic environment. The social role of the corporation; U.S. competitiveness and business and environmental issues.

4083 Literature in Business. Prerequisites: Junior standing, admission to the Honors Program. Foundations of American business through selected literary masterpieces.
Vertebrate host’s ability to defend itself against these structures and the functions which they find within living cells, the dynamics of Cytology.

Prerequisites: BIOL 1304 and BIOL 3112

Chemical Engineering (CHE)

2033 Introduction to Chemical Process Engineering. Lab 3. Prerequisite: CHEM 1515. Application of mathematics and scientific principles to solving chemical engineering problems. Simple material and energy balances applied to process design. The nature and application of unit operations and unit processes to the development of chemical processes.

3013 Rate Operations I. Lab 3. Prerequisites: 2033 and ENSC 3233. Basic rate equations for heat, mass and momentum transport; the transport analogies, solutions and correlations for predicting transport rates for practical applications; utilization in design and analysis of process equipment.

3113 Rate Operations II. Prerequisites: 3013, 3473. Continuation of CHE 3013.

3473 Chemical Engineering Thermodynamics. Lab 3. Prerequisites: ENSC 2213; concurrent enrollment in 3033 and CHEM 3434. Application of thermodynamics to chemical process calculations. Behavior of fluids, including estimation of properties by generalized methods. Study of chemical thermodynamics, including heats of reaction, chemical reaction and phase equilibria.

4002 Chemical Engineering Laboratory I. Lab 6. Prerequisites: 3013 and 3473. Processes of heat, mass, and momentum transfer, unit processes, and unit operations principles to the analysis of bench and pilot-scale equipment. Interpreta-

4123 Virology. Prerequisite: BIOL 3014 or one course in biochemistry. Corequisite: 3224. Virus-host interactions including structure-function of animal, plant, and bacterial viruses. Discussion of the molecular biology of virus infection and development. Same course as MICR 4123.

4264 Cell Physiology. Lab 3. Prerequisite: BIIC 3653 or BIOL 3014. Cellular activities and fundamental physiological processes. Same course as ZOOL 4264.

4273 Developmental Biology. Prerequisites: BIOL 3024 and corequisite BIOL 3014 or one course in biochemistry. The molecular biology and molecular genetics of developmental processes such as cell division, differentiation, migration, cell-cell communication, and gene expression in a wide variety of organisms.

4325 Bioenergetics. Prerequisites: BIOL 3653 or BIOL 3014. Bioenergetic reactions and mechanisms involved in energy production in plants, animals and microbial systems. Same course as MIRC 4323.

4993 Senior Honors Project. Prerequisites: departmental invitation, senior standing. Honors Project participation. A research project under the direction of a faculty member resulting in a written report to be judged by a second faculty member. Required for graduation with departmental honors in CLML.

4343 Environmental Engineering. Prerequisites: 3013, 3473. Application of science and engineering principles to minimize the adverse effects of human activities on the environment. National and environmental regulations; predictive movement and fate of chemicals in the geospheres; multimedia pollution assessment, analysis and control.

4473 Chemical Reaction Engineering. Lab 3. Prerequisites: senior standing. Principles of chemical kinetics rate concepts and data treatment. Elements of reactor design principles for homogeneous systems; introduction to heterogeneous systems.

4581 Seminar. Prerequisite: senior standing; Recent developments in chemical engineering and the process industries.

4840 Process Control Laboratory. 2.5 credits, maximum 5. Lab 4-6. Prerequisites: 3013 and MATH 2233. Experimental study of control loop performance including: process dynamics, sensors, feedback controllers, and control valves. Analog and digital techniques including: pneumatic and electronic components, programmable controllers, and computer simulation with colorgraphics.

4843 Chemical Process Instrumentation and Control. Prerequisites: 3013 and MATH 2233. Instruments for measuring temperature, pressure, composition and other process variables; different modes of control and their influence on process stability. System analysis and design through linearization technique.

4993 Master’s Thesis. 1-6 credits, maximum 6. Prerequisite: approval of major professor. Methods used in research and thesis writing.

5030 Professional Practice. 2-6 credits, maximum 8. Prerequisites: senior standing and consent of instructor. Application of chemical engineering principles to the solution of real-life engineering problems in an actual or simulated industrial environment. Includes application of design and test procedures, economic evaluation and reporting on one or more assigned projects.

5110 Special Topics In Chemical Engineering. 2-3 credits, maximum 6. Lab 2-6. Prerequisite: consent of instructor. Application of chemical engineering principles to the solution of real-life engineering problems in an actual or simulated industrial environment. Includes application of design and test procedures, economic evaluation and reporting on one or more assigned projects.

5123 Advanced Chemical Reaction Engineering. Prerequisite: 4473. Advanced principles and applications of chemical kinetics in catalysis, heterogeneous systems, non-ideal reactions, polymerization and biological reactions.

5213 Selected Diffusional Unit Operations. Mass Equilibrium stage and transfer unit concepts. Mass transfer concepts of diffusional unit operations such as absorption, adsorption, crystallization, drying, humidification and liquid extraction.
3 Bioengineering. Prerequisite: consent of instructor. Application of fundamental chemical engineering principles to biochemical, biomed-ical and physiological processes. Fermentation technology, biological mass transfer and kinetics, bioreactor design and scale-up, artificial organs, drug delivery formulations, pharmacoco-logical kinetics, biomaterials, and human physiology.

593* Biomedical Engineering. Prerequisite: consent of instructor. Application of fundamental engineering principles to biomedical processes. Transport in biological systems, drug delivery, tissue engineering, biomaterials, artificial or-gans, physiological modeling, and biomedical sensors.

541* Fundamentals of Polymer Engineering. Funda-mental principles in the engineering of macromolecules. Various aspects of polymer engi-neering including definitions and nomenclature, polymer physical chemistry, mass-transfer, rheological and mechanical properties, industrial production and applications.

542* Process Heat Transfer. Application of funda-mental principles of single- and two-phase fluid dynamics and heat transfer to the design and analysis of process heat transfer equipment.


570* Optimization Applications. Prerequisite: graduate stand-ing. A survey of various methods of unconstrained and constrained linear and non-linear optimization. Applications of these meth-o-dologies using hand-worked examples and available software packages. Intended for en-gineering and science students. Same course as ECE 5703, EIM 5023 and MAE 5703.

573* Neural Networks. Prerequisite: graduate stand-ing. Introduction to mathematical analysis of networks and learning rules, and on the applica-tion of neural networks to certain engineer-ing problems image and signal processing and control systems. Same course as ECEN 5735 and MAE 5733.

574* Chemical Engineering Process Modeling. 3 credits, maximum 6. Chemical engineering sys-tems and process models. Analytical and nu-merical methods of solution of resulting equa-tions or systems of equations, with computer methods in a chemical engineering context.

579* Advanced-process Design and Economics. Prerequisites: 4124, 4224. Application of chemi-cal engineering principles to the design and analysis of process equipment and plants; pre-diction and extrapolation of thermal and physical properties; methods for design and synthe-sis of process units and equipment.


5873* Air Pollution Control Engineering. Causes, ef-fects and control of atmosphere pollution. Same course as CIVE 5873.

5990* Special Problems. 2-4 credits, maximum 9. Prereq-uisite: consent of instructor. Individual re-port of progress on chemical engineering involve-ment in research operations, processes, equipment, experi-ments, literature search, theory, computer use or combinations of these.

6000* Doctoral Thesis. 2-15 credits, maximum 30. Prerequisite: approval of major professor. The doctoral candidate will register for a maximum of 3 semester credit hours to a maximum of 15 semester credit hours in each semester during which laboratory work is in progress. Methods used in research and thesis writing. An original investigation of a problem in chemical engi-neering and its report in a dissertation.

610* Chemical Engineering Seminar. 1-3 credits, maximum 3. Advanced research and develop-ment topics.

6023* Chemical Engineering Science I. Prerequisites: 5123 and 5423. Theoretical aspects of fluid dynamics, heat transfer and mass transfer. Boundary layer theory, multiphase flow theory of diffusion and interphase mass transfer. Analo-gies between heat, mass and momentum trans-fers.


6223* Advanced Chemical Engineering Thermody-namics. Prerequisite: 5843. Phase equilibrium in multicomponent systems. Irreversible pro cesses. Properties of fluids and the prediction of properties by statistical methods. Applica-tion of thermodynamics to unit operations.

6440* Advanced Topics in Chemical Engineering. 3-6 credits, maximum 9. Topics in chemical engi-neering unit operations in design. Advanced mathematical techniques in chemical engineer-ing problems. May be repeated for credit if subject matter varies.


Chemistry (CHEM)

1014 (L,N)Chemistry in Civilization. Lab 2. Sym-bols, methods and contributions to society of the chemical sciences. Includes polymers, pol-lution, energy, consumer chemicals, drugs, nuclear science and other topics. No credit for students with credit in 1215, 1314.

1215 (L,N)General Chemistry. Lab 2. Prerequisite: MATH 0123 or high school equivalent. The be-ginn ing course recommended for students in the applied biological sciences. No credit for students with credit in 1014, 1314.

1225 (N)General Chemistry. Lab 2. Prerequisite: 1215 or advanced placement. A continuation of gen-eral chemistry, recommended for students in the applied biological sciences. No credit for students with credit in 1515.

1314 (L,N)General Chemistry. Lab 2. Prerequisite: MATH 1513 or concurrent enrollment in 1613, 1715 or a higher level math course. The begin-ning chemistry course recommended for stu-dents in basic biological sciences (including preclinical science and pre-veterinary sci-ence), physical sciences and engineering. No credit for students with credit in 1014, 1215.

1413 (L,N)General Chemistry. Lab 3. Prereq-uisite: PHYS 1313 recommended. Directed in-quiry hands on study of chemical reactions. Recommended for elementary education majors as model course to learn and teach science.

1515 (L,N)General Chemistry. Lab 2. Prerequisite: 1314 or advanced placement. A continuation of general chemistry. No credit for students with credit in 1225.


2122 Quantitative Analysis Laboratory. Lab 6. Prerequisite: 2113 or concurrent enrollment. Labo-ratory work related to material covered in CHEM 2113.

2990 Special Problems in Chemistry for Non-majors. 1-2 credits, maximum 2. Prerequisite: 1515 or concurrent enrollment. Independent training in chemistry at the lower-division level.

3015* The Chemistry of Organic Compounds. Lab 4. Prerequisites: 1215 and 1225 or equivalent. Terminal, one-semester non-majors course in organic chemistry covering the general prin-ciples of nomenclature, structures, bonding, methods of preparation, reactions and uses of acyclic, cyclic, and aromatic compounds. No credit for students with credit in 3053 or 3112.

3053* Organic Chemistry. Prerequisite: 1515 or equivalent. Hydrocarbons and their derivatives, including specific compounds of theoretical, biological or industrial importance. No credit for students with credit in 3015.

3112 Organic Chemistry Laboratory. Lab 6. Prereq-uisite: 3153 or concurrent enrollment. Labo-ratory exercises related to theoretical principles covered in CHEM 3053 and 3153. No credit for students with credit in 3105.

3153* Organic Chemistry. Prerequisite: 3053. A con-tinuation of 3053.


3353 Descriptive Inorganic Chemistry. Prerequisite: 1225 or 1515. Structures and properties of the elements and their many compounds in the broadest sense which includes the modern technologically important materials, organome-tallics, and inorganic substances of biological significance.
Organic Polymers.

Prerequisites: 3153 and 3553. The theory, practice and instrumentation in various areas of modern electroanalytical chemistry.

Solid-state Chemistry. Prerequisite: 5260. Structure, bonding, and properties of crystalline and amorphous inorganic solids. Emphasis on the characterization of inorganic solids and phase transitions in inorganic solids.


Spectrometric Identification of Organic Compounds. Lab 3. Prerequisite: 4320. Lectures on ultraviolet, circular dichroism, infrared, nuclear magnetic resonance (NMR) and mass spectrometry (MS). More advanced techniques in NMR and MS stressed. Hands-on training and use of modern spectroscopic instrumentation in laboratory.

Mechanism and Structure in Organic Chemistry. Prerequisite: 3153 and 3553. Relationship of properties of organic compounds to their structure; mechanisms of organic reactions.

Chemical Thermodynamics I. Prerequisite: 3553. Statistical and classical thermodynamics applied to chemical systems.

Quantum Chemistry II. Prerequisite: consent of instructor. Supervised study of selected topics and fields not otherwise covered.

Photons I: Advanced Optics. Lab 9. Prerequisite: ECEN 3813 or PHYS 3213, or consent of instructor. Advanced optics including spectral and time characteristics of detectors, characteristics of lasers, time, spectral and spatial parameters of laser emission, interferometric techniques, and nonlinear effects such as two-photon absorption and second and third harmonic generations. Ultrashort laser pulses. Same course as ECEN 6803 and PHYS 6803.

Photons II: THz Photonics and THz-TDS. Lab 3. Prerequisite: 6803. THz photonics and THz time-domain spectroscopy (THz-TDS). Concept and techniques of designing electronic circuits with ultrashort laser pulses to generate and detect freely propagating pulses of THz electromagnetic radiation using several operational research systems. Same course as ECE 6811 and PHYS 6811.

Photons II: Spectroscopy I. Lab 3. Prerequisite: 6803. Operating principles and applications of laser spectroscopy of atoms, molecules, solids and complex fluids. Absorption, emission, photon correlation, coherence, time resolved spectroscopy, Raman spectroscopy and non-linear optical. Same course as ECE 6821 and PHYS 6821.

Photons III: Spectroscopy II. Lab 3. Prerequisite: 6803. Advanced spectroscopic instruments and methods used for investigation of semiconductors and solid state materials. Stimulated emission characterized both in wavelength and in time. Time-resolved fluorescence measurements. Multiphotonic excitations. Fast measuring techniques including subnanosecond detectors, picosecond streak cameras, an ultrafast four-wave mixing and correlation techniques. Time-dependent photoconductivity measurements. Same course as ECEN 6831 and PHYS 6831.

Chemistry of Natural Products. Prerequisite: 5323. Complex naturally occurring organic compounds such as alkaloids, terpenes and steroids.

Special Topics in Organic Chemistry. 1-9 credits, maximum 9. Prerequisite: 3153. Deals with topics not covered in other courses.

Chemical Kinetics. Prerequisite: 3553. The kinetic chemical reactions and their theoretical interpretation.

Quantum Chemistry II. Prerequisite: 5623 or PHYS 5613. Molecular quantum mechanics and chemical bonding.

Molecular Spectroscopy. Prerequisite: 5623. Spectra and structure of molecules.

Chemical Thermodynamics II. Prerequisite: 5563. A continuation of 5563.

Selected Topics in Advanced Physical and Inorganic Chemistry. 1-6 credits, maximum 12. Prerequisite: consent of instructor. Supervised study of selected topics and fields not otherwise covered.

Solid-state Chemistry. Prerequisite: 3260. Chemistry of main group and transition metal organometallic compounds, metal clusters, and catalysis by organometallic polymers, bioinorganic chemistry, and materials chemistry.

Research. 1-12 credits, maximum 55. Prerequisite: M.S. degree in chemistry or permission of instructor. Independent investigation under the direction and supervision of a major professor.

Advanced Seminar. Prerequisite: 5011 or M.S. degree. Preparation and oral presentation of critical reviews on chemical subjects. Usually related to the student's research area. Completion of 1 credit hour required for the Ph.D. degree.

Special Topics in Analytical Chemistry. 1-6 credits, maximum 6. Supervised study of topics and fields not otherwise covered.

Electroanalytical Chemistry. Prerequisite: 4024. The theory, practice and instrumentation in various areas of modern electroanalytical chemistry.

Analytical Spectroscopy. Prerequisite: 4024. Survey of selected topics in analytical applications of spectroscopic techniques. Fundamental concepts as well as current trends in research, including instrumentation.

Modern Topics in Chemical Thermodynamics. Prerequisite: 5260. Inorganic Chemistry. 1-3 credit hours, maximum 3. Prerequisite: 3353 or equivalent, and 3 hours of physical chemistry. Bonding theory, molecular symmetry and structure, characterization of inorganic compounds, coordination chemistry, crystal field theory, solution chemistry, and mechanisms of inorganic reactions in solution.

Special Topics in Organic Chemistry. 1-9 credits, maximum 9. Prerequisite: 3153. Deals with topics not covered in other courses.

Chemical Kinetics. Prerequisite: 3553. The kinetic chemical reactions and their theoretical interpretation.

Quantum Chemistry II. Prerequisite: 5623 or PHYS 5613. Molecular quantum mechanics and chemical bonding.

Molecular Spectroscopy. Prerequisite: 5623. Spectra and structure of molecules.

Chemical Thermodynamics II. Prerequisite: 5563. A continuation of 5563.

Selected Topics in Advanced Physical and Inorganic Chemistry. 1-6 credits, maximum 12. Prerequisite: consent of instructor. Supervised study of selected topics and fields not otherwise covered.

Photons I: Advanced Optics. Lab 9. Prerequisite: ECEN 3813 or PHYS 3213, or consent of instructor. Advanced optics including spectral and time characteristics of detectors, characteristics of lasers, time, spectral and spatial parameters of laser emission, interferometric techniques, and nonlinear effects such as two-photon absorption and second and third harmonic generations. Ultrashort laser pulses. Same course as ECEN 6803 and PHYS 6803.

Photons II: THz Photonics and THz-TDS. Lab 3. Prerequisite: 6803. THz photonics and THz time-domain spectroscopy (THz-TDS). Concept and techniques of designing electronic circuits with ultrashort laser pulses to generate and detect freely propagating pulses of THz electromagnetic radiation using several operational research systems. Same course as ECE 6811 and PHYS 6811.

Photons II: Spectroscopy I. Lab 3. Prerequisite: 6803. Operating principles and applications of laser spectroscopy of atoms, molecules, solids and complex fluids. Absorption, emission, photon correlation, coherence, time resolved spectroscopy, Raman spectroscopy and non-linear optical. Same course as ECE 6821 and PHYS 6821.

Photons III: Spectroscopy II. Lab 3. Prerequisite: 6803. Advanced spectroscopic instruments and methods used for investigation of semiconductors and solid state materials. Stimulated emission characterized both in wavelength and in time. Time-resolved fluorescence measurements. Multiphoton excitations. Fast measuring techniques including subnanosecond detectors, picosecond streak cameras, an ultrafast four-wave mixing and correlation techniques. Time-dependent photoconductivity measurements. Same course as ECEN 6831 and PHYS 6831.

Chemistry of Natural Products. Prerequisite: 5323. Complex naturally occurring organic compounds such as alkaloids, terpenes and steroids.

Special Topics in Organic Chemistry. 1-9 credits, maximum 9. Prerequisite: 3153. Deals with topics not covered in other courses.

Chemical Kinetics. Prerequisite: 3553. The kinetic chemical reactions and their theoretical interpretation.

Quantum Chemistry II. Prerequisite: 5623 or PHYS 5613. Molecular quantum mechanics and chemical bonding.

Molecular Spectroscopy. Prerequisite: 5623. Spectra and structure of molecules.

Chemical Thermodynamics II. Prerequisite: 5563. A continuation of 5563.

Selected Topics in Advanced Physical and Inorganic Chemistry. 1-6 credits, maximum 12. Prerequisite: consent of instructor. Supervised study of selected topics and fields not otherwise covered.

Photons I: Advanced Optics. Lab 9. Prerequisite: ECEN 3813 or PHYS 3213, or consent of instructor. Advanced optics including spectral and time characteristics of detectors, characteristics of lasers, time, spectral and spatial parameters of laser emission, interferometric techniques, and nonlinear effects such as two-photon absorption and second and third harmonic generations. Ultrashort laser pulses. Same course as ECEN 6803 and PHYS 6803.

Photons II: THz Photonics and THz-TDS. Lab 3. Prerequisite: 6803. THz photonics and THz time-domain spectroscopy (THz-TDS). Concept and techniques of designing electronic circuits with ultrashort laser pulses to generate and detect freely propagating pulses of THz electromagnetic radiation using several operational research systems. Same course as ECE 6811 and PHYS 6811.

Photons II: Spectroscopy I. Lab 3. Prerequisite: 6803. Operating principles and applications of laser spectroscopy of atoms, molecules, solids and complex fluids. Absorption, emission, photon correlation, coherence, time resolved spectroscopy, Raman spectroscopy and non-linear optical. Same course as ECE 6821 and PHYS 6821.

Photons III: Spectroscopy II. Lab 3. Prerequisite: 6803. Advanced spectroscopic instruments and methods used for investigation of semiconductors and solid state materials. Stimulated emission characterized both in wavelength and in time. Time-resolved fluorescence measurements. Multiphoton excitations. Fast measuring techniques including subnanosecond detectors, picosecond streak cameras, an ultrafast four-wave mixing and correlation techniques. Time-dependent photoconductivity measurements. Same course as ECEN 6831 and PHYS 6831.

Chemistry of Natural Products. Prerequisite: 5323. Complex naturally occurring organic compounds such as alkaloids, terpenes and steroids.

Special Topics in Organic Chemistry. 1-9 credits, maximum 9. Prerequisite: 3153. Deals with topics not covered in other courses.

Chemical Kinetics. Prerequisite: 3553. The kinetic chemical reactions and their theoretical interpretation.

Quantum Chemistry II. Prerequisite: 5623 or PHYS 5613. Molecular quantum mechanics and chemical bonding.

Molecular Spectroscopy. Prerequisite: 5623. Spectra and structure of molecules.

Chemical Thermodynamics II. Prerequisite: 5563. A continuation of 5563.
Photons III: Microscopy I. Lab 3. Prerequisite: 3553 or consent of instructor. The structure and imaging of solid surfaces. Basics of scanning probe microscopy (SPM). Contact and noncontact atomic force microscopy (AFM). Scanning tunneling microscopy (STM) in air. Same course as ECHN 6414 and PHYS 6841.


Photons III: Microscopy III and Image Processing. Lab 3. Prerequisite: ECHN 5793. Digital image processing, including projects. Image acquisition and display, image enhancement, geometric operations, linear and nonlinear filtering, image restoration, edge detection, image analysis, morphology, segmentation, recognition, and coding/compression. Same course as ECHN 6861 and PHYS 6861.


Photons IV: Semiconductor Synthesis and Devices III. Lab 3. Prerequisite: 6803. Processing, fabrication, and characterization of semiconductor optoelectronic devices in class 100/1000 cleanrooms. Cleanroom operation including general procedure for material preparation and device fabrication. Preparation and processing using a variety of processing such as mask aligner, vacuum evaporators and rapid thermal annealer. Testing using optical and electrical testing apparatus such as I-V, C-V, and IV measurements, open channels, and computer programs. Same course as ECHN 6891 and PHYS 6891.

Civil Engineering (CIVE)


3413 Structural Analysis. Lab 3. Prerequisite: ECHN 2143. Analysis of internal forces and deflections of structures subjected to static loading. Beams, trusses, and framed structures analyzed by appropriate classical methods. Classical and modern computer procedures for the analysis of statically indeterminate structures.
Human Impact on the Environment. The activities of humans and how they affect the aquatic, terrestrial and atmospheric environment.

Unit Operations in Environmental Engineering. Prerequisites: 3813, ENSC 3233. Fundamental principles of water and wastewater treatment including basic theory and development of design parameters. Application of these to the design of unit operations and processes in various treatment plants.

Master's Thesis or Report. 1-6 credits, maximum 6. Prerequisite: graduate standing. A student studying for a master's degree will enroll in this course for 2 credit hours if a report is to be written; 6 credits if a thesis is to be written.

Civil Engineering Seminar. 1-3 credits, maximum 6. Prerequisites: graduate standing and approval of major professor. Review of literature of major fields of civil engineering.

Aquatic Chemistry. Prerequisites: 5813 or concurrent enrollment, CHEM 1515 or equivalent. Application of chemical principles to environmental problems. Chemical kinetics, chemical equilibrium, acid-base chemistry, and development of pKa-pH diagrams and coordination chemistry. Precipitation and dissolution reactions and oxidation-reduction reactions.

Civil Engineering Research. 1-6 credits, maximum 6. Prerequisites: graduate standing and approval of major professor. Research and investigations other than thesis studies.

Engineering Practice. 1-6 credits, maximum 9. Prerequisite: approval of adviser. Professional supervised civil engineering practice involving the application of basic engineering principles. The student assumes a degree of professional responsibility. Activities must be approved in advance by the student's adviser and may consist of engineering experience on-campus or off-campus, or both. Periodic reports both oral and written are required as specified by the adviser.

Engineering Problems. 1-3 credits, maximum 6. Prerequisite: graduate standing. Problems of particular interest to graduate students in the field of applied science.

The Legal and Regulatory Environment of Engineering. Prerequisite: junior, senior or graduate standing. The U.S. and Oklahoma court systems. Tort law and labor law having an impact on engineering and construction. Union organization and activities. Government contracting and the laws governing it. Discussions of the Occupation Safety and Health Act and Americans with Disabilities Act. In-Depth look at environmental policy, laws, and regulations affecting engineering including NEPA, CWA, SDWA, RCRA, CERCLA, and CAA. Water law.


Project Engineering and Management. Prerequisite: graduate standing or consent of instructor. Management of the design and construction of civil engineering projects. Topics include owner's study, formation of project teams, design coordination, construction, and project closeout.

5433* Energy Methods in Applied Mechanics. Prerequisites: 3413, MATH 2233 or MAE 3323. Advanced structural mechanics from the standpoint of virtual work; energy principles and variational calculus applied to the analysis of structures, mechanisms, dynamics, and vibrations.

5443* Theory of Elastic Stability. Prerequisite: 5403. General theory of elastic stability; buckling of columns; analysis of beam-columns; stability analysis of structural frames, thin-walled beams of open cross-section, and plate structures.

5453* Engineering Analysis. Prerequisite: senior standing and consent of instructor. Advanced; classical mathematical skills for engineers. Diverse analysis and general tensor analysis, curvilinear coordinates, partial differential equations, perturbation theory, integral equations, special functions, eigen function analysis, integral transform methods, variational methods.


5503* Computer-aided Structural Analysis and Design. Prerequisites: 3413; 3513 and 3523 (or concurrent enrollment); senior or graduate standing. Major comprehensive design experience. Promotion of a design office atmosphere in using a team approach. Industry practitioners provide design projects and critique results. Emphasis on modern computer-based computation and presentation tools.

5513* Advanced Reinforced Concrete Design. Prerequisite: 3523. Advanced topics in reinforced concrete design with emphasis on frames, slabs, and earthquake-resistant structures.

5523* Advanced Steel Structure Design. Prerequisite: 3513. Advanced topics in steel design such as plastic design, plate girders, composite design, fatigue and fracture, stability, and bracing design.


5543* Bridge Design. Prerequisites: 3513 and 3523. Structural design of steel and concrete highway bridges, including bridge types, parts of a bridge, loads and load distribution, analysis, design, and bridge rating. Emphasis on topics of special interest to students.

5553* Fatigue and Fracture Mechanics. Prerequisite: MAE 4333 or consent of instructor. Fracture processes in engineering materials including design considerations, failure avoidance and prevention. Fatigue life prediction of materials and high-strength, toughness-limited materials emphasized. Same course as MAE 5553.

5643* Pavement Evaluation and Rehabilitation. Lab 3. Prerequisite: 3653 or consent of instructor. "State-of-the-art" pavement evaluation procedures and rehabilitation techniques. Field and laboratory methods of evaluating in situ pavement performance. Rehabilitation techniques including resurfacing, recycling, reconstruction, and restoration. Selection of the most feasible rehabilitation method based on life cycle costs.

5653* Asphalt Materials and Mix Design. Lab 1.5. Prerequisite: 3653 or consent of instructor. Principles of asphalt mix design including material characteristics and performance. Evaluation of Hveem and Marshall mix design methods. Asphalt cements, rubberized asphalt polymer asphalts, emulsions, cutbacks, and aggregates. Laboratory sessions focused on the engineering properties of the materials discussed.

5673* Concrete Materials and Mix Design. Lab 1.5. Prerequisite: senior or graduate standing. Principles of concrete mix design including material characteristics, strength and durability requirements, environmental effects and forensic analysis. ACI and PCA mix design procedures. Laboratory sessions focused on the theoretical and practical aspects of concrete technology.

5693* Pavement Design and Analysis. Prerequisite: 3653 or consent of instructor. Principles of pavement design including stress analyses, load and environmental effects and material characteristics. AASHTO, PCI and AI methods of pavement design. Computer methods. Practical aspects of asphalt. Life cycle cost analyses and construction methods.

5703* Soils in Construction. Prerequisites: 3713, 4711 or consent of instructor. Soils types and general behavior during construction; earthwork construction requirements and specific considerations for embankments, pavements, buildings and retaining structures; groundwater control during construction; soil modifications for stabilization; and construction considerations for geosynthetics. Basic design considerations, including selection of placement conditions for compaction; proportioning of groundwater control systems; selection of type and amount of soil modifier, and design of geosynthetics to meet specific functions.

5713* Soil Mechanics. Prerequisites: 3713 and 4711. Application of soil mechanics principles and concepts in geotechnical areas of permeability and seepage, settlement analysis, bearing capacity, lateral earth pressures and retaining walls, slope stability, and metastable soils.

5723* Foundation Engineering. Prerequisites: 3713 and 4711. Types of structural foundations including footings, mats, rafts, piles and drilled shafts. Site characteristics, exploration programs, field data, test results and construction methods as basis for selection of type of foundation and design. Geotechnical design procedures and considerations.


5743* Soil-Structure Interaction. Prerequisites: 3713 and senior or graduate standing in civil engineering. The mechanical interaction effects between soils and structures using suitable engineering procedures such as finite differences and finite element methods. Civil engineering problems where interaction effects are most dominant including grade beams (beams on elastic foundation), axially- and laterally-loaded piles, cantilever and anchored sheet pile walls.

5753* Engineering Soil Stabilization. Prerequisites: 3713 and 4711. Theoretical and practical aspects of engineering soil stabilization as a method for improving and upgrading low quality and unstable soils for engineering purposes. Use of lime, fly ash, portland cement, asphalt, and other physical and chemical admixtures. Application of different stabilization methods such as preloading, deep compaction, injection, and reinforcement.


5813* Environmental Laboratory Analysis. Lab 3. Prerequisite: 4833 or concurrent enrollment. Analytical procedures for water and wastewater contaminants. Emphasis on the chemical theory of procedures, analytical work and an understanding of the significance or need for such laboratory data for surface and groundwater management and water and wastewater treatment processes and design.

5823* Environmental Risk Assessment and Management. Prerequisites: an introductory course in statistics and background in engineering, management or science. Environmental risk assessment and management. Applies elements of statistics, probability and environmental simulation to determine the public health and ecological risks from activities of humans.


5843* Hydrology II. Prerequisite: 3843. Physical phenomena of the surface water hydrologic processes. Derived and empirical models for evaporation, infiltration, basin runoff and unsteady flow routing will be presented. Basic flood analysis techniques will also be studied.

5853* Bioremediation. Prerequisite: 3813 or equivalent science background. Process selection and design of bioremediation systems for reclamation of contaminated hazardous and industrial waste sites, soils, sludges. Site analysis emphasizing contaminant and environmental characteristics. Engineering design factors to promote successful bioremediation. Design project required.
Advanced Unit Operations in Environmental Engineering. Prerequisite: 4833. Theory and design of advanced physical-chemical water treatment and wastewater treatment processes applied to municipal, industrial, and hazardous waste situations.

5873* Air Pollution Control Engineering. Causes, effects and control of atmospheric pollution.

5893* Residuals and Solid Waste Management. Theory, design and operation of systems for handling, treatment, and disposal of process sludges (water treatment, wastewater treatment, industrial) and solid wastes. Potential material reclamation options.


Water Resources Planning and Management. Application of engineering economics and microeconomic theory to the planning and management of water resources projects including flood control, hydroelectric, water supply, and urban stormwater. Systems analysis approaches, primarily linear and dynamic programming, and their application in water resources.

5931* Water Treatment. Prerequisite: 4833. Theory, design and operation of water treatment plants. Sizing of various unit processes. Water treatment plant control procedures.

5413* Unit Operations and Processes Laboratory. Lab 3. Prerequisite: 4833, 5813 or equivalent. Techniques of data collection and analysis applied to design of physical, chemical and biological processes.


5963* Open Channel Flow. Prerequisite: 3833. Open channel hydraulics, energy and momentum concepts, resistance, channel controls and transitions, flow routing, and sediment transport.

5973* Ground Water Quality. Prerequisite: graduate standing or consent of instructor. Ground water protection legislation. Fate and transport of nutrients, metals, other anions and cations, organics, bacteria and viruses in the subsurface environment. Pollution containment, abatement techniques. Aquifer restoration.

5983* Groundwater Pollution Control. Theory, design and operation of groundwater pollution control systems. Includes examples from site specific applications as well as regional or national focus.


6010* Seminar. 1-6 credits, maximum 30. Independent research under the direction of a member of the graduate faculty by students working beyond the level of Master of Science degree.

6010* Ph.D. Research and Thesis. 1-16 credits, maximum 30. Independent research under the direction of a member of the graduate faculty by students working beyond the level of Master of Science degree.

6413* Finite Element Analysis in Engineering. Prerequisites: 3843 and 5913. Application of finite-difference and finite-element methods to predict water flow and chemical and biological water quality in saturated-unsaturated groundwaters, streams, lakes, urban areas, and watersheds.

6913 Advanced Environmental Laboratory Analysis. Lab 3. Prerequisite: 5813. Instrumental analysis of environmental contaminants. Process samples, effluents, residuals, and environmental samples. Use of gas and liquid (ion) chromatography, atomic absorption and other nalytical methods.


Communication Sciences and Disorders (CDIS)

2213 Phonetics. Prerequisite: sophomore standing. The analysis and description of speech at the segmental and suprasegmental levels. Development of students' perceptual and analytic skills in speech sound production. Practice using the International Phonetic Alphabet for broad and narrow transcription. Overview of the relationship between speech and hearing.


224 Civil Engineering
Survey of Communication Disorders. Prerequisite: sophomore standing. The normal development of speech, language, and hearing. The characteristics, diagnosis and treatment of speech, language, and hearing disorders among all age groups. Suggestions for related professions involved with people with communication disorders.

(S)Speech and Language Development. Prerequisites: 2213, 3213 and acceptance into professional program. Normal acquisition of phonology, morphology, semantics, syntax, and pragmatics in children. Biological, cognitive, social bases of language acquisition. Description of dialect variations, second language acquisition, and atypical language development. The relationship between spoken and written language development.

Clinic Practicum. 1-3 credits, maximum 3. Lab 2-6. Prerequisites: 4022, 4031, 4323 or 4413, senior standing, 3.25 GPA in the major and consent of adviser. Supervised clinical practicum in speech-language pathology and audiology.

Clinical Methods and Issues. Prerequisites: 2213, 3213, 3224; acceptance into professional program via Declaration of Intent in CDIS. Fundamental process and procedures of clinical practicum, report writing, goal selection; production, assessment and recording of speech and language behaviors; development of interpersonal skills with clients, families, and other professionals; problem solving skills; professional organization and credentialing requirements.

Clinical Observations. Lab 2. Prerequisites: 2213, 3213, 3224; declared communication sciences and disorders major; must be taken concurrently with or subsequent to 4022. Observation and critiquing of speech and language pathology and audiology clinical activities.

Sign Languages. Prerequisite: junior standing or consent of instructor. Introduction to methods of sign language currently used among the U.S. deaf society, socially and educationally, including traditional American Sign Language (ASL), Manually Coded English (MCE, SEE) and fingerspelling. Linguistic components of sign and various sociological, psychological, and adaptive communication issues having an impact on the deaf community. Two hours per week, devoted to lecture and three one hour involved in a variety of interactive sign language skill work in smaller groups.

Aural Rehabilitation for the Acoustically Handicapped. Prerequisites: 2213, 3123, 3213. Clinical aspects of habilitation and rehabilitation programs for the deaf and the hard-of-hearing, including speech reading, auditory training, speech conservation, speech and language therapy, amplification and counseling. Study of amplification units including assistive listening devices.

Anatomy and Physiology of the Speech Mechanism. Lab 1. Prerequisite: 3213 or consent of the instructor. Structure and function of the respiratory, phonatory, articulatory, and neural systems involved in the oral communicative processes. Laboratory experiences required.

Language Analysis. Prerequisites: 3224, and one of: FLL 2443, ENGL 2443, 4003, 4013, 4063, 4039. Applications of content, form and usage in the communication sciences and disorders. Analysis of sound, sentence and discourse levels. Variations as a function of age, culture, disability (spoken or written), and disorder type.

Diagnostic Procedures in Communication Disorders. Prerequisites: 3224, 4022. Speech and language diagnostic testing and procedures, interpreting diagnostic information and deriving appropriate treatment goals.

Speech Science. Prerequisite: 4214. Scientific bases of the acoustic parameters, the perceptual and productive processes of speech, and the interrelationships of these factors during speech communication.

Language Assessment and Intervention. Prerequisite: 3224. Principles of language assessment, diagnosis, intervention; goal selection and procedural processes for language intervention with infants, toddlers and preschool-age children.


Stuttering. Prerequisite: junior standing or consent of instructor. Recent research into the nature, causes and treatment of stuttering.

Independent Study in Communication Sciences and Disorders. 1-3 credits, maximum 3. Prerequisite: junior standing and consent of instructor. Directed readings or research in communication sciences and disorders.

Senior Honors Thesis. Prerequisite: departmental invitation, senior standing. Honors Program participation. A guided reading and research program ending with an honors thesis under the direction of a faculty member. Required for graduation with departmental honors in communication sciences and disorders.

Research and Thesis. 1-3 credits, maximum 6. Prerequisite: consent of graduate faculty. Research in speech, language and hearing sciences and disorders.

Research Methods in Communication Disorders. Prerequisite: 3213. Research methods with emphasis on methods used most frequently in communication sciences and disorders: experience evaluating, devising, and implementing research.


Dysphagia. 2-3 credits, maximum 3. Prerequisite: 4214. Anatomy and neurophysiology of the swallowing mechanism in relation to pediatric and adult dysphagia. Evaluation, diagnosis and treatment of swallowing problems in children and adults including videofluoroscopic swallowing, and case study integrated into this course. The first two-thirds of the course focus on adult dysphagia and the latter one third on pediatric dysphagia.

Motor Speech Disorders. Prerequisite: 5153. Nature, evaluation and treatment of neurologically-based motor speech disorders such as dysarthria and apraxia.

Cognitive Communication Disorders. Prerequisite: 5153. Nature, evaluation and treatment of acquired cognitive communication disorders secondary to traumatic injury or dementia.

Advanced Practicum. 1-6 credits, maximum 9. Prerequisite: consent of instructor. Practical experience for the advanced student on or off campus.

Communication Disorders in Infants and Toddlers. Prerequisite: 3224. Family-centered assessment and intervention and prevention issues with infants and toddlers, birth to 3 years of age. Children who are at risk or have communication disorders. Impact of perinatal, neonatal and postnatal biological and environmental risks on developmental outcome.


Voice Disorders. Prerequisite: 4313. The physiology of the vocal mechanism and factors which cause voice deviations. Recent research on diagnostic and intervention procedures in a variety of disorders. Independent study, observations in medical settings, and special demonstrations.

Adaptive Communication Systems. Prerequisites: consent of instructor. Practical experience in communication sciences and disorders or consent of instructor. Evaluation and management of communication disorders in individuals requiring specially adapted educational intervention programs. Adaptive communication technologies.

Craniofacial Anomalies. Prerequisites: 4214, 4313. Recent research in the etiology, assessment and management of communicative disorders in individuals with orofacial anomalies.

Communication Disorders in Individuals with Developmental Delay. Prerequisites: 3224, 5113. Etiology, assessment and intervention considerations for communication disorders in children and adults with varying degrees of developmental delay.
5710* Special Topics in Communication Disorders. 1-4 credits, maximum 9. Prerequisite: consent of department head. Individual and group investigations of problems in communication sciences and disorders.

5720* Seminar in Communication Disorders. 1-3 credits, maximum 3. Prerequisite: consent of instructor. Topics relevant to the evaluation and treatment of communication disorders presented on a rotating basis.

5730* Independent Study in Communication Sciences and Disorders. 1-3 credits, maximum 3. Prerequisite: graduate standing and consent of instructor. Directed readings or research in communication sciences and disorders.

5731* Professional Issues. Prerequisite: graduate standing in speech pathology. Discussion of professional standards, ethics, practice and issues in speech-language pathology.

5742* Multicultural Applications in Communication Disorders. Prerequisites: 3224, 4253, or consent of instructor. The study of communication differences and disorders in culturally and linguistically diverse individuals. Clinical applications in assessment and intervention. Case study and program design.


5760* Portfolio. 1-2 credits, maximum 2. Prerequisite: graduate standing. Nature and preparation of professional portfolio with faculty guidance.

Computer Science (CS)

1002 Computer Literacy. Lab 2. For students with little or no personal computer skills. Use of Internet and productivity software such as word processing and spreadsheets.


2133 (A) Computer Science I. Prerequisite: MATH 1513 or equivalent. Introduction to computer science using a block-structured high-level computer language, including subprograms and arrays. Principles of problem solving, debugging, documentation and good programming practice. Elementary methods of sorting and searching. Use of operating system commands and utilities.


2301 FORTRAN 77 Programming. Lab 2. Prerequisite: 2113. FORTRAN 77 control structures, arrays, subroutines, functions, input/output. A major programming assignment will be completed by each student enrolled in the course.


2351 UNIX Programming. Lab 2. Prerequisite: 2113. The UNIX programming system. The programming environment. The UNIX file system and the shell. Use of pipes and filters.

2432 The C Programming Language. Prerequisite: 2113. C programming language types, operators, expressions, control flow, functions, structures, pointers, arrays, UNIX interface.

2570 Special Problems in Computer Science. 1-3 credits, maximum 6. Prerequisites: consent of instructor and freshman or sophomore standing. Current topics and applications of computer science. Existing and new topics to computer science. Allows lower-division students to study topics not provided in existing classes. Can be individual study or a class with a new subject.

2653 Discrete Mathematics I. Prerequisite: MATH 1513 or 1715. Logic, set theory proof techniques, probability and combinatorics, relations and function, matrix algebra, graphs, Boolean algebra and lattices. Same course as MATH 2653.

3030 Industrial Practice in Computer Science. 1-6 credits, maximum 12. Prerequisites: 3443, MATH 2155, junior standing, consent of departmental adviser. Applied computing in industry. Topics vary with cooperating employers. Written reports will be specified by adviser.

3302 ADA Programming. Prerequisite: 2133. ADA-R control structures, data structures, subprograms, types, parallel processing, exception conditions.

3363* Organization of Programming Languages. Prerequisites: 2133, 3570. Programming language constructs. Run time behavior of programs. Language structure and abstract data structures and data flow programming paradigms.


3423* File Structures. Prerequisite: 2133. Basic physical characteristics of peripheral storage devices. File organization and processing methods. Text sequential, direct, indexed, tree structured and inverted files. Application of data structure concepts to logical and physical file organization. Performance analysis. Elements of advanced data base systems.

3443 Computer Systems. Prerequisite: 2133. Functional and register level description of computer systems, computer structures, addressing techniques, macros, linkage, input-output operations. Introduction to file processing operations and auxiliary storage devices. Programming assignments are implemented in assembly language.

3513 Numerical Methods for Digital Computers. Prerequisites: MATH 2155, 3013, knowledge of FORTRAN. Digital computer approximate solutions of algebraic and transcendental equations, solutions of linear and nonlinear equations, functional approximations, least squares curve fitting and applied topics. Practical programming experience in applications of these techniques.

3570 Special Problems in Computer Science. 1-3 credits, maximum 6. Prerequisites: junior standing and consent of instructor. Current topics and applications of computer science. Existing and new topics to computer science. Allows lower-division students to study topics not provided in existing classes. Can be individual study or a class with a new subject.


3653 (A) Discrete Mathematics II. Prerequisite: 2653 or MATH 3613. A continuation of 2653; algebraic structures, coding theory, finite state machines, machine decomposition, computability, formal language theory. Same course as MATH 3653.

4003* Mathematical Logic and Computability. Prerequisite: MATH 2613 or PHIL 4003 or consent of instructor. The basic metamathematics of first order logic: soundness, completeness, compactness, Lowenheim-Skolem theorem, undecidability of first order logic, Godel's incompleteness theorem. Topics include enumerability, diagonalization, formal systems, standard and nonstandard models, Godel numberings, Turing machines, recursive functions, and evidence for Church's theses. Same course as MATH 4003 and PHIL 4003.

4113* (A) Techniques of Computer Science for Science and Engineering. Prerequisites: one year calculus and senior or graduate standing. For graduate and advanced undergraduate students requiring a one-semester treatment of computer topics. No background in computing topics assumed. Comprehensive treatment of the FORTRAN language with emphasis on numerical applications. Number systems, finite arithmetic, iterative processes, program structuring, numerical methods, program libraries are covered.

4143 Computer Graphics. Prerequisites: MATH 2133, MATH 2145. Interactive graphics programming; graphics hardware; geometrical transformation; data structures for graphic representations; viewing in 2 and 3 dimensions; representation of 3D shapes; hidden edge and hidden surface removal algorithms; shading models.
Computer Science 227

5000 Research and Thesis. 1-6 credits, maximum 6. Prerequisite: consent of major professor. A student studying for a master's degree who elects to write a thesis or a report must enroll in this course.

5013 Linear Programming. Prerequisites: MATH 3013 or IEM 4014; FORTRAN. Simplex algorithm to solve deterministic linear optimization models considering maximization and minimization objectives; degeneracy, alternative optima and no feasible solutions. Revised simplex procedures. Duality theory, economic interpretations, dual simplexing and complementary pivoting. Sensitivity analysis and parametric programming. Special cases of linear optimization; problems and underlying mathematical foundations. Large-scale models including computational considerations. Same course as INDEN 5013.

5030 Professional Practice. 1-9 credits, maximum 6. Prerequisites: graduate standing in computer science, consent of the department head. Experience in the application of computer science principles to problems encountered in industry and government. Participation in projects under the direction of a faculty member, with a research program ending with an honors project under the direction of a faculty member, with a second faculty reader and an oral examination. Required for graduation with departmental honors in computing and information science.


4443 Compiler Writing I. Prerequisites: 2133, 3443. Syntax and semantics of procedures-oriented languages and theory of translation techniques used in their compilation. Study of languages for particular application areas, including nonalgebraic languages.

5013 Numerical Mathematics: Analysis. Prerequisites: MATH 2233, MATH 3013, knowledge of FORTRAN. Machine computing, algorithms, and analysis of errors applied to interpolation and approximation of functions solving equations and optimizing functionals. Fixed-point and Newton-Raphson methods for integrals and differential equations. Same course as MATH 4513.

5423 Advanced Organization of Operating Systems. Prerequisites: 2133, 3443 or ECEN 3313. Process management, distributed systems and their systematic design. Introduction to the use, structure, and architecture of computer networks. Networking experiments to describe network topologies. A guided research project. Same course as ECEN 4283.

4273 Advanced Organization of Operating Systems. Prerequisites: 2133, 3443 or ECEN 3313; UNIX knowledge. Computer networks, distributed systems and their systematic design. Introduction to the use, structure, and architecture of computer networks. Networking experiments to describe network topologies. A guided research project. Same course as ECEN 4283.

4513 Computer Organization and Architecture. Prerequisite: 3443. Computer architecture, compiler control, microprogrammed control, addressing structures, memory hierarchies, hardware description languages, specific architectures, hardware simulation, emulation.

5014 Computer Science Collaboration. Lab 2. Prerequisite: computer science for students whose undergraduate major was not computer science. Programming in high-level languages. Programming in assembly language. Algorithm design and analysis. Computer system fundamentals. Fundamental data structures.

5213 Advanced Software Engineering. Lab 2. Prerequisite: 4273. Continuation of 4273. Advanced theory and practice of software design methodology. Large-scale design and implementation problems. Experimental design for software engineering. Same course as ECEN 5273.

5253 Computer Networking Programming. Prerequisite: 4283. Detailed technical concepts related to computer and telecommunications software development. Client-server programming using various application program interfaces, including STREAMS, the Transport Layer Interface (TLI), and Berkeley Sockets. Application development using TCP/IP protocols.


5323 Design and Implementation of Operating Systems II. Prerequisite: 4273. Task systems and concurrent programming, synchronization and inter process communication. Theoretical investigation of memory management, strategies, and scheduling algorithms, queuing theory, distributed operating systems. System accounting, user services and utilities.

4443 Compiler Writing II. Prerequisite: 4443. Continuation of 4443. Theory and practice of compiler writing techniques. Compiler writing systems. A formal approach to computer languages.


5413 Data Structures and Algorithm Analysis II. Prerequisites: 3363. Data structures and their application in recursive and iterative algorithms. Static and dynamic data structure representations and processing algorithms. Dynamic and virtual storage management.

5421 Information Organization and Retrieval. Prerequisites: 3423, 4343 or equivalents. An overview of database management systems, entity-relationship model, relational model, algebra, calculus, structural query language, relational database design with normalization theorems, database integrity constraints, object-oriented model.


5513 Numerical Analysis I. Prerequisite: 4513 or MATH 4513. Algorithms and error analysis; solution of equations; interpolation and approximation theory.

5543 Numerical Analysis for Differential Equations. Prerequisites: 4513 or MATH 4513 and 4233. Advanced machine computing, algorithms, analysis of truncation and rounding errors, convergence and stability applied to discrete variable, finite element, and spectral methods in ordinary and partial differential equations. Same course as MATH 5543.

5553 Numerical Analysis for Linear Algebra. Prerequisites: MATH 3013 and CS 4513 or MATH 4513. Advanced machine computing, algorithms, analysis of rounding errors, condition, convergence, and stability applied to direct and iterative solution of linear systems of equations, linear least squares, and eigenvalue problems. LU and QR factorization, conjugate gradients, QR algorithm, and Lanczos method. Same course as MATH 5553.
Automata and Finite State Machines. Prerequisite: 5313. Finite state model, state diagrams and flow tables, equivalent states and equivalent machines. Formal grammars, context-free languages, and their relation to automata. Turing machines, computability and recursive function. Same course as MATH 5653.

Computability and Decidability. Prerequisite: 5313. Effectiveness, primitive recursivity, general recursivity, recursive functions, equivalence of computability, definitions, decidability, and recursive algorithms. Same course as MATH 5663.

Artificial Intelligence and Expert Systems. Prerequisites: 4793, graduate standing in computer science. Advanced knowledge representation and expert systems programming, including reasoning under uncertainty. Applications to planning, agents, intelligent agents, natural language processing, robotics and machine learning. Development of an expert system or research report required. Common lectures with ECE 5293, IEM 5933, and MAE 5793.

Research and Dissertation. 2-15 credits, maximum 30. Prerequisites: graduate standing and approval of advisory committee. Independent research under the direction of a member of the graduate faculty. For students working toward a Ph.D. degree.

Nonlinear and Integer Optimization. Prerequisites: 5013 or IEM 4014; FORTRAN or PASCAL. Theoretical and practical aspects of nonlinear and integer optimization. Development and application of nonlinear optimization techniques for unconstrained and constrained problems; sequential search, gradient, penalty and barrier, and projection methods. Development and application of integer and mixed integer techniques for unconstrained and constrained problems; implicit enumeration, branch and bound, and cutting methods. Same course as IEM 6023.

Advanced Topics in Computer Organization. 2-6 credits, maximum 12. Prerequisites: 5113 and 5253. Structure and organization of advanced computer systems, parallel and pipelining computers, methods of computation, alignment networks, conflict-free memories, bounds on computation time.

Advanced Topics in Computer Architecture. Prerequisite: 5253 or ECE 5253. Innovations in the architecture and organization of computers, with an emphasis on parallelism. Topics may include pipelining, multiprocessors, data flow, and reduction machines. Same course as ECE 6253.

Advanced Topics in Programming Languages. 2-6 credits, maximum 12. Prerequisite: 5313. Interpreter models of programming language semantics, Vienna definition language, lambda calculus, LISP definition; Knuth semantic systems and their formulation, translational and denotational semantics. May be repeated with change of topics.

Advanced Topics in Operating Systems. 2-6 credits, maximum 12. Prerequisite: 5323. Design and analysis of operating systems. Concurrent processes, server scheduling, models of auxiliary storage, memory management, virtual systems, performance algorithms. Maybe repeated with a change in topics.

Advanced Topics in Information Systems. 2-6 credits, maximum 12. Prerequisites: 5413, 5423. Principles of distributed database systems. Overview of relational database management systems (DBMS) and computer networks, distributed DBMS architecture, distributed database design, distributed concurrency control, query processing, distributed DBMS reliability.


Advanced Topics in Analysis of Algorithms. 2-6 credits, maximum 12. Prerequisite: 5413. Analysis of various algorithms. Sorting, searching, computational complexity, lower bounds for algorithms; NP-hard and NP-complete problems; parallel algorithms; proof of correctness of algorithms. May be repeated with change of topics.

Algebraic Structures of Formal Grammars. Prerequisites: 5313, 5653. Context-free languages, Kleene languages, Dyck languages, context-sensitive languages; use of algebraic systems to define languages; linear bounded automata.

Advanced Topics in Artificial Intelligence. 2-6 credits, maximum 12. Prerequisite: 5793 or consent of instructor. Machine learning; computer perception and robotics; logic programming; natural language understanding; intelligent agents; medical informatics. May be repeated with change of topics.

Construction Management Technology (CMT)

Introduction to Construction. Lab 1. Overview of the entire construction industry with emphasis on construction materials, methods and systems. Both building and heavy highway construction drawings and their interpretation.

Construction Drawings and CAD. Lab 6. Interpretation and production of construction drawings, architectural and engineering drafting using both drafting machines and computer aided drafting.

Construction Computer Application in Construction. Lab 3. Prerequisite: 1213 and MATH 1513. Disk operating systems, introduction to programming in Basic, word processing, spreadsheets. Applications to the construction industry.

Construction Practices and Procedures. Light, heavy and industrial construction. Foundation layout, framing and finish work, site investigations, excavation, precast concrete, tilt up, structural steel and metal building construction and project management.


Estimating I. Prerequisites: 2253 and 2333. Quantity take-off with emphasis on excavation, formwork and concrete, masonry, rough carpentry and miscellaneous specialty items.

Construction Practice. Prerequisites: junior standing and consent of department head. Supervised field experiences in construction during the junior or senior year, emphasizing the wide variety of layout, concrete placement, framing and finish techniques employed.

Timber and Form Design. Lab 3. Prerequisite: MECDT 3323. Basic timber structures with emphasis on concrete form applications.

Environmental Building Systems. Lab 3. Prerequisite: PHYS 1214. Plumbing, heating, air-conditioning, electrical and lighting systems as applied to residences and commercial buildings.


Concrete Design. Lab 3. Prerequisite: MET 3323. Analysis and design of reinforced and pre-stressed concrete in accordance with the ACI building code.

Advanced Construction Management Problems. 1-6 credits, maximum 6. Prerequisites: junior standing and consent of instructor. Special problems in construction management.

Estimating II. Prerequisite: 3263. Extensive use of actual contract documents for quantity take-off, pricing and assembling the bid for several projects. Use of computers in estimating.


Construction Manager Concepts. Prerequisites: 4783 or LIVE 4273. Capstone course utilizing skills and knowledge of estimating scheduling, bidding, construction management, CAD, TOM, partnering, safety, and other managerial resources. Defining the expanding role of the construction manager in industry.

Construction Safety and Loss Control. Prerequisite: senior standing. A detailed study of OSHA Part 1926 - Construction Safety and Health Compliance and related safety topics; all elements of the OSHA 30-hour training course; students completing the course are OSHA Certified Competent Persons; concepts and methods of loss control.

Construction Law and Insurance. Prerequisite: senior standing. Legal and insurance problems as they pertain to the construction industry.

Seminar. Prerequisites: CIVE 3614. Construction scheduling; construction equipment management; advanced techniques of construction project layout and control.
Counseling Psychology (CPSY)

1112 World of Work. Assists students in exploring career options through increased understanding of self and expanded knowledge of occupational information. Includes a study of the decision-making process and a look at the present and future changing world of work. 5000

Master's Thesis. 1-6 credits, maximum 6. Prerequisite: consent of advisory committee chairperson. Report of research conducted by a student in the master's program in counseling. Credit given and grade assigned upon completion and acceptance of the thesis.

5042 Interviewing Techniques. Basic principles underlying effective interviewing and interpersonal communication skills. Overview of various types of interviews. Application and analysis of interviews through video and audio tapes.

5123 Medical Information in Counseling. Orientation to medical information and medical aspects of disability. Application to clinical problems in human service professions such as rehabilitation counseling, counseling psychology, and related disciplines.

5173 Gerontological Counseling. An examination of mental health treatment modalities and approaches to counseling with older adults. An experiential component is included.

5183 Introduction to Rehabilitation Counseling. Background, legal aspects and philosophy of rehabilitation. Overview of current practices in rehabilitation and related areas.

5223 Psychology of Disability. Psychological and sociological implications of physical disability and illness. Dynamics involved in adjusting to disabling conditions including issues in rehabilitation psychology, counseling, and somato-psychotherapy.

5320 Seminar in Counseling Psychology. 3-9 credits, maximum 9. Prerequisite: graduate standing. In-depth exploration of contemporary topics in counseling psychology.

5453 Vocational and Career Information. Local, state and national sources of occupational information about jobs and sociological factors related to career planning and worker effectiveness.

5473 Introduction to Counseling Practice. Prerequisite: graduate standing. Orientation to counseling practice through observation and participation. The supervised experiences permit the student and the counselor education staff to evaluate the student's strengths and weaknesses as a potential counselor or student personnel administrator.

5483 Community Counseling and Resource Development. Prerequisite: graduate standing. Application of educational, preventive, and crisis interventions in a variety of human service settings, including the development and evaluation of community helping resources.

5493 Professional and Ethical Issues in Counseling. Prerequisite: admission to community counseling, elementary or secondary school counseling graduate program or consent of instructor. Principles and issues of communication, professionalism and ethics. Seminar format with special emphasis on student's thorough preparation for, and active participation in, class discussions.

5503 Multicultural Counseling. Emphasis on effective communication skills in cross-cultural counseling or helping relationships and the integration of theoretical knowledge with experimental learning. Psycho-social factors, life styles, etc. of various cultural and ethnic groups and their influence on the helping relationship.

5513 Secondary School Counseling and Development. Cooperation of the school counselor, teachers, principals, and parents emphasized in organizing, developing, implementing, and evaluating a counseling and development program in secondary schools.

5523 Individual Appraisal. 3 credits, maximum 6. Methods of developing a framework for understanding individuals and techniques for data collection. Report in written form such as interviews, testing, and case study. The study of individual differences including ethnic, cultural, and gender factors.

5533 Developmental Interventions. Lab 2. Counseling theories and techniques for working with children, adolescents, and their parents in individual and group counseling and consulting. Laboratory portion translates theory to practice.

5543 Career Development Theories. Historical and contemporary viewpoints advanced by Ginsberg, Super, Holland, Roe, etc. Counselors are assisted in developing the theoretical and applied basis for developing school-based career education programs and for assisting individuals in career planning.

5553 Principles of Counseling. A comprehensive foundation for counseling practice and the application of contemporary theories to further knowledge of counseling as a communication process.

5563 Conceptualization and Diagnosis in Counseling. Prerequisites: 5473 and 5553 or consent of instructor. Foundation in skills necessary to conceptualize and diagnose clients presentations of problems in counseling. Intake interviewing and report writing skills, case conceptualization skills, and differential diagnostic skills using the DSM system.

5573 Elementary School Counseling and Development. Cooperation of the school counselor, teachers, principals, and parents emphasized in organizing, developing, implementing, and evaluating a counseling and development program in elementary schools.

5583 Group Process. Lab 2. Group dynamics, theory and techniques applicable to working with people of all ages in various school and non-school settings. Group member competencies are stressed during the laboratory period.

5593 Counseling Practicum. 3-12 credits, maximum 12. Prerequisites: grade of "B" or better in 5473 and 5553; admission to the counseling and student personnel program or consent of instructor. Supervised experience in human interaction processes of counseling and consulting with the major goal of facilitating positive growth processes through individual supervision. May be conducted in a variety of settings with a wide range of developmental levels.

5673 Rehabilitation Counseling Practicum. 1-12 credits, maximum 12. Prerequisites: graduate standing and consent of instructor. Applied experience for graduate students in counseling.

5686 Internship in Counseling. Prerequisites: grade of "B" or better in 5593 and admission to counseling program. Supervised experience working and studying in a counseling agency or setting.

5720 Workshop. 1-9 credits, maximum 9. Professional workshops on various topics. Designed to meet unique or special needs of professionals in various mental health fields.

6000 Doctoral Dissertation. 1-25 credits, maximum 25. Prerequisite: consent of advisory committee chairperson. Report of research conducted by a student in the doctoral program in counseling psychology. Credit given and grade assigned upon completion and acceptance of the doctoral dissertation.

6053 Ethical and Legal Issues in Professional Psychology. Prerequisite: consent of instructor. Ethical and legal standards applied to the professional practice of psychology.

6063 Principles of Counseling Psychology. Prerequisite: admission to the doctoral program in counseling psychology. Development, theoretical foundations and applications of therapeutic models of counseling and psychology.

6123 Adult Personality Assessment. Prerequisite: admission to counseling, school, or clinical psychology program. Administration and interpretation of adult personality assessment instruments such as Rorschach, TAT and DAP.

6153 Personality Theories. Prerequisite: graduate standing. An in-depth analysis of personality theories and personality disorders.

6310 Advanced Practicum and Supervision. 3-12 credits, maximum 12. Prerequisite: admission to counseling psychology program. For prospective counseling psychologists, counselor educators and supervisors, and practicing counselors. Supervised assistance in development of counseling, consulting and supervisory competencies.

6313 Advanced Group Interventions. Lab 1. Prerequisite: admission to counseling psychology program or consent of instructor. Discussion and exploration of various aspects of group development and treatment. Theory and application of theory. Various factors associated with group psychotherapy cohesion, dynamics and screening.
Counseling Psychology Practicum I. Prerequisite: admission into the doctoral program in counseling psychology. For prospective counseling psychologists. Individual and group supervision and didactic experiences to facilitate the development of counseling psychology competencies with clients at practicum sites. Integrating theory and research into the practice of counseling psychology.

Counseling Psychology Practicum II. Prerequisite: grade of "B" or better in 6431. For prospective counseling psychologists. Individual and group supervision and didactic experiences to facilitate the development of counseling psychology competencies with clients at practicum sites. Integrating theory and psychological assessment skills into the practice of counseling psychology.

Counseling Psychology Practicum III. Prerequisite: grade of "B" or better in 6432. For prospective counseling psychologists. Individual and group supervision and didactic experiences to facilitate the development of counseling psychology competencies with clients at practicum sites. Building integrating consultation skills into the practice of counseling psychology.

Advanced Practice in Marital and Family Treatment. Prerequisite: admission to counseling, school or clinical psychology program. Advanced methods in assessment, diagnosis and treatment of marital and family problems. Skill development, professionalism; ethics and case management. Dynamics of co-therapy and joint treatment. Case consultation format. Same as PSYC 6552.

Advanced Internship in Counseling. 1-3 credits, maximum 6. Prerequisite: admission to the doctoral program in psychology. Designed to facilitate counseling effectiveness and to set the stage for a productive life of professional practice.

Directed Reading. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Directed reading for students with advanced graduate standing.

Curriculum and Instruction Education (CIED)

Improving College Reading Skills. Lab 1. Individualized instruction and lab experiences for the improvement of college reading and learning skills, including vocabulary, reading rate, comprehension and learning strategies. May be used to fulfill the reading improvement requirement established by State Regents policy. Graded on a satisfactory-unsatisfactory basis. 0123

Reading and Study Skills for College Students. 1-4 credits, maximum 4. Lab 1-4. Instruction and laboratory experience for the improvement of reading rate, vocabulary, comprehension and study skills. Graded on pass-fail basis. 1230
4313* Young Adult Literature. Survey of print and non-print materials, including multicultural and multi-ethnic materials for young adults from middle school through high school. History, criticism, selection and evaluation of young adult literature and exploration of its relation to the needs and interests of young people. Same course as LBSC 4313.

4323 Social Studies in the Elementary School Curriculum. Prerequisite: full admission to Teacher Education. Purposes, selection and organization of content, teaching and learning procedures and evaluation of outcomes in elementary social studies.

4343 Science in the Middle Level Curriculum. Prerequisites: enrollment in 3620 and full admission to Teacher Education. Objectives, organization, and selection of science content and the analysis of teaching, learning, and evaluation procedures for middle level science.

4353 Science in the Elementary School Curriculum. Prerequisite: full admission to Teacher Education. The purposes, selection and organization of content, teaching and learning procedures and evaluation of outcomes in elementary school science.

4450 Internship in Elementary Education. 1-12 credits, maximum 12. Lab 3-36. Prerequisites: concurrent enrollment in 4453 or 4730 and 4720 and full admission to Professional Education. Advanced clinical a perience as associate (student) teacher in schools, kindergarten through grade eight. Graded on a pass-fail basis.

4453 Senior Seminar in Elementary Education. Prerequisite: concurrent enrollment and full admission to Professional Education. Legal and ethical issues forms of assessment including standardized testing, working with colleagues and other professionals, integration of performing arts in luding music and drama, and school climate and community relations. Available in discipline-specialized sections: English/language arts, mathematics, science and social studies.

4713 Teaching and Learning in the Secondary School. Prerequisite: full admission to Teacher Education. Purposes, selection and organization of curriculum content, teaching and learning theories and procedures, and evaluation of outcomes for diverse students. Teaching techniques and materials in grades 7-12 subject areas. Available in certification disciplines: art, English/language arts, foreign languages, mathematics, science, social studies.

4720 Internship in the Secondary Schools. 1-12 credits, maximum 12. Lab 3-36. Prerequisites: concurrent enrollment in 4730 or 4724 and full admission to Professional Education. Supervised observation and student teaching in fields in which competencies in the content, methods, philosophy, and historical perspective of contemporary environmental education curricula using both indoor and outdoor settings as a multidisciplinary learning laboratory.

5000 Master's Report or Thesis. 1-6 credits, maximum 6. Prerequisite: consent of adviser. Students studying for a master's degree enroll in this course for a total of 2 credit hours if they write a report or 6 hours if they write a thesis.

5033 Teaching Foreign Languages in the Schools. Prerequisite: full admission to Professional Education. Curriculum, materials, methods and procedures related to foreign languages (grades K-12).

5043 Fundamentals of Teaching. Current issues and trends in teaching theory, practice and research with emphasis on teacher reflection.

5053 Fundamentals of Curriculum Development. A study of curriculum that includes philosophy, history, decision making, major concepts and terms.

5063 Curriculum Inquiry. Study of major research in the field of curriculum studies and supervision, with analysis of various forms of inquiry in curriculum research, such as philosophical, phenomenological, historical, empirical, narrative, critical, feminist and action inquiry, among others.
Pedagogical Research. Theory and application of pedagogical inquiry with emphasis on teacher as researcher, pedagogical question formulation and techniques of pedagogical inquiry including narrative, autobiography, case writing, action research, and artificial documentation of teacher performance.


Advanced Studies in Children's Literature. 1-3 credits, maximum 6. The history of children's books against a world background of prevailing political, economic and social factors influencing cultural patterns and values. The tools of research in children's literature and the nature and direction of contemporary children's book publishing in the United States and abroad.

Photography for Instruction. Photography skills emphasizing 35mm and instamatic type cameras with application to instruction and other communication situations such as photo-copying, and high-contrast film for graphics, and simple photography projects for school-age students.

Language Arts in the Curriculum. Content and current issues in the language arts. Materials and methods for teaching the communication process.

Middle School Curriculum. Theory of planning and developing learning experiences appropriate to the needs and interests of early adolescents.

Kindergarten-Primary Curriculum. Study of kindergarten-primary curriculum including philosophy, history, current practice and issues. For administrators, teachers and students in curriculum and early childhood education.

Teaching Science in the Elementary School. Materials, methods and classroom procedures related to science in the elementary school.


Environmental Education in the Curriculum. Integration of environmental concepts in the total school curriculum. Review of K-12 environmental education curricula and methods of teaching environmental education in formal and informal settings.

Intermediate (4-6) Mathematics Education. The study of numerical and algebraic concepts and operations, the development of the mathematics curriculum and instruction at the intermediate (4-6) grade levels. Problem solving, fractions, decimals, percent, and applications.


Practicum in School Mathematics. 1-3 credits, maximum 6. Lab 2-6. Diagnostic and therapeutic procedures in mathematics with students. Laboratory classes provide for clinical experiences in evaluation and instruction with children experiencing difficulty in mathematics.

Kindergarten-Primary (K-3) Mathematics Education. Theory and research on mathematics learning and teaching from the preschool level through the early elementary years. Study and analysis of children's construction of mathematics knowledge and the implications for teaching. Methods for promoting conceptual understanding and enthusiasm for the further study of mathematics.

Workshop in Science Education. 1-4 credits, maximum 4. Develops and/or implements elementary and secondary science programs.

Teaching Social Studies in the Schools. Curriculum, materials, methods and procedures related to social studies.

The Visual Arts in the Curriculum. 1-3 credits, maximum 6. Lab 2. Creative approaches to the use of two- and three-dimensional media as they relate to various aspects of education. Opportunities available for periodic group and individual evaluation in order to give direction and significance to future growth.

Developmental Reading at the Primary Level. Analysis of sequential growth in reading from the preschool level through the early elementary years. Examination of the reading process and instructional procedures.

Developmental Reading at Intermediate, Middle and Secondary Levels. Examination of the developmental reading curriculum at intermediate, middle and secondary levels including evaluation of teaching methods and materials.

Diagnosis and Treatment of Reading Problems. Diagnosis of reading disabilities, remedial measures and work with clinical cases.

Clinical Aspects of Reading Disability. Refines the diagnostic and remedial skills of the student through the study of clinical instruments, research, info mal measurements and remedial approaches used in reading clinics.

In-service in Reading. 1-6 credits, maximum 6. Lab 2-4, Prerequisite 5463. Application of diagnostic and therapeutic procedures with readers of all ages. Laboratory classes provide for clinical experience in evaluation and instruction in developmental and remedial programs in reading for children.

Effective Teaching of Mathematics in the Secondary School. Prerequisite: consent of instructor. Directed advanced practicum in secondary school mathematical education. Includes study of current research findings in mathematical education, teaching strategies, materials and evaluation procedures in the secondary school. For experienced classroom teachers, superintendents, principals and supervisors.

Multicultural and Diversity Issues in Curriculum. Understanding of the historical and contemporary perspectives toward cultural diversity. Development of an awareness of diverse culture and language communities; understanding of critical issues of race, class, gender, and ethnicity in education; perennial issues of: multiculturalism in public education and in global society; a comprehensive overview of principles and current research on bilingual and multicultural education.

Developmental Reading for College and Adult Level Readers. Emphasis on assessment of the needs, materials, curricula, and instructional strategies for college and adult readers. The study of illiteracy. Consideration of the development, organization and supervision of programs for such learners.

Inservice for middle to secondary teachers especially with professional development in their own school settings and in further graduate work. Examination of own practices through reflection and research, study of diverse adolescents, sharing of teaching approaches and materials across the curriculum, and exploration of outreach to school, family, and community. Teacher leadership.

Education Workshop. 1-8 credits, maximum 8. For teachers, principals, superintendents and supervisors who need advanced curriculum and instruction coursework related to K-12 subject areas and pedagogy, in the areas of construction and administration. Students must register for the full number of credit hours for which the workshop is scheduled for a particular term.

Seminar in Education. 1-6 credits, maximum 6. Seminar topics may differ depending upon the nature of current interests and topics in American education.

Seminar in Mathematics Education. 1-6 credits, maximum 6. Lab 0-6. Prerequisite: consent of instructor. Problems, issues and trends in mathematics education.

Directed Study. 1-3 credits, maximum 3. Lab 1-3. Prerequisite: consent of instructor. Directed study for master's level students.

Doctoral Thesis. 1-15 credits, maximum 15. Required of all candidates for the Doctor of Education degree. Credit is given upon completion of the thesis.

Contemporary Issues in Curriculum Studies. 1-6 credits, maximum 6. Examination of selected contemporary topics in curriculum studies.

Analysis of Teaching. Advanced study of multiple forms of analysis of teaching such as behavioral, phenomenological, and constructivists with emphasis on major research on teaching reflection and teacher narrative.

Curriculum Leadership. A study of curriculum leadership and implications for schooling; focus on what it means to be a curriculum leader in times of major societal change and educational reform.
Design, Housing and Merchandising (DHM)


1103 Basic Apparel Assembly. Lab 4. Basic apparel assembly techniques. Problems including basic fit, spreading and cutting methods and equipment, and use and application of sewing equipment including lock, chain, and overedge.

1123 Graphic Design for Interiors. Lab 6. Interior design majors only. Drafting and visual communication techniques related to interiors.

1433 Fashion Innovation and Marketing. The process of fashion innovation; variables of fashion affecting production and distribution of consumer goods; development of present structure in the fashion industry.

2003 Creative Problem Solving in Design and Merchandising. Participatory problem solving in design and merchandising; critique of proposed solutions as a positive process of evaluation.

2110 Fashion Showmanship. 1 credit, maximum 8. Preparation, production and evaluation of special fashion-related events. Professional learning experiences will include modeling techniques, organization and directing procedures.


2303 Materials and Finishes for Interior Building Systems. Prerequisites: 1003, 1123, 2993. Materials and finishing processes in the design and production of interior and building systems.

2343 Design and Space. Lab 6. Prerequisites: 1123, 2223 and 2313. Creative exploration of three-dimensional spaces in interior design.

2573 (L)Textiles. Lab 2. Science principles as the basis for understanding fibers, the basic structure of yarns and fabrics. Relationships between the chemical composition of fibers and properties such as tensile strength, flammability, elasticity, moisture absorption, and dye affinity. Understanding science principles in relation to textile properties for evaluation of textile products. Recommended for education majors seeking knowledge to be used for innovative teaching of science principles in grades K-12. Required for all DHM majors.


2993 Communication and Presentation Techniques for Apparel and Interior Design. Lab 4. Prerequisites: 1003, ART 1103 and SPCH 2713. Creative communication methods and techniques including a variety of media for two- and three-dimensional presentations in apparel and interior design.

3002 Professional Image and Dress. Role of appearance and dress in creating a professional image; expectations of worn clothing, figure and wardrobe analysis, professional clothing needs, individualized clothing decisions.

3013 Flat Pattern Design. Lab 4. Prerequisites: 2203 and MATH 1513. Interpretation of dress design developed through the medium of flat pattern; introduction to pattern drafting.

3023 Computer-aided Flat Pattern Design. Lab 4. Prerequisite: 3013. Advanced apparel design problems using flat pattern and computer-aided design (CAD) techniques.

3102 Fashion Sketching. Lab 4. Prerequisites: 1003 or 4 credit hours of art and completion of 60 credit hours. Principles and techniques of sketching in the fashion field.

3153 Mass Production of Apparel and Related Products. Lab 4. Understanding and applying mass production strategies for apparel and related products. Design for production and production operations including CAD marker making and material utilization, production simulation, modeling, and costing.

3203 Functional Clothing Design. Lab 4. Prerequisites: 2573, 3013 and 4 credit hours of chemistry. Problem-solving approach to functional clothing design for specialized market segments: athletic sportswear, occupational clothing, children's wear, clothing for the handicapped) including performance evaluation of selected materials using standard methods of testing.

3213 (H)Heritage of Dress. Prerequisite: 3 credit hours of history. Survey of historic modes of dress as they reflect the social, economic and cultural life of a people. Application of design principles to modern dress.

3233 (H)Heritage of Interiors I. Religious, civic, commercial, and domestic architecture and furnishings prior to and including the 18th Century with emphasis on the periods which have greatly influenced housing and interior design.

3243 Design of Interior Components. Lab 4. Prerequisite: pass proficiency review. Design, materials, construction and production of interior design components including custom furnishings and interior treatments and modification.

3253 Environmental Design for Interior Spaces. Lab 4. Prerequisite: pass proficiency review. Design factors and human performance criteria for lighting, acoustics and thermal/ atmospheric comfort as they relate to the practice of interior design.

3263 Interior Design Studio I: Residential. Lab 4. Prerequisite: pass proficiency review. Studio course utilizing the design process in the analysis and planning of residential environments.

3300 Supervised Field Experience. 1-3 credits, maximum 6. Prerequisite: 3243 or consent of instructor. Field experience in specialized residential, commercial and institutional design with both historic and contemporary elements.

3353 (S)Socio-Economic Aspects of Housing. Family housing needs, present social and economic conditions affecting housing and building processes and the roles of government and housing.

3363 Interior Design Studio II: Small Scale Contract. Lab 4. Prerequisites: 3243 and 3263. Studio course utilizing the design process in the analysis and planning of small office, institutional and retail environments with emphasis on materials, lighting, codes and accessibility.

3373 Computer-aided Design for Interiors. Lab 4. Prerequisite: 1123. Computer-aided design and drafting for two-dimensional and three-dimensional interior systems.

3403 Fashion Retailing. Prerequisites: 1433, ACCT 2103, ECON 1113. Marketing structures at retail level; job descriptions and responsibilities at management level; financial and control functions.
3533 Decorative Fabrics. Lab 4. Prerequisite: 3 credit hours in art. Historic and contemporary textile designs. Creation of textile designs using personal inspirations, cultural expressions and a variety of techniques.

3553 Profitable Merchandising Analysis. Prerequisites: ACCT 2103, MATH 1513 or 1483. Relationship analysis of profit and loss statement. Retail mathematical calculations necessary to plan and control merchandising results, open-to-buy, mark-up, mark-down, turn-over, stock-sales ratio.

3563 Merchandise Acquisition and Allocation. In-depth study of buying and distributing merchandising.

3643 Apparel and Accessories for Special Markets. Prerequisites: 1433, PSYC 1113, SOC 1113, and completion of 60 credit hours. An analysis of the apparel and accessory needs of specialized market segments and the products designed to meet those needs, with consideration given to both product design and merchandising.

3823 Professional Practices for Interior Design. Prerequisites: 2943, 3263 and 3303. Future professional role and responsibilities, business procedures and employer-employee relationships which characterize the employment situation in interior design.

3853 Visual Merchandising and Promotions. Lab 1. Prerequisites: 1003, 1433 and completion of 60 credit hours. Study and application of principles and practices in merchandise presentation and promotions for commercial purposes.

3991 Pre-internship Seminar. Prerequisites: 24 credit hours of required DCHM courses with a 2.50 major GPA and SPCH 2713. Skills requisite to completion of a directed, practical experience in a work situation within the fashion industry.

3994 Internship. Prerequisites: 3433, 3553, 3663 and 3991 (apparel merchandising students); 3013 and 3991 (apparel design and production students). Directed practical experience in an approved work situation related to the fashion industry.

4003 (S)Environmental Perspectives on Apparel and Interior Design. Prerequisites: completion of 90 credit hours. Analysis of apparel and interior design, development and use from physical, technical, economic, political, religious, social and aesthetic perspectives.

4011 Post-internship Seminar. Prerequisite: 3994. Study and comparison of student work experiences. Individual student conferences, review of merchant supervisor reactions.

4143* Design for Special Needs. Problems and alternative solutions for apparel and interiors for special groups, e.g., the aging, children, the handicapped, special markets. Includes field study or design problem.

4163* (H)Housing in Other Cultures. Housing and interior design and expressions of cultural beliefs, attitudes, family patterns and environmental influences.

4243* Drawing. Lab 4. Prerequisite: 2203. Interpretation of garment design developed through the medium of drawing on dress forms.

4263* Interior Design Studio III: Large Scale Contract. Lab 4. Prerequisites: 3253, 3363 and 3823. Studio course utilizing the design process in the analysis of large scale office planning and institution design including systems and specifications.

4293* Interior Design Studio IV. Lab 4. Prerequisite: 4263. Studio course developing comprehensive interior design projects in historic preservation and adaptive reuse and an advanced design project.

4323* (H)Heritage of Interiors II. Prerequisite: 3233 or consent of instructor. Exploration of the architecture, interiors and furnishings of a variety of structures. Residential, commercial, governmental, institutional, and recreational buildings of different cultures of the 19th and 20th centuries.

4403* Advanced Apparel Design. Lab 2. Prerequisites: 3013 or 4243. Application of design and pattern-making principles and apparel assembly processes in the development of original designs.

4443* Facility Management for Contract Interiors. Philosophy and principles of facility management and the practice of coordinating the physical workplace in relation to the workforce and organizational structure of the corporate environment.

4453* Entrepreneurship and Product Development for Apparel and Interiors. Prerequisites: ECON 1113 and completion of 90 credit hours. In-depth study of entrepreneurship concepts as applied to manufacturers and retailers of apparel and interior products including product development, accounting and control, merchandising and buying, operation and management, advertising and promotion.

4523 Critical Issues in Design, Housing and Merchandising. Prerequisite: senior standing. Capstone course examining critical issues in design, housing and merchandising in the context of central themes from general education.

4810* Problems in Design, Housing and Merchandising. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Selected areas of study in design, housing and merchandising.

4820 Professional Internship. 1-6 credits, maximum 6. Prerequisites: 3823 and consent of instructor. A supervised internship experience which simulates the responsibilities and duties of a practicing professional.

4850* Special Unit Course in Design, Housing and Merchandising. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Selected areas of study in design, housing and merchandising.

4900 Honors Creative Component. 1-3 credits, maximum 3. Prerequisites: College of Human Environmental Sciences Honors Program participation, senior standing. Guided creative component for students completing requirements for College Honors in the College of Human Environmental Sciences. Thesis, creative project or report under the direction of a faculty member in the major area, with second faculty reader and oral examination.

4993* (I)Textiles and Apparel in the International Economy. Prerequisites: 2913, ECON 1113, and 90 hours. Broad multi-disciplinary study of textiles and apparel in the international economy.

5000* Master's Thesis. 1-6 credits, maximum 6. Prerequisites: graduate standing and consent of master's thesis advisor. Research related directly to design, housing and merchandising for the master's thesis.

5003* Theoretical Perspectives for Design, Housing and Merchandising. A study of terminologies associated with theory. Exploration of key theories and their application to practice and research in design, housing and merchandising.

5110* Research Developments in Design, Housing and Merchandising. 1-3 credits, maximum 3. Current development and needs in research in design, housing and merchandising including application of research methods to design, housing and merchandising and research planning.

5113* Theories of Creative Process in Design and Merchandising. A study of the creative processes used in art, science, business and hybrid disciplines, with application to design and merchandising.

5233* Design Evaluation. Prerequisite: consent of instructor. Theoretical perspectives on evaluation of applied design; examination and evaluation of historic and contemporary designers, their philosophies and their work.

5240* Master's Creative Component. 1-6 credits, maximum 6. Prerequisites: consent of major professor and department head. An in-depth design application of theoretical design models and philosophies. A maximum of six hours to be used by graduate students following Plan III for the master's degree.

5273* Interpretive Theories of Material Culture. A theoretical analysis of the influences of cultural values and characteristics upon the design, acquisition and use of apparel, furnishing and building products, and the cultural diffusion of these material goods.

5343* Constructed Environment and Human Behavior. Prerequisites: 5110, 5273, PSYC 1113, SOC 1113. An exploration and evaluation of the physical attributes of the constructed environment and the interrelationships with the social and psychological aspects of human behavior.

5360* Advanced Studies in Design, Housing and Merchandising. 1-6 credits, maximum 6. Investigation into special areas in the fields of design, housing and merchandising.

5383* Design, Housing and Merchandising in Higher Education. Prerequisite: 9 credit hours in design, housing and merchandising. Development and organization of curricula and teaching methods for design, housing and merchandising.

5440* Career Internship. 1-6 credits, maximum 6. Prerequisites: consent of instructor and department head. An individualized career-oriented internship. Selected learning experiences in approved work situations in industry, government, education or research institutions related to design, housing or merchandising.
Economics (ECON)

1113* (S)The Economics of Social Issues. Issues-oriented approach. Basic economic principles introduced and developed through study of important social issues: for example, inflation, unemployment, poverty, discrimination, crime, population growth and environmental quality. Develops the economist's approach to social problems, and evaluates the contribution of economics to their solution. No credit for students with prior credit in 2103 or 2203. No general education credit for students also taking ECON 2103 or AGEC 1114.

2103 (S)Introduction to Microeconomics. Prerequisite: 15 credit hours. Goals, incentives and outcomes of economic behavior with applications and illustrations from current social issues: operation of markets for goods, services and factors of production; the behavior of firms and industries in different types of competition; income distribution; and international exchange. No general education credit for students also taking ECON 1113 or AGEC 1114.

2203 Introduction to Macroeconomics. Prerequisite: 2103 or AGEC 1114. The functioning and current problems of the aggregate economy: determination and analysis of national income, employment, inflation and stabilization; monetary and fiscal policy; and aspects of international interdependence.

3010 Special Topics in Economics. 1-3 credits, maximum 9. Prerequisite: Consent of instructor. Analysis of a contemporary topic in economics. Course content will vary to reflect changing social issues and trends in applied economics.


3023 Managerial Economics. Prerequisite: 2203. Application of economic theory and methodology to decision problems of private industry, non-profit institutions and government agencies; demand and cost analysis, forecasting, pricing and investment.

3113* (S)Intermediate Microeconomics. Prerequisite: 2203. How the market system organizes economic activity and an evaluation of its performance. Principles of price theory developed and applied to the interactions of consumers, producers and resource owners in markets characterized by different degrees of competition.

3123* (S)Intermediate Macroeconomics. Prerequisite: 2203. Development of a theoretical framework for studying the determinants of national income, employment and general price level. National income accounting, consumption, investment, government spending and taxation, the supply of and demand for money. Monetary, fiscal and incomes policy considered with regard to unemployment, inflation and economic growth.

3213 Game Theory and Experimental Economics. Prerequisite: three credit hours in economics. The fundamentals of strategic actions presented in a game theory context and the validation of the strategic ideas with economic experiments.

3313* Money and Banking. Prerequisite: 2203. The economics of money and banking. Operations of commercial banks and structure and competition of the banking industry. Organization and operation of the Federal Reserve System and its effects on interest rates, employment and prices. An introduction to monetary economics and international banking concludes the course.

3423* (S)Public Finance. Prerequisite: 3 credit hours in economics. The economics of the government sector. Scope of government activity, efficiency in government expenditures, federal budget, fiscal and debt management policy. Principles of taxation. Major tax sources, tax distribution, tax issues. Current public finance problems such as revenue sharing, negative income tax, urban transport systems and national health insurance.

3513* (S)Labor Economics and Labor Problems. Prerequisite: 3 credit hours in economics. Economic analysis of contemporary labor market problems and survey of U.S. unionism. The labor force, education and training, discrimination, inflation and unemployment theories of the labor movement, economic impact of unions and public policy toward labor.

3523* (S)Poverty and Economic Insecurity. Prerequisite: 3 credit hours in economics. Problems, programs and proposals for dealing with poverty and economic insecurity.

3613* (S)International Economic Relations. Prerequisite: 3 credit hours in economics. The ideas of the great economists with emphasis upon economic concepts and systems of thought in relation to social, ethical and political ideas under evolving historical conditions.

3623 American Economic History. Economic development and economic forces in American history; emphasis upon industrialization and its impact upon our economic society since the Civil War. Same course as HIST 4513.

3903* (S)Economics of Energy and the Environment. Prerequisite: 2103. Issues related to the development and use of energy resources, and the management of the natural environment.

4000 Economics Honors Seminar. 3-6 credits, maximum 6. Prerequisite: Honors Program participation. Topical seminar in economics for junior and senior students in the Honors Program. Special problem areas of the economy or the economics discipline. Appropriate for Honors students in any major.
4010* Basic Studies in Economics. 1-6 credits, maximum 6. Prerequisite: 3 credit hours in economics. Economic concepts, theory, issues and problems. Designed for elementary and secondary teachers in economics education teaching methods included.

4213 Econometric Methods. Prerequisites: 2203, STAT 3013 or 4013. Basic quantitative methods used in economic analysis emphasizing applications to economic problems and interpretation of empirical results. Statistical analyses, regression and forecasting techniques using computer programs.

4223 Business and Economic Forecasting. Prerequisites: 2203; STAT 3013 or 4013. Forecasting business and economic variables. Regression models and time series models such as exponential smoothing models, seasonal models, and Box-Jenkins models. Evaluation of methods and forecasting accuracy. Application of methods using computer programs.

4313* Advanced Banking. Prerequisite: 3313. Central and commercial banking, including Federal Reserve policymaking, banking structure, capital adequacy and taxation of banks. Friedman's proposals for monetary and banking reform.

4413 State and Local Government Finance. Prerequisite: 3 credit hours in economics. State and local government revenue and expenditure patterns in a federal fiscal system; intergovernmental fiscal problems; taxation in a federal system; adjustment to economic growth and change.

4513* Labor and Public Policy. Prerequisite: 3513 or MGMT 3313 or BUSL 3213. Public policy affecting union-management relations; common law, state and federal legislation; Wagner, Taft-Hartley and Landrum-Griffin Acts; labor dispute adjustment with emphasis on the theory, legal status and practice of arbitration, in both private and public sectors.

4643* (S)International Economic Development. Prerequisite: 3 credit hours in economics. Problems of underdeveloped economics related to the world economy; obstacles to economic growth and policies for promoting growth.

4713* (S)Economics of Industries. Prerequisite: 2103. Industrial organization of major U.S. industries. The structure-conduct-performance paradigm is used to evaluate the costs and concentration interact with pricing, marketing and R&D decisions to affect industry profitability, technological progress, and the efficient allocation of resources. Case studies included.

4723 Economic Analysis of Law. Prerequisite: 3 credit hours in economics. Use of economic analysis to explain why certain laws exist and to evaluate the effects of various alternative rules of law on economic efficiency and behavior. Emphasis on the economics of the common law areas of property, contracts, and torts. Also, products liability, crime and punishment, distributive justice, and discrimination.

4823* (S)Comparative Economic Systems. Prerequisite: 2203. Comparative analysis of the economic theory and institutions of capitalism, socialism, and mixed systems.

4913* (S)Urban and Regional Economics. Prerequisite: 3 credit hours in economics. Urban and regional economics; the spatial aspects of poverty, land use, the urban environment and rural-industrial development.

4993 Economics Honors Thesis. Prerequisites: departmental invitation, senior standing, Honors Program participation. A guided reading and research program preparing honors thesis under the direction of a faculty member, with second faculty reader and oral examination. Required for graduation with departmental honors in economics.

5003* Research and Thesis. 1-6 credits, maximum 6. Workshop for the exploration and development of research topics. Research leading to the master's thesis.

5003* Research Report. Prerequisite: consent of committee chairperson. Supervised research for M.S. report.

5101* Research and Independent Studies. 1-3 credits, maximum 10. Prerequisite: consent of departmental committee under a workshop arrangement or supervised independent studies.

5103 Contemporary Environmental Policy. Economic, social and political factors that influence the formation and implementation of environmental policy. Environmental policy instruments (including pollution taxes, standards and marketable pollution permits), measurement of environmental damages and risk. Risk comparison, regulatory issues, health risk assessment, and risk communication. Political-economic considerations.

5033* Macroeconomic Analysis. Prerequisite: three hours of economics or consent of instructor. Study of the determinants of aggregate output, employment, price level, and interest rates, including international aspects. Monetary, fiscal, and exchange rate policies and impact on the macroeconomy and business environment. No credit for Ph.D. students in economics.

5113 Managerial Economics. Economic theory applied to business decision making. Concepts of microeconomics and macroeconomics related to understanding the economic system, analysis of policy, forecasting, and international economics. No credit for Ph.D. students in economics.

5123* Microeconomic Theory I. Prerequisites: 3113, MATH 2265 or MATH 2713. Contemporary price and allocation theory with emphasis on comparative statics.

5133* Macroeconomic Theory I. Prerequisites: 3123, MATH 2265 or MATH 2713. National income, employment and the price level from the point of view of comparative statics.

5223* Mathematical Economics I. Prerequisites: 3113, MATH 2265 or equivalent. Mathematical concepts of single variable and multivariate calculus, topological properties of Euclidean space, convergence, linear algebra, optimization theory and the Kuhn-Tucker Theorem with applications from economic theory.

5243* Econometrics I. Prerequisite: 4213 or STAT 4043. Theory and application of econometrics to economic problems. Topics include OLS, GLS, distributed lags, serial correlation, heteroskedasticity, and simultaneous equations.

5313* Monetary Economics I. Contemporary issues in monetary theory and policy. Demand for money and supply of money theory, interest rate theory and issues in monetary policy.

5413 Economics of the Public Sector I. Allocation and distribution effects as well as incidence of governmental budget policies.

5433 Economics of the Public Sector II. Fiscal policy as a means of promoting economic stabilization and growth.

5543* Labor Market Theory and Analysis. A critical evaluation of the theoretical and empirical literature dealing with labor market processes; wage determination and the impact of unions on relative wages; estimation of aggregate labor supply; resource allocation and labor mobility; the inflation-employment tradeoff and the economics of labor market discrimination.

5613 International Finance. Open economy macroeconomics and the role of devaluation, fiscal and monetary policy in the open economy, monetary approach to the balance of payments, portfolio balance and asset market approaches to the determination of exchange rates.

5623 Economic Development I. Characteristics and problems of less-developed countries. Criteria of growth and development with emphasis on strategies for development and the role of capital, labor, technological progress and entrepreneurship. Growth models.

5633 International Trade. International trade and commercial policy. Comparative advantage, general equilibrium and modern trade theories; welfare implications of international resource allocation models; the theory of protection and international interdependence.

5643 Economic Development II. Major problems of development policy. Inflation and mobilization, of capital, investment criteria, agriculture, foreign trade, population and manpower, planning and programming methods.

5703* The Economics of Organization and Competitive Advantage. Prerequisite: 3113 or 5113 or consent of instructor. An analysis of organizational architecture (the assignment of decision-making rights, performance evaluation, and reward systems within an organization). An appropriate architecture to give an organization a competitive advantage and to help an organization develop prowess in innovation and reputation, providing other sources of competitive advantage.

5713* Industrial Organization I. Organization and operation of the enterprise sector of a free enterprise economy; interrelations of market structure, conduct and performance; public policies affecting these elements.

5723* Industrial Organization II. Alternative market structures and their relationships to market performance; the empirical evidence concerning these. Public policies toward business, including emphasis on U.S. antitrust laws and economic analysis of their enforcement; theories, of public utility regulation.

5903* Regional Economic Analysis and Policy. Selected topics in location theory, regional economic growth and policies toward regional development in the U.S.
Urban Economics. The urban area as an economic system. Problems of economic policy in urban environment.

Research and Thesis. 1-12 credits, maximum 30. Prerequisite: approval of advisory committee. Workshop for the exploration and development of research topics. Research leading to the Ph.D. dissertation.

Seminar in Economic Policy. 1-3 credits, maximum 6. Intensive analysis of selected problems in economic policy. Individual research, seminar reports and group discussion of reports.


Microeconomics Theory II. Prerequisite: 5123. Contemporary price and allocation theory with emphasis on general equilibrium analysis. Welfare economics.

Macroeconomics Theory II. Prerequisite: 5133. National income, employment and the price level from the point of view of dynamics. Growth models.

Mathematical Economics II. Prerequisite: 5223. A mathematical approach to general equilibrium and welfare economics.

Econometrics II. Prerequisite: 5243. Advanced econometric theory covering single and simultaneous equations models, seemingly unrelated regressions, limited dependent variable models, causality, and pooled models.

Monetary Economics II. Intensive analysis of classical monetary theory and individual research on selected problems in monetary economics. The ideas of Patinkin, Wicksell, Fisher and Keynes.

History of Economic Thought. Economic theories from the 18th century until the present with emphasis on the origin and improvement of analytical tools.

Seminar in Economics Systems. Selected topics dealing with the economic theory and institutions of capitalism, socialism, communism, and fascism. Individual research, seminar reports, and group discussion of reports.

Education (EDUC)

Orientation to Education. Lab 1. Study of the profession of education with emphasis on the skills, qualities and student support services available throughout the campus. Graded on a pass-fail basis.

Innovative Education Studies. 1-3 credits, maximum 6. Designed to meet unique or special needs of individuals involved in education. Topics include contemporary approaches to meeting educational challenges on the professional as well as the personal classroom experience. Graded on a pass-fail basis.

Study Abroad. 1-18 credits, maximum 36. Prerequisites: consent of the Office of International Programs and associate dean of the college. Participation in a formal study abroad program in which a semester or year is spent in full-enrollment at a university outside the U.S.

Honors Directed Study. 1-3 credits, maximum 3. Prerequisite: admission to the College of Education's Honor Program. Individualized directed study approved by a sponsoring professor or Honors coordinator.

Honors Colloquium. 1-9 credits, maximum 9. Prerequisites: consent of instructor or honors coordinator. Study of an interdisciplinary and interdisciplinary nature of various important issues and aspects as related to the field of education. Provides an intellectual challenge for the able student with a strong dedication to scholarship.

Teacher Education Seminar. 1-6 credits, maximum 6. Problems, trends, and pertinent education issues. May include simulation, small-group instruction and field-based experiences. For the pre-service or in-service level.

Teacher Education Practicum. 1-9 credits, maximum 9. Prerequisites: admission to Professional Education. Directed observation and supervised laboratory and clinical experiences in appropriate teacher education program areas. Appraisal and learning theory approaches employed.

Contemporary Educational Issues. 1-6 credits. Maximum 6. Contemporary topics and issues in the broad field of education. May include television instruction, small group discussion and outreach and field experiences. Written reports required. Graded on a pass-fail basis.

Educational Field Experiences. 1-6 credits. Maximum 6. Prerequisite: consent of instructor. Guided field experience appropriate to a specific program of study. Field experience precedes and follows by appropriate on-campus seminars, readings and reports.

Educational Leadership (EDLE)

Thesis or Report. 1-10 credits, maximum 10. Prerequisite: consent of instructor. Master's students may earn up to two hours of credit for a report or six hours of credit for a thesis. Students working on a senior's report may earn a maximum of 10 hours of credit.

The Principalship. Prerequisite: 5000-level course in school administration or equivalent. Strategies, techniques and solutions used by the principal in the administration and leadership of a public school.


Community Education. Purpose, organization and administration of community education and its various components.

Education Workshop. 1-4 credits, maximum 8. Analysis of organizational, administrative, and instructional problems by common schools and higher education personnel.

Education Law. Study of the legal framework of education (constitutional law, case law, and Oklahoma law) with emphases on church-state issues, tort liability, teachers' rights, and student rights.

Public School Administration. The scope and function of public school administration.

Historical Background of Contemporary Issues in Higher Education. The history of American colleges and universities to the present; an overview of major contemporary issues in American higher education.

Administration and Law In Higher Education. Overview of the organization and administration operations and analyses of social, political and legal influences on colleges and universities.


Educational Ideas. Decision-making processes used in educational systems and use of modern technologies for curricular enhancement and professional development.

Critical Issues in Higher Education. Issues that have shaped and are shaping higher education in American society.

Connecting Theory and Practice in Administered Schools. Application of research findings and theoretical concepts to best practice in administering educational organizations.

Professional Development and Instructional Improvement. Developmental perspectives on human, conceptual and technical skills needed for continuing professional development and instructional improvement through supervisory processes.

Public School Finance. Development of conceptual bases in economics of education, taxation, distribution systems, policy analysis; application to Oklahoma school finance; and introduction to budget development.


The Superintendency. Integration of theory and practice through examination of roles and responsibilities of the superintendent. Leadership, communications and the changing nature of public education.
The Human Factor in Administering Schools. Analysis and critique of current issues in school personnel administration such as recruitment, selection, promotion, morale, salary, staff relations and teacher assessment.

The Politics of Education. Activities of schools as they relate to the political environment, e.g., voter behavior, change strategies and community power structures.

Special Topics in Education Law. Analysis and critique of selected topics in school law relating to public school administration.

Higher Education Law. National and state constitutional provisions, laws, and court cases concerning higher education. Considerable legal research required.

Special Topics in Education Facilities. Analysis and critique of validity of selected established standards and research in education facilities.

The Impact of College on Students and on Society. The psychological and sociological impact that attending four-year colleges and universities has on undergraduates from their freshman year until they graduate.

Organizational Theory in Education. Selected organizational typologies, conceptualizations and theoretical frameworks as they relate to organizational behavior and behavior of personnel in organizations.

Organizing, Developing and Administering Community Education. Relationship between education and the community, with special emphasis on community needs and resources and the development of a total community education program. Skills and competencies for planning, implementing and evaluating community education programs.

Problems in Educational Administration. 1-4 credits, maximum 8. Special administrative problem in common schools or higher education, e.g., school plant, school/community relations, administration and the instructional programs, attrition and finance.

The Community Junior College. The American two-year college including historical and philosophical development, curricula, students and the learning process, faculty and instruction, administration and governance, support and control. Principles, practices and problems of community colleges in America.

Finance in Higher Education. Problems and prospects of financing American education, with in-depth discussion of selected topics, e.g., social capital, federal aid, faculty salaries and state support.

Special Problems. 1-4 credits, maximum 8. Assists administrators with either recurrent or unique problems arising in common schools or in higher education. Emphasizes evaluation and planning related especially to staff, programs and faculty needs.

Effective Teaching in Colleges and Universities. Relevant research and practice about effective college teaching, role of faculty in higher education settings, and development of teaching strategies and lessons for application in college classrooms.

Planning and Educational Change. Organizational and environmental parameters, sources of change, barriers to change, and strategies for planning and implementing organizational change.

Historical Development of Higher Education. History and development of higher education, studies of objectives and functions of institutional types and of students and faculty.

Administration in Higher Education. Functions and principles of administration in higher education from historical and contemporary points of view. Both internal and external forces acting on the institution treated.

Development and Implementation of Academic Programs. Development and implementation of academic programs including curriculum for colleges and universities, investigation of teaching-learning relationships, and instructional emphasis.

Educational Leadership. Leadership and the implications of leadership across contexts, cultures and time.

College and University Presidency. The role and function of the presidency. For those who anticipate a career in college and university administration or a related management position.

The Academic Department. Organization and administration in higher education emphasizing an analysis of the academic department and its leader, the department head.

Directed Reading. 1-4 credits, maximum 6. Directed reading for students with graduate standing.

Seminar. 1-4 credits, maximum 10. Topical issues related to administration and/or higher education, including research techniques available to analyze such topics.

Internship in Education. 1-4 credits, maximum 8. Prerequisite: consent of department head. Directed internship experiences designed to relate ideas and concepts to problems encountered in education by faculty and administrators.

Practicum. 1-5 credits, maximum 9. Prerequisite: consent of instructor. Required of all candidates for the Specialist in Education degree. Designed to help the student carry out an acceptable field study or research project. Credit given upon completion of the written report.

Psychological Foundations of Childhood. The child from conception to puberty with focus on educational implications of development in cognitive, affective and psychomotor domains.

Psychology of Adolescence. The adolescent from pubescence to adulthood with focus on educational implications of development in cognitive, affective and psychomotor domain.

Child and Adolescent Development. The person from conception through adolescence with focus on education implications of development in cognitive, affective, social, and physical domains.

Exploration of the Creative Experience. The creative experience in art (visual to performing), articulation (oratory to literature), thought (philosophy to psychology), business (practices to products), leisure (procreation to recreation). Western and Eastern viewpoints. Personal creative development fostered by modeling and by investigation of proven techniques. A wide range of creative endeavor with an experiential approach. Future-oriented applications.
Counseling Techniques for Teachers of Gifted and Talented Students. Techniques for dealing with the conflicts experienced by gifted and talented students. Strategies for consultation with teachers, peers, and parents regarding optimal development of gifts. Peer counseling techniques, dealing with self-concept, social and emotional concerns, problem solving and decision making, referral procedures and self analysis for teachers related to learning and teaching philosophy and style.

Practicum In School Psychometry. 2-6 credits, maximum 6. Prerequisites: admission to school psychometry program, successful completion of required course work and consent of instructor. Supervised experience in the practice of skills and procedures of school psychometry in a school setting.

Advanced Educational Psychology. Learning and its effect upon coping and adjustment. How learning, environmental and personality factors interact to change human behavior.

Seminar in Educational and School Psychology. 3-9 credits, maximum 9. In-depth exploration of contemporary topics in educational and school psychology.

Differentiated Curriculum Techniques and Materials for Gifted and Talented. Development of curriculum content for horizontal and vertical enrichment and acceleration. Commercial and teacher-prepared materials in imagination; imagery; analogy; metaphor; inductive, deductive and abductive thinking; science; philosophy; psychology; logic systems; problem solving; concept learning; creativity; creative dramatics, etc. Conceptual approaches to the use of the preceding in various interest-based and non-interest-based formats.

Psychology of Learning. Application to education of the principles and theories of the psychology of learning.

Practicum in School Psychology. 2-6 credits, maximum 6. Prerequisites: admission to school psychology program and consent of instructor. Supervised experience in the schools of psychology. Assessment, consultation, direct interventions and development of professional practice for school psychologists within school settings. Science-based child-success model. Two-three semester sequence.

Practicum with Exceptional Learners. 1-8 credits, maximum 8. Lab 1-8. Prerequisite: consent of instructor. Supervised individual and group experience with exceptional learners. The particular experience (learning disability, mental retardation, gifted etc.) is determined by the student's field of specialization.

Creativity for Teachers. Theoretical origins of creativity and their concomitant applications in the learning environment. Blocks to creative thinking, imagination, imagery, creativity testing, developing ideas and innovations, creative problem solving and teaching techniques and methods to maximize creative potential in all kinds and types of students.
6210* Internship in School Psychology. 3-6 credits, maximum 12. Prerequisites: admission to school psychology program; completion of all course work; completed readiness for internship form and approval of school psychology faculty. Supervised field experience of nondoctoral school psychologists by certified school psychologists for a minimum of 1200 hours over the course of an academic year, or half-time for two years.

6310* Doctoral Practicum in School Psychology. 1-6 credits, maximum 6. Prerequisites: 5510 and consent of instructor. Advanced practica for doctoral students in school psychology. Supervised experiences in assessment, consultation, intervention and supervision activities in a non-school setting.

6233* Psychological Consultation. Prerequisite: admission to graduate program in the SAHEP or psychology program. Models and strategies for the delivery of special services in the schools and other agencies that focus on serving the mental health needs of children, adolescents and adults. The use of consultation as a problem solving alternative to the assessment/label approach.

6333* Instructional Assessment and Consultation. Prerequisite: admission to College of Education or psychology program; or consent of instructor. Development of skills in consulting with educational and agency personnel and families regarding academic and educational functioning. Systematic curriculum-based assessment and measurement techniques as well as planning, implementing and evaluating instructional interventions. Evaluation of the instructional environment.

6343* Behavioral Assessment and Consultation. Prerequisites: 5113 or equivalent; admission to school psychology, clinical psychology or counseling psychology program; or consent of instructor. Development of psychological skills in systematic behavioral assessment and consultation with application to school, agency and home settings. Systematic behavioral observation, data collection and intervention design, implementation and evaluation.

6460* Internship in Educational Psychology. 1-9 credits, maximum 9. Prerequisite: consent of instructor. Supervision and guidance of teaching and service in educational psychology. May be repeated for credit when work assignment varies. Required of all teaching assistants in educational psychology during the first semester of each new teaching assignment. Includes cooperative planning and evaluation.

6533* Human Motivation. A theoretically-oriented approach to the concept of motivation; essential precursors to human behavior and applications to the solution of real and hypothetical problems.

6610* Doctoral Internship in School Psychology. 3-6 credits, maximum 6. Prerequisites: admission to school psychology doctoral program, completion of all course work; readiness for internship form, approved by school psychology faculty. Supervised experience of doctoral school psychologists for final preparation to enter the profession of school psychology. Designed to fulfill requirements of APA and State Board of Examiners of Psychologists.

6613* Instructional Systems Design. A practically-oriented coverage of analyzing, defining, sequencing and validating instructional systems. Development of educational objectives, course development, matching instruction to individual differences and evaluation of systems. Techniques of developing and validating instructional components.

6850* Directed Readings in Educational and School Psychology. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Directed reading for students with advanced graduate standing in educational and school psychology.

6850* Internship in Education. 1-8 credits, maximum 8. Lab 3-24. Prerequisites: admission to advanced graduate program and consent of area coordinator. Directed off-campus experiences designed to relate ideas and concepts to problems encountered in the management of the school program.

Educational Technology (EDTC)

3123 Applications of Educational Technologies. Lab 2. Introduction to the design and development of instruction using educational media and technology. Materials development, contemporary applications of computers and other electronic systems to instruction. Integration of instructional design, instructional media, and instructional computing.

4113* Multi-media Program Production. Prerequisite: 3122. Design and production of synchronized automatic sound slide programs coordinated with subject matter content. Includes photographic techniques, audio recording, and sound-mixing methods, graphics, and synchronizing techniques. Individual projects required.

4703* Computer Applications in the Middle School Science Curriculum. Principles and techniques related to using microcomputer technology in teaching middle school science; microcomputer interfacing, simulation, and interactive videodisk.

5000* Master's Report or Thesis. Prerequisite: consent of instructor. Students studying for a master's degree in this course for a total of 2 credit hours if they write a report or 6 hours if they write a thesis.

5103* Advanced Computing Applications in Education. Lab B-2. Includes educational applications involving authoring systems, data-base management, hardware interfacing, and non-instructional uses within the school environment. Impact of current issues on instructional computing.

5113* Videotape Television for Instruction. Educational design and production of videotape using single camera, small studio production and other technology. Individual and team projects.

5153* Computer-Based Instruction Development. Lab B-2. Prerequisite: 4113. Examinations of curriculum strategies, related research issues, and techniques for developing computer-based instruction. Students will develop and evaluate computer-based instruction with case studies.

5720* Education Workshop. 1-8 credits, maximum 8. For teachers, principals, superintendents and supervisors who have definite problems in instruction or administration. Students must register for the full number of credit hours for which the workshop is scheduled for a particular term.

5752* Educational Technology Strategies. Lab 1. Principles of designing instructional units and courses incorporating integrated advanced technologies within the framework of the current educational environment. Contemporary education issues. Advanced educational technologies: importation, information amassment, accessibility, linkage to curricula, support, planning, and teacher empowerment. Assumes concept of teacher as designer/conductor vs. teacher as consumer.

5773* Administration and Supervision of Audiovisual Materials. Building, planning, selecting and purchasing equipment and materials, surveying existing materials, and planning and financing adequate programs. For administrators or teachers who are responsible for audiovisual programs.

5850* Directed Study. Prerequisite: consent of instructor. Directed study for master's level students.

6000* Doctoral Dissertation. Required of all candidates to the Doctor of Education degree. Credit is given upon completion of the thesis.

6005* Directed Reading. Prerequisite: consent of instructor. Directed reading for students with advanced graduate standing to enhance students' understanding in areas where they wish additional knowledge.

6880* Internship in Education. Prerequisite: consent of instructor. Directed off-campus experiences designed to relate ideas and concepts to problems encountered in the management of the school program.

6910* Practicum. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Helps the student carry out an acceptable research problem (practicum) in a local school situation. Credit given upon completion of the written report.

Electrical and Computer Engineering (ECEN)


Experiment Methods III. Lab 3. Prerequisites: 3021, 3713; corequisite: 3313. Third laboratory in electrical measurements and instrumentation techniques and devices. Use of transistor operating points, Behavior of BJTs and MOSFETs. Operational amplifiers and feedback circuits. Reinforces ECEN 3313, continuing the design experience in the context of electronic devices.

3113 Energy Conversion. Lab 2. Prerequisites: 3021, 3613. Physical principles of electromagnetic and electromechanical energy conversion devices and their application to conventional and renewable energy systems. Power systems, lossless and phasor models; steady-state performance.

3213 Microcomputer Principles and Applications. Lab 2. Prerequisite: junior standing or above. Introductory microcomputers. Digital logic elements and number systems, memory components and organization. Microprocessor and microcomputer system architecture, assembly language programming, software development, interfacing techniques.


3313 Electronic Devices and Applications. Prerequisites: 2011, 3713. Semiconductor electronic components including MOSFETs, BJTs, JFETs, and diodes. Emphasis on device models and use of solid state electronic devices to analyze, synthesize and design amplifiers and switching circuits. Spice simulations are extensively utilized. Basic building blocks for analog and digital applications.


3613 Electromagnetic Fields. Prerequisites: ENSC 2613, MATH 2233. Time-harmonic and transient response of transmission lines. Maxwell's equations and their applications to engineering problems in electrostatics, magnetostatics, electro-magnetic fields and plane wave propagation.

3713 Network Analysis. Prerequisites: ENSC 2613, MATH 2233. Laplace transform, transfer functions, magnetically coupled circuits and two-port networks.


4243 Computer Architecture. Prerequisites: 3213 and 3233. Functional organization and hardware design of digital computer systems with emphasis on microprocessor-based systems. CPU organization, features of microprocessors including advanced 32-bit CPUs, memory system design including cache, virtual memory, error detection and correction, I/O operations including direct memory access and peripheral interface design.

4263 Computer Engineering Projects. Lab 2. Prerequisites: 3233, 4013 and 4213. Team projects involving design, construction, and testing of hardware interfaced with mini- and micro-computers. Emphasis on software and hardware documentation. IEEE-488 bus; interface chips; comparison of mini-computer operating systems, IEEE-488 bus; data link interface chips; mini- and micro-computers as laboratory tools and system components.

4273 Software Engineering. Lab 2. Prerequisites: CS 2133, 3443 or ECEN 3213. Fundamental characteristics of the software life cycle. Tools, techniques, and management controls for development and maintenance of large software systems. Software metrics and models. Human factors and experimental design. Same course as CS 4273.

4283 Computer Networks. Prerequisites: 3213 or CS 3443. UNIX knowledge of computer networks and distributed systems and their systematic design. Introduction to the use, structure, and architecture of computer networks. Networking experiments to design network topology. Same course as CS 4283.

4303 Digital Electronics Circuit Design. Lab 2. Prerequisite: 3233, 3313. Theory of digital and electronics circuits. Digital logic families TTL, ECL, NMOS, CMOS, GaAs. Large signal models for transistors. Implementation at RAM and ROM. Circuit design for LSI and VLSI.


4503 Communication Electronics. Prerequisite: 3313. Design of tuned voltage and power amplifiers, oscillators and mixers, modulation and detection, and parametric amplifiers.


4703 Active Filter Design. Lab 2. Prerequisites: 3413 and 3713. Introduction to passive filters; operational amplifiers as network elements; filter specifications; design of active filters. Laboratory design projects and computer simulations.


4773 Real Time Digital Signal Processing. Prerequisite: 4763 or equivalent. DSP Processor architectures and programming. A/D, D/A, polled and interrupt-driven I/O. Realtime implementation of FIR/FIR filters and other DSP algorithms on special purpose DSP hardware from Motorola, Texas Instruments and others. Link between DSP theory and practical implementation.


5000 Thesis or Report. 1-6 credits, maximum 6. Prerequisite: approval of major professor. A student studying for the master's degree will enroll in this course for a maximum of six credit hours.

5030 Professional Practice. 1-8 credits, maximum 8. Experience in application of electrical engineering principles to typical problems encountered in industry and government engineering design and development projects. Solutions to the problems require participation by the student in the role of junior engineer or engineering intern. Problem solutions involve economic and ecological considerations as well as technology, and must be adequately documented.

5050 Seminar. 1-12 credits, maximum 12. Prerequisite: consent of adviser. Students investigate certain engineering problems not normally covered in existing courses.


5123 Engineering Systems Reliability Evaluation. Techniques and concepts needed for evaluating the long-term and short-term reliability of a system. Topics include static and spurious generation capacity; transmission, composite, interconnected, and dc system reliability evaluations; and power system security. Applications to other systems not power systems included.

5153 Direct Energy Conversion. Energy conversion techniques and applications; thermoelectrics, thermionics, fuel cells, MHD and other processes involving electrical, mechanical and thermal energies. State-of-the-art developments in direct energy conversion using selected papers from journals and other publications. Gives the student a proper perspective of the possibilities and problems associated with satisfying future energy requirements.


5253 Digital Computer Design. Prerequisite: 3233. Analysis and design of digital computers. Arithmetic algorithms and the design of the arithmetic logic unit (ALU). Serial and parallel data processing, control and timing systems; microprogramming; memory organization alternatives; input/output interfaces. Same course as CS 5253.

5363 VLSI Digital Systems Design. Prerequisite: 4303; recommended: 5253. Design of very large-scale digital systems on a single chip. Review of MOS technology. Design rules imposed by fabrication techniques. Structural systems for control and data flow; system timing; highly concurrent systems. Experimental opportunities available.

5273 Advanced Software Engineering. Lab 2. Prerequisite: 4273. Continuation of 4273. Advanced theory and practice of software design methodology. Large scale design and implementation problems. Experimental design for software engineering. Same course as CS 5273.

5283 Computer Vision. The development of machine vision and advanced image understanding techniques for robotics, automated inspection, biomedicine. Object recognition, motion analysis, object tracking, segmentation, representation, and 3-D analysis.

5293 Artificial Intelligence and Expert Systems. Prerequisite: graduate standing in electrical engineering. Focus on: search-oriented problem solving, knowledge representation, logical inference, building. An expert system, artificial intelligence languages, specialized machine architectures. Applications to planning, natural language processing, and robotics. Development of an expert system or research report required. Common lectures with CS 5793, IEM 5933 and MAE 5793.


5353 Advanced Power Electronics. Prerequisite: 4133. Characteristics of high power semiconductor devices and the application of such devices to power conditioning, inversion, and wave shaping at high power levels.

5363 CMOS Analog Integrated Circuit Design. Prerequisite: 4313. Advanced study of solid state CMOS linear integrated circuits. Topics include: Op Amps, comparators, multipliers, D/A and A/D converters and Op Amp building blocks. Op Amp building blocks include, differential pairs, current mirrors, gain, output stages, and references. VLSI layout and circuit simulation using SPICE.


5463 Nonlinear System Analysis and Control. Prerequisite: 4413 or MAE 4053. Failure of linearization: phase-plane analysis; limit cycles; Lyapunov stability; hyperstability and input-output stability; controllability and observability of nonlinear systems; feedback linearization; robust nonlinear control system design. Same course as MAE 5463.


5483 Digital Data Acquisition and Control. Prerequisite: undergraduate course in programming. Use of microcomputers operating in real-time applied to engineering systems for data acquisition and control, use of analog to digital, digital to analog, and digital input/output, synchronous and asynchronous programming. Competence in the engineering use of microcomputers through lectures and laboratory applications. Same course as MAE 5483.

5493 Software Design for Real-time Distributed Systems. Prerequisite: 5483 or MAE 5483 or consent of the instructor. Fundamental concepts associated with the design of software for implementation on distributed computer systems using real-time operating systems. Parallel processing in a real-time environment and control algorithm design. State-of-the-art boards including analog-to-digital and digital-to-analog equipment and newest computer-aided software engineering tools. Same course as MAE 5493.
Stochastic Systems. Prerequisites: 3513 and 4503 or STAT 4033. Theory and applications involving probability, random variables, functional analysis of random variables, and stochastic processes, including Gaussian and Markov processes. Correlation, power spectral density, and nonstationary random processes. Response of linear systems to stochastic processes. State-space formulation and covariance analysis. Same course as MAE 5513.

Estimation Theory. Prerequisite: 5513 or MAE 5513. Optimal estimation theory including linear and nonlinear estimation of discrete and continuous random functions. Wiener and Kalman filter theory included. Same course as MAE 5523.

Modem Communication Theory. Prerequisite: 5513. Noise as a random process, analog and digital signal detection in the presence of noise, optimum receiver design using signal space concepts and introduction to information theory. Trade-offs between bandwidth, signal-to-noise ratio and the rate of information transfer. Example system designs include earth satellite, deep space and terrestrial communication systems and computer communication networks.

Data Transportation and Protection. Data and its representation; finite field matrices, pseudorandom sequences; information protection; error-correcting codes; sequence division networks; synchronization; and channel and error control.

Telecommunications Systems. Prerequisite: graduate standing, Ways and means voice, data and video traffic is moved long distances. Network technologies, ISDN, SONET, cellular telephone); and Wide Area Networks); the telephone system (POTS, network synchronization and switching, ISDN, SONET, cellular telephone); and video (NTSC, switching and timing, compressed video standards such as MPEG and Px64, HDTV).


Antenna Theory. Prerequisite: 3613. Fundamental antenna parameters, including directivity, efficiency, radiation resistance, and pattern. Analysis of dipole, loop, aperture, broadband, and traveling wave antennas. Array theory. Introduction to numerical techniques used in modern antenna design.

Adaptive Control. Prerequisite: 5473 or 5713 or MAE 5473 or MAE 5713. Analysis and design of control techniques that modify their performance to adapt to changes in system operation. Review of systems analysis techniques, including state variable representations, linearization, discretization, covariance analysis, stability, and linear quadratic Gaussian design. On-line parameter estimation, model reference adaptive systems, self-tuning regulators, stable adaptive systems. Same course as MAE 6453.

Advances in Nonlinear Control. Prerequisite: 5463 or MAE 5463. Introduction to vector fields and Lie algebra; controllability and observability of nonlinear systems; local decompositions; input-output and state-space representation of nonlinear systems; feedback linearization; controller design. Advanced concepts of Hamiltonian systems. Same course as MAE 6463.

Robust Multivariable Control Systems. Prerequisite: 5713 or MAE 5713. Introduction to multivariable systems: SISO robustness vs. MIMO robustness; multivariable system poles and zeros; MIMO transfer functions; multivariable Nyquist theorem; performance specifications; stability of feedback systems; linear fractional transformations (LFT’S); parameterization of stabilizing controllers; structured singular value; algebraic ricatti equations; H2 optimal control; H-infinity controller design. Same course as MAE 6483.

Information Theory. Prerequisite: 5513 or consent of instructor. Mathematical theory of information (Shannon theory) including information measures, rates and capacities. Source coding theory including algebraic and error-correcting codes. Design of waveforms for noise immunity. Information transfer in learning systems.

Photonics I: Advanced Optics. Lab 9. Prerequisite: 3813 or PHYS 3213 or consent of instructor. Advanced optics including spectral and time characteristics of detectors, characteristics of lasers, time, spectral and spatial characteristics of laser emission, interferometric techniques, and nonlinear effects such as two-photon absorption and second and third harmonic generation. Emphasis on optical laser pulses. Same course as CHEM 6803 and PHYS 6803.

Photonics II: Spectroscopy. Lab 3. Prerequisite: 6803. Advanced spectroscopic instruments and methods used for investigation of semiconductor and solid state material. Stimulated emission characterized both in wavelength and in time. Time-resolved fluorescence measurements, multiphotonic excitations. Fast measuring techniques including subnanosecond detectors, picosecond streak cameras, and ultrafast four-wave mixing and correlation techniques. Time-dependent photocconductivity measurements. Same course as CHEM 6831 and PHYS 6831.


Photonics III: Microscopy II. Lab 3. Prerequisite: CHEM 3553 or consent of instructor. Advanced techniques of SPM. Magnetic force microscopy, Kelvin force microscopy, STM in vacuum. Characterization of materials with SPM. Nanolithography with SPM. Device manufacturing and analysis. Same course as CHEM 6851 and PHYS 6851.

Photonics III: Microscopy III and Image Processing. Lab 3. Prerequisite: 5793. Digital image processing, including projects. Image acquisition and display, image enhancement, geometric operations, linear and nonlinear filtering, image restoration, edge detection, image analysis, morphology, segmentation, recognition, and coding/compression. Same course as CHEM 6861 and PHYS 6861.


Photonics IV: Semiconductor Synthesis and Devices II. Lab 3. Prerequisite: 6803. Processing, fabrication and characterization of semiconductor optoelectronic devices in class 100/1000 cleanrooms. Cleanroom operation including general procedures for material processing and device fabrication. Device processing using a variety of processing such as mask aligner, vacuum evaporators and rapid thermalannealer. Testing using optical and electrical testing apparatus such as IV, C-V, Hall, and optical spectral measurement systems. Same course as CHEM 6891 and PHYS 6891.

Electrical Engineering Technology (EET)


1104 Fundamentals of Electricity. Lab. 3. Prerequisite: MATH 1513. Elementary principles of electricity covering basic electric units. Ohm’s law, Kirchoff’s law, circuit solutions, network solutions, magnetism, inductance and capacitance.

1244 Circuit Analysis I. Lab. 4. Prerequisites: 1104, co-requisite: MATH 1613. Analysis of AC electric circuits. The use of network theorems and phasors, coupled circuits, resonance, filters, and power.

2213 Essentials of Electricity. Lab. 2. Prerequisites: MATH 1513, 1613. Electric circuits and machines, including Ohm’s law, magnetism, direct-current motors, generators and controls, alternating current, single-phase circuits, polyphase circuits and alternating current machinery. For non-electronics majors only.

2303 Technical Programming. Lab. 3. Prerequisites: 1104, MATH 1513 or completion of comparable engineering science courses. Introduction to machine programming using industrial standard languages, emphasis on problems from science and technology.

2354 Pulse and Digital Techniques. Lab. 3. Prerequisites: 1244 and 1225. Electronic circuits used in digital control and computation. Pulse generation, Boolean algebra and logic circuits.

2635 Solid State Devices and Circuits. Lab 1. Prerequisites: 1244, MATH 1613. Diodes, transistors, LSI linear devices; their operation and applications in electronic circuits.


3104 Elements of Electricity and Electronics. Lab. 1. Prerequisite: MATH 1513. Essentials of electricity, controls, and electronics for non-majors. No credit for ECT majors.


3234 Nondestructive Testing. Lab. 2. Commonly used nondestructive testing in industry: radiography, Magneflux, liquid penetrant, ultrasonic and eddy current testing.
3254 Microprocessors I. Lab 3. Prerequisites: 2544. An introductory course in microprocessor programming and interfacing. The assembly language instruction set, writing and executing programs, bus timing, address decoding, memory systems, and peripheral interfacing. Emphasis on 8082-based systems.

3264 Microprocessors II. Lab 3. Prerequisites: 2544, 3254. Assembly language programming and interfacing of microcontrollers. Microcontroller architecture, the assembly language instruction set, writing and executing programs, timers, serial and parallel ports, analog-to-digital conversion, pulse width modulation, I/O interface, and system design.

3354 Advanced Circuits I. Lab 1. Prerequisites: 2634, 3113, MATH 2133. Fundamentals of mixers, oscillators, detection, modulation, amplifier strips, feedback, coupled circuits and impedance matching.


4050 Advanced Electronic Problems. 1-4 credits. Maximum 4. Prerequisites: junior standing and consent of head of department. Special problems in the electronic area.

4153 Fluid Mechanics. 3. Prerequisites: 3354, 3363, 3354 and 3733. Methods of fluid mechanics; for engineering and nonengineering students. Topics include point-to-point, LANS, WANs, and switched networks. Topologies, protocols, routing, error detection and correction, text compression, modulation techniques, OSI, TCP/IP, Internet, and ISDN. Laboratory focus on design, assembly, test, demonstration, oral and written presentation of the design project. Capstone course for the computer option.

4314 Elements of Control. Lab 3. Prerequisites: 3113, 3123, 3363, 4314. Theory and application of specific control systems. Laboratory focus on design, assembly, test, demonstration, and oral presentation of the design project. Capstone course for the electronics option sequence.

4654 Microwave Techniques. Lab 3. Prerequisites: 3113, 3354, GENT 3123. Communication principles and measurement techniques in the UHF and microwave spectrum, coaxial and waveguide transmission lines, antenna systems and signal transmission, modulation and demodulation, oscillators and amplifiers, introduction to signal transmission and modulation methods.

4832 Senior Project. Lab 3. Prerequisite: 20 credit hours of upper-division electronics courses or consent of instructor. For the student’s last semester. A synthesis of all pertinent skills and knowledge developed in the curriculum. Students work as product design group developing a useful or marketable electronics product or device through design, assembly, test, and demonstration phases. Graded written and oral presentations.

Engineering (ENGR)


1311 Introductory Engineering Graphics. Principles, techniques and skills of graphics as used in engineering.

1322 Engineering Design with CAD. Lab 2. Introduction to engineering design using modern design methodologies and state-of-the-art computer-aided design tools. Hands-on design, construction and testing through participation in a design project contest.


2030 Co-op Industrial Practice I. 1-6 credits, maximum 12. Prerequisites: sophomore standing and permission of Co-op coordinator. Pre-engineering industrial practice. Written reports as specified by advisor. Application of credit to meet degree requirements varies with level and department.

2100 Orientation Projects. Lab 2-6. 1-3 credits, maximum 3. Prerequisite: pre-engineering standing. Enrollment in independent study or small groups. Projects to assist students with special needs to adjust to engineering curriculum.

2030 Co-op Industrial Practice II. 1-6 credits, maximum 12. Prerequisites: junior standing and permission of Co-op coordinator. Pre-engineering industrial practice. Written reports as specified by advisor. Application of credit to meet degree requirements varies with level and department.

2300 Study Abroad. 1-18 credits, maximum 36. Prerequisites: OSU GPA of 3.00 or higher and consent of Office of International Programs and the associate dean of the College. Participation in a formal study abroad program spending a semester or year in full-time enrollment at a university outside the U.S.

3111 Introduction to Engineering for Transfer Students. Prerequisite: transfer status with 28 or more credit hours completed. Algebra base treatment of the physical principles of sound in music and speech, and the sense of hearing. Sound production by musical instruments, acoustic response of auditoriums, and principles of sound reinforcement.

3254 Microprocessors I. Lab 3. Prerequisites: 2544. An introductory course in microprocessor programming and interfacing. The assembly language instruction set, writing and executing programs, bus timing, address decoding, memory systems, and peripheral interfacing. Emphasis on 8082-based systems.

3264 Microprocessors II. Lab 3. Prerequisites: 2544, 3254. Assembly language programming and interfacing of microcontrollers. Microcontroller architecture, the assembly language instruction set, writing and executing programs, timers, serial and parallel ports, analog-to-digital conversion, pulse width modulation, I/O interface, and system design.

3354 Advanced Circuits I. Lab 1. Prerequisites: 2634, 3113, MATH 2133. Fundamentals of mixers, oscillators, detection, modulation, amplifier strips, feedback, coupled circuits and impedance matching.


4050 Advanced Electronic Problems. 1-4 credits. Maximum 4. Prerequisites: junior standing and consent of head of department. Special problems in the electronic area.

4153 Fluid Mechanics. 3. Prerequisites: 3354, 3363, 3354 and 3733. Methods of fluid mechanics; for engineering and nonengineering students. Topics include point-to-point, LANS, WANs, and switched networks. Topologies, protocols, routing, error detection and correction, text compression, modulation techniques, OSI, TCP/IP, Internet, and ISDN. Laboratory focus on design, assembly, test, demonstration, oral and written presentation of the design project. Capstone course for the computer option.

4314 Elements of Control. Lab 3. Prerequisites: 3113, 3123, 3363, 4314. Theory and application of specific control systems. Laboratory focus on design, assembly, test, demonstration, and oral presentation of the design project. Capstone course for the electronics option sequence.

4654 Microwave Techniques. Lab 3. Prerequisites: 3113, 3354, GENT 3123. Communication principles and measurement techniques in the UHF and microwave spectrum, coaxial and waveguide transmission lines, antenna systems and signal transmission, modulation and demodulation, oscillators and amplifiers, introduction to signal transmission and modulation methods.

4832 Senior Project. Lab 3. Prerequisite: 20 credit hours of upper-division electronics courses or consent of instructor. For the student’s last semester. A synthesis of all pertinent skills and knowledge developed in the curriculum. Students work as product design group developing a useful or marketable electronics product or device through design, assembly, test, and demonstration phases. Graded written and oral presentations.

Engineering (ENGR)


1311 Introductory Engineering Graphics. Principles, techniques and skills of graphics as used in engineering.

1322 Engineering Design with CAD. Lab 2. Introduction to engineering design using modern design methodologies and state-of-the-art computer-aided design tools. Hands-on design, construction and testing through participation in a design project contest.


2030 Co-op Industrial Practice I. 1-6 credits, maximum 12. Prerequisites: sophomore standing and permission of Co-op coordinator. Pre-engineering industrial practice. Written reports as specified by advisor. Application of credit to meet degree requirements varies with level and department.

2100 Orientation Projects. Lab 2-6. 1-3 credits, maximum 3. Prerequisite: pre-engineering standing. Enrollment in independent study or small groups. Projects to assist students with special needs to adjust to engineering curriculum.

2030 Co-op Industrial Practice II. 1-6 credits, maximum 12. Prerequisites: junior standing and permission of Co-op coordinator. Pre-engineering industrial practice. Written reports as specified by advisor. Application of credit to meet degree requirements varies with level and department.

2100 Orientation Projects. Lab 2-6. 1-3 credits, maximum 3. Prerequisite: pre-engineering standing. Enrollment in independent study or small groups. Projects to assist students with special needs to adjust to engineering curriculum.

2030 Co-op Industrial Practice II. 1-6 credits, maximum 12. Prerequisites: junior standing and permission of Co-op coordinator. Pre-engineering industrial practice. Written reports as specified by advisor. Application of credit to meet degree requirements varies with level and department.

2111 Statics. Lab 2. Prerequisites: PHYS 2014 and MATH 2145. Resultants of force systems, static equilibrium of rigid bodies and statics of structures. Shear and moment diagrams.

2122 Elementary Dynamics. Prerequisite: 2112. Kinematics and kinetics of particles, systems of particles, and rigid bodies from a Newtonian viewpoint utilizing vector algebra and calculus. Work energy and impulse momentum principles.

2123 Elementary Dynamics. Prerequisite: 2113. Kinematics and kinetics of particles, systems of particles, and rigid bodies from a Newtonian viewpoint utilizing vector algebra and calculus. Work-energy and impulse-momentum principles. Planar and three-dimensional kinetics and kinematics of rigid bodies.

2142 Strength of Materials. Prerequisite: 2112. Bending moments, deformation and displacements in elastic and plastic deformable bodies.


2213 Thermodynamics. Prerequisites: CHEM 1515, PHYS 2014, MATH 2145. Properties of substances and principles governing changes in form of energy. First and second laws.

2613 Introduction to Electrical Science. Prerequisites: PHYS 2114 and MATH 2155. Elements of electrical engineering; AC and DC circuits, mesh and node formulation, network equations, steady-state response to sinusoids, energy, power and power factor.

3233 Fluid Mechanics. Prerequisites: MATH 2233 or concurrent enrollments, CHEM 1314 or 1515 and PHYS 2141. The study of fluid properties, statics, conservation equations, dimensional analysis and similitude, viscous flow in ducts, inviscid flow, boundary layer theory, open channel flow, turbomachinery and fluid measurement techniques.
Engineering and Technology Management (ETM)

5110* Seminar. 1-6 credits, maximum 6. Prerequisites: admission to the master's program or consent of instructor. Guided study in a topic area selected to enhance a student's program.

5111* Introduction to Strategy, Technology, and Integration. Prerequisite: admission to the M.S. in ETM program or consent of instructor. The first credit hour of a three-credit hour creative component requirement. The "big picture" of engineering and technology management, emphasizing the importance of strategy, technology, and integration, where timing of products and services are keys to market success.

5211* Capstone to Strategy, Technology and Integration I. Prerequisite: admission to the M.S. in ETM program or consent of instructor. The first part of the capstone and the second credit hour of the creative component requirement. Proposal for a project to be completed for the ETM 5131 course. Substantive use of ETM course material, and a notable and relevant contribution to the student's organization. Participation in formal critique and discussion of other proposals.

5313* Capstone to Strategy, Technology and Integration II. Prerequisite: admission to the M.S. in ETM program or consent of instructor. The second part of the capstone and the third and final credit hour of the creative component requirement. Presentation of student's project. Substantive use of ETM course material, and a notable and relevant contribution to the student's organization. Participation in formal critique and discussion of other projects.

5211* Enterprise Integration. Prerequisite: admission to the M.S. in ETM program or consent of instructor. Conceptualizing, designing and operating advanced manufacturing systems within an integrated enterprise-wide framework. Recent developments in computer and communication technologies and conceptual breakthroughs regarding the nature and behavior of integrated enterprises.

5211* Application and Execution of Engineering Teaming. Prerequisite: admission to the M.S. in ETM program or consent of instructor. Management of team issues inherent in the application and implementation of high performing work teams. The team's roles in improving organizational performance, along with the best practice procedures and techniques that increase team effectiveness.

5211* Benchmarking. Prerequisite: admission to the M.S. in ETM program or consent of instructor. Benchmarking as an effective approach to study and adopt or adapt methodologies representing best specific practices from any industry; or identify and assess performance based on equivalent and common measures, usually from those in the same or similar industries, including competitors.

5241* Strategic Project Management. Prerequisite: admission to the M.S. in ETM program or consent of instructor. Overview of traditional project management concepts and techniques (i.e., Gantt charts, PERT, CPT) along with several technical issues related to their effective use. Fundamental nature of the problems associated with several technical issues related to their effective use. Fundamental nature of the problems associated with effectively managing and coordinating of multiple discrete projects within an overall systems integration initiative. A framework for addressing these problems.

5251* Problem Solving and Decision Making. Prerequisite: admission to the M.S. in ETM program or consent of instructor. Patterns utilized by successful managers for decision making. Organizational skills, investigation through questioning and logic, decision making among alternatives, and ensuring the success of decision. Analyzing problems and decisions, appraising situations, managing problems of human performance, and implementing processes.

5261* Process Discipline. Prerequisite: admission to the M.S in ETM program or consent of instructor. A combination of theory and practice for understanding processes involved in any production.

5271* Technology Forecasting and Assessment. Prerequisite: admission to the M.S. in ETM program or consent of instructor. A framework and analytical tools for developing technological foresight. Technology monitoring, forecasting and assessment in the context of a family of emerging technologies.

5281* Comprehensive Planning. Prerequisite: admission to the M.S. in ETM program or consent of instructor. Continuous and systematic process of thought about the future, resulting in a plan or specific course of action for communicating, coordinating, and controlling activities. Strategic, long-range, tactical, operational, contingency and performance planning.

5291* Failure Mode and Effects Analysis in Design. Prerequisite: admission to the M.S. in ETM program or consent of instructor. A design technique for reducing risk and improving reliability of a system, design or process. Potential failures in any of these studied methodically during design. The concepts, tools and techniques applicable to any product or process.

Engineering Technology

(See specific technology programs listed alphabetically)

English (ENGL)

0083 Composition for International Graduate Students. Lab 2. Review of complex sentence structure and organizational patterns, with an emphasis on documented research paper writing and oral presentation. Graded on a satisfactory-unsatisfactory basis.

0123 Basic Composition. Intensive instruction in grammar and error avoidance (especially the differences between spoken and written English), paragraph structure, and essay writing. May be used for skills remediation or to satisfy high school curricular deficiency in English. Graded on a satisfactory-unsatisfactory basis.

1010 Studies in English Composition. 1-2 credits, maximum 2. Special study in composition to allow transfer students to fulfill general education requirement as established by Regent's policy.

1113 Freshman Composition I. The fundamentals of expository writing with emphasis on structure, development and style.

1123 International Freshman Composition I. Lab 2. Restricted to students whose native language is not English. Expository writing with emphasis on structure and development. Special attention to problems of English as a second language. This course may be substituted for 1113.

1213 Freshman Composition II. Prerequisite: 1013 or 1113. Expository composition with emphasis on technique and style through intensive and extensive readings.

2233 Introduction to Technical Writing. Prerequisite: admission to the M.S. in ETM program or consent of instructor. Patterns utilized by successful managers for decision making. Organizational skills, investigation through questioning and logic, decision making among alternatives, and ensuring the success of decision. Analyzing problems and decisions, appraising situations, managing problems of human performance, and implementing processes.

2513 Languages of the World. A comprehensive survey of world languages. The essential structural and historical organization of languages. The process of languages as a basic human function. Same course as FLL 2443.

2453 Languages of the World. A comprehensive survey of world languages. The essential structural and historical organization of languages. The process of languages as a basic human function. Same course as FLL 2443.

2453 Languages of the World. A comprehensive survey of world languages. The essential structural and historical organization of languages. The process of languages as a basic human function. Same course as FLL 2443.

2453 Languages of the World. A comprehensive survey of world languages. The essential structural and historical organization of languages. The process of languages as a basic human function. Same course as FLL 2443.
Survey of British Literature I. The beginnings through the Neoclassic Period. 2653
Survey of British Literature II. The Romantic Period to the present. 2773
Survey of American Literature I. The Puritans through the Romantic Period. 2883
Survey of American Literature II. The Romantic Period to the present. 3033
Fiction Writing. Directed readings and practice in writing fiction with special attention to techniques. 3043
Poetry Writing: Directed readings and practice in writing poetry with special attention to techniques. 3053
Scriptwriting. In a workshop setting, the reading and discussion of screenplays produced by students' peers and by professionals, completion of exercises on action and characterization, and the writing of a short, fictional screenplay. 3123
Classical Mythology. The heritage of classical Greek and Roman myths as revealed in selected examples of British and American literature. 3163
World Literature I. Selected literary masterpieces exemplifying ideals and values in Western cultures. 3173
World Literature II. Selected literary masterpieces exemplifying ideals and values in non-Western cultures. Emphasis on the study of non-Western literature available in English. 3183
Native American Literature. Origins and development of a literary tradition in its historical and cultural context. 3193
African-American Literature. Origins and development of a literary tradition in its historical and cultural context. 3200
Special Problems in Language and Literature. 1-3 credits, maximum 3. Prerequisite: 9 credit hours of English. Specialized readings and independent study. 3203
Advanced Composition and Rhetoric. Prerequisite: 9 hours of English. Theories of regulative grammar and rhetoric as applied to the writing process. 3240
Criticism. 3 credits, maximum 6. Study and application of principal critical theories in literature, film or technical writing. 3323
Technical Writing. Prerequisites: 1113, 1213, and junior standing. Applied writing in areas of specialization. Intensive practice in professional writing modes, styles, research techniques and editing for specialized audiences and/or publications. This course may be substituted for 1213 with an "A" or "B" in 1113 and consent of the student's college. 3333
Short Story. Origins, development, theory and craft of the short story. 3353
Film as Literature. Plays, novels and short stories that have been brought to the screen since the invention of motion pictures; examination of that process with emphasis on aesthetics and theory. 3363
Drama. Origins, development, theory and craft of drama. 3373
Popular Fiction. 3 credits, maximum 6. Study of certain popular genres of fiction including science fiction, detective fiction, Western fiction, horror and the grotesque, the romance, American humor. Course content varies by semester. Exploration of the characteristics and evolution of the genre while developing skills in reading, writing and thinking critically. 3410
History of American Film. Lab 2. Introduction to the history of the American cinema, the principal eras in American film history, key directors, and the main genres. Basic approaches to film history and key theorists. 3453
History of International Film. Lab 0-2. Introduction to the history of international cinema and the principal eras in film history, focusing on the moments when different national cinemas flourished. 3603
British Literature to 1600. Historical development. Major writers and their works. 3633
British Literature 1600-1800. Historical development. Major writers and their works. 3643
British Literature 1800-1900. Historical development. Major writers and their works. 3653
British Literature Post 1900. Historical development. Major writers and their works. 3703
American Literature to 1800. Historical development. Major writers and their works. 3713
American Literature 1800-1900. Historical development. Major writers and their works. 3723
American Literature Post 1900. Historical development. Major writers and their works. 3813
Readings in the American Experience. Life in the New World from the colonial to the postmodern era using a multiplicity of interdisciplinary texts that demonstrate the emergence and ongoing evolution of distinctive American identities. 4003
History of the English Language. The growth of the English language. 4013
English Grammar. The traditional terminology and concepts of English grammar leading or evolving into the several current systems of description. 4063
Descriptive Linguistics. The methodology of linguistic analysis. 4083
Applied Linguistics. The study of topics in psycholinguistics, including language and the brain, animal communication and language acquisition. 4263
Aesthetics of Film. The form, meaning and value of American and international motion pictures. Films discussed vary from semester to semester. 4303
British Drama 1500-1660. Genre development. Major writers and their works. 4313
British Drama 1660-1800. Genre development. Major writers and their works. 4323
British Drama Post 1800. Genre development. Major writers and their works. 4333
American Drama. Genre development. Major writers and their works. 4403
American Poetry to 1900. Genre development. Major writers and their works. 4413
American Poetry Post 1900. Genre development. Major writers and their works. 4433
British Poetry Post 1900. Genre development. Major writers and their works. 4450
Culture and the Moving Image. 3 credits, maximum 9. The study of the moving image in a social or cultural context, including genre, auteurs and auteurism, film and feminism, television and other media. 4453
Contemporary Literature. Genre development. Major writers in the novel, poetry, or drama and their works. 4520
Problems in English. 1-3 credits, maximum 6. Prerequisite: 12 credit hours of English. Specialized readings and independent studies. 4523
Technical Writing Internship. Prerequisite: 6 credit hours of English including 3323. Practice in writing resumes, proposals, abstracts and articles. Concentrated review of mechanics, proofreading, editing and interviewing techniques. Second eight weeks will include internship experience. 4533
Advanced Technical Writing. Prerequisite: 6 credit hours of English including 3323. Specialized writing projects growing out of areas of specialization with emphasis on practical and marketable skills. 4543
Technical Editing. Prerequisite: 9 credit hours of English. Scientific and technical editing skills; emphasis on editing project. 4553
Document Design. Prerequisite: six credit hours of English, including 3323. Design theories and practice for hard copy, computer screens and visuals. Students will learn about design standards, page layout, instructional design, desktop publishing, typography, reading theory, and current research in visual design. 4563
Scientific and Technical Literature. Prerequisite: 6 credit hours of English. Scientific and technical style. 4633
Advanced Fiction Writing. Prerequisite: 3033. Student practice and composition. 4643
Advanced Poetry Writing. Prerequisite: 3043. Student practice and composition.
4913 Seminar in Shakespeare. Intensive study of a limited number of plays. Assignment of problems to individual students.
4713 Milton. The more notable minor poems. Major plays and selected criticism.
4513 Studies in English Grammar. 3 credits, maximum 6. Selected study of current topics in grammatical theory as it applies to the teaching of English.
5420 Seminar in British Literature of the 15th Century. 3 credits, maximum 6. Selected writers and their works, themes and literary developments of the 16th century.
5430 Seminar in British Literature of the 17th Century. 3 credits, maximum 6. Selected writers and their works, themes and literary developments of the 17th century.
5440 Seminar in British Literature of the 18th Century. 3 credits, maximum 6. Selected writers and their works, themes and literary developments of the 18th century.
5460 Seminar in British Literature of the 19th Century. 3 credits, maximum 6. Selected writers and their works, themes and literary developments of the 19th century.
5480 Seminar in Modern Literature. 3 credits, maximum 6. Selected writers and their works, themes and literary developments of modern literature.
5520 Internship in Technical Writing. 1-6 credits, maximum 6. Practice in writing appropriate documents such as proposals, manuals (software, hardware, reference, training), articles, functional specifications in job-simulation situations. Review of academic materials as appropriate.
5533 Seminar in Advanced Technical Writing. Specialized writing projects growing out of student's special interests and emphasizing the student's career preparation. Coverage of manuals, proposals, and visual aids used to communicate technical information.
5543 Seminar in Scientific and Technical Editing. Managing technical documentation production; developing scientific and technical editing skills; special emphasis on editing project.
5563 History of Scientific and Technical Literature. Structural, stylistic and rhetorical analysis of selected scientific and technical works.
5573 Theories of Communication. Survey of a broad range of theories of communication and application of those theories to technical communication.
4663 Advanced Scriptwriting. Prerequisite: 3053. Discussion of professional screenplay and critiquing peers' work; completion of exercises on structure, visualization, and characterization; and writing a fictional screenplay.
4703 Shakespeare. The Canterbury Tales in Middle English.
4713 Milton. The more notable minor poems, prose selections and the major poems. Major plays and selected criticism.
4723 Milton. The more notable minor poems, prose selections and the major poems. Major plays and selected criticism.
4730 Single Author or Work. Study of a single author or a work, chosen at the instructor's discretion.
4733 Literature by Women. The collection of literature written by women in England and America, classical and modern figures.
4803 American Novel Post 1900. 3 credits, maximum 6. Study of a single author or a work, chosen at the instructor's discretion.
4901 Tutor Training. Lab 3. Training to become effective writing tutors and teachers through face-to-face conferences with writing students, weekly seminar presentations, and discussions of current writing center theory and practice.
4910 Regional Literature. Literature of a nation such as Ireland or Canada, or of a region such as the American Southwest. Topic varies by semester.
4963 Issues in English: Senior Seminar in Creative Writing. Prerequisite: senior standing. A capstone course for creative writing majors. Issues and professions related to the degree. A cross-genre workshop and seminar designed to aid in understanding the whole of progression as writers and thinkers. Aids student in the completion of required creative thesis.
4973 Issues in English: Technical Writing. Prerequisite: senior standing. A capstone course for technical writing majors. Issues and professions related to the degree.
4993 Senior Honors Thesis. Prerequisites: admission to Arts and Sciences Honors Program and 3.50 cumulative GPA. For Honors students in their final semester. Thesis written on a topic of student's choice and directed by a faculty member. Final approval of thesis requires oral defense.
Environmental Writing. Consideration of the historical, political, cultural, and ethical contexts of modern environmentalism and examination of the rhetorical strategies in several types of environmental discourse, including risk communication, environmental impact statements, scientific papers and research reports, EPA communications, and other forms of environmental writing directed toward the general public. Major writing project tailored to individual research interests and career goals with the aim of producing a publishable document.

Proposal and Grant Writing. Exploration of principles and practices for writing proposals and grants, in part by surveying research in argumentation and persuasion, and in part by applying principles and practices of rhetorical analysis, document design, and publication management appropriate to this genre.

Seminar in Early American Literature. 3 credits, maximum 6. Selected writers and their works, themes and literary developments of the 17th and 18th centuries.

Seminar in American Literature of the 19th Century. 3 credits, maximum 6. Selected writers and their works, themes and literary developments of the 19th century.

Seminar in Contemporary Literature. 3 credits, maximum 6. Selected writers and their works, themes and literary developments of the 20th century.

Seminar in Fiction Writing. 3 credits, maximum 6. Writing fiction at the professional level.

Seminar in Poetry Writing. 3 credits, maximum 6. Writing poetry at the professional level.

Seminar in Scriptwriting. 3 credits, maximum 6. Scriptwriting at the professional level.

Special Problems. 1-3 credits, maximum 6. Investigation into a designated area of English reading to material for creative component option (M.A.). Graded on a pass-fail basis.


Seminar in Single Author or Work. 3 credits, maximum 9. A study of one text and its various readings; or a study of the development and range of a writer's work in the English language.

Studies in Fiction Writing. 3 credits, maximum 6. Prerequisite: 5730. Individual projects in fiction.

Studies in Poetry Writing. 3 credits, maximum 6. Prerequisite: 5740. Individual projects in poetry.

Studies in Scriptwriting. 3 credits, maximum 6. Prerequisite: 5750. Individual projects in Scriptwriting.

Seminar or Directed Study. 1-6 credits, maximum 9. Specialized readings or independent studies.

Seminar in Genre. 3 credits, maximum 9. The development, traditions, concerns or characteristics of genre in selected texts. Major genres and subgenres considered.

Seminar in Race, Region or Gender. 3 credits, maximum 9. A study of the complex relations between race, region or gender and the texts that represent them.

Studies in New Media. Selected work in new media, for example film, literary adaptation to film, film and television.

Studies in Literary Criticism. 3 credits, maximum 9. Selected work in literary criticism, for example ancient and neo-classical, 19th century, 20th century.

Topics in Rhetorical Theory. 3 credits, maximum 6. Study of advanced topics in rhetorical theory and research. May focus on an important thinker, or a specific theme, or some combination of thinkers and themes.

Topics in Linguistics. 3 credits, maximum 9. Prerequisite: 5143. Study of advanced topics in linguistic theory and research.

Topics in Second Language Acquisition. 3 credits, maximum 9. Prerequisite: 5243. Study of topics in second language theory and research.


Entomology (ENTO)

2003 (N)Insects and Society. A course for non-majors that emphasizes the impact of insects on society. Influence of arthropods in beliefs, culture and fears and the view of insects in folklore and mythology from ancient times to present. Focus on the use of insects as model systems in biological research. Exposure to the use of insects in teaching, music, art, literature and the cinema.

2023 Introduction to the Science of Entomology. Lab 2. Basic structure, function and classification of insects and closely related animals. Coverage of insects in ecosystems and development and use of control programs that reduce reliance on chemical pesticides.

3003 Livestock Entomology. Lab 2. Economic importance, biology and control of pests affecting domestic animals.

3021 Postharvest Insect Pests. Lab 2. Prerequisite: 2023 (or concurrent enrollment) or 3003. The biology and management of insect pests of bulk-stored grains, flour, feed, dried fruits and nuts, and those of quarantine significance for export of fresh fruits and vegetables within food processing plants, warehouses, wholesale and retail distribution systems.

3043 Insect Physiology. Prerequisites: 2023; one course in organic chemistry, nine credit hours of biology. Functions of the organ systems of insects. Lecture-demonstrations of selected insect physiology techniques. Same course as 5043.

3331 Insect Pests of Agronomic Crops. Lab 2. Prerequisite: 2023 or concurrent enrollment. Sampling and decision-making processes for evaluation and control of insect pests populations in agronomic crops. Coverage of identification of pests and beneficials and damage symptoms resulting from insect feeding in crops.

3421 Horticultural Insects. Prerequisite: 2023 or concurrent enrollment. Identification, biology and control of pests attacking horticultural crops. Emphasis on pests injurious to vegetables, fruits, pecans, greenhouse plants, turf and ornamental trees and shrubs.

3461 Insects in Forest Ecosystems. Lab 2. Prerequisite: concurrent enrollment in 2023. Identification and seasonal life history of insect pests and beneficial insects on shade trees in urban settings, in commercial forests, and in forest products.

3644 Insect Morphology. Lab 4. Prerequisite: 2023. Insect development and comparative morphology. Same course as 5644.

4223 Ecological Methodology. Lab 2. Prerequisite: one course in either ecology or general biology. Use of insects and other invertebrates for describing and evaluating interactions of individuals and populations with their environments. Coverage of behavioral and physiological ecology on consequences to individuals; population and community ecology considered in dynamics of groups of organisms in ecosystems.

4464* Systematic Entomology. Lab 4. Prerequisite: 2023 or equivalent. Classification and comparative biology of insects.

4800 Undergraduate Traineeship. 1-5 credits, maximum 5. Prerequisite: consent of instructor. Participation in research or extension pest management programs of departmental faculty.

4854* Medical and Veterinary Entomology. Lab 4. Prerequisite: 3553, Biology and control of insects affecting public health.

4922 Applications of Biotechnology in Arthropod and Pathogen Control. Prerequisites: introductory biology and chemistry or equivalent. Applications of biotechnology in controlling arthropod pests of plants and animals and plant pathogens. Introduction to underlying technology, products being developed, their effectiveness and associated problems or concerns resulting from their use. Same course as PLP 4922.


5003* Insect Biochemistry. Prerequisite: consent of instructor. Biochemical processes in insects and closely related arthropods with emphasis on metabolic pathways unique to this group. Biochemical aspects of arthropod host interactions.

5020* Special Problems. 1-8 credits. Prerequisite: graduate standing. Selected studies in the area of entomology, acarology or araneology.
5043* Advanced Systematic Entomology. 1-5 credits, maximum 5. Prerequisite: 5464. Special problems in advanced systematics entomology.


5513* Biological Control. Lab 2. Prerequisite: 2023 or equivalent or consent of instructor. The ecological principles and applied practices of biological control of insects, weeds and plant pathogens. Laboratory work including the scientific basis of biological control; natural enemies and their biology; biological control methods; and biological control in integrated pest management programs.

5523* Integrated Management of Insect Pests and Pathogens. Lab 2. Prerequisites: 2023 and PLP 3344 or equivalent or consent of instructor. Modern theory and practices for management of insect pests and pathogens in plant production systems, emphasizing an ecologically-based, integrated approach. Basic concepts of pest management, decision-making, cost/benefit analysis, and risk/benefit analysis. Same course as PLP 5523.

5550* Advanced Agronomic Entomology. 1-5 credits, maximum 5. Prerequisite: 4523. Special problems in advanced agronomic entomology.

5613* Host Plant Resistance. Lab 2. Prerequisites: 2023 and PLP 3344 or equivalent and a general genetics course or consent of instructor. Interactions of plants and the herbivorous insects and pathogenic micro-organisms that attack them. Development and deployment of multiple-pest resistant cultivars in crop management systems. Same course as PLP 5613.


5660* Readings in Integrated Pest Management. 1-2 credits, maximum 2. Prerequisite: 4523 or equivalent. Reading and discussion of current publications relating to biological and economic theories that form the basis for integrated pest management (IPM) programs.

5710* Advanced Medical and Veterinary Entomology. 1-5 credits, maximum 5. Prerequisite: 4854. Special problems in methods of disease transmission, animal parasite control and the relationships existing between parasite and host.

5733* Natural Chemical Mediators in Ecology. Prerequisites: BIOL 1114, CHEM 3015 or equivalent. Interactions among organisms mediated by naturally produced chemicals. An interface of ecology, behavior, physiology and chemistry with examples from animals, plants and microorganisms. Origin, function, significance and utilization of semichemicals.

5753* Insecticide Toxicology. Prerequisite: organic chemistry or 15 credit hours biology. Properties and mode of action of the major insecticidal materials. Assessment of their impact on the environment.

5860* Epidemiology of Arthropod-borne Diseases. 1-4 credits, maximum 4. Lab to be arranged. Prerequisite: 4854 or equivalent. The relationships existing between the hosts, arthropod vectors and causal agents of disease and the principles of disease prevention or suppression by the intelligent use of biological principles.

5870* Scientific Presentations. 1 credit, maximum 5. Prerequisite: consent of instructor. Preparation and delivery of scientific presentations including 50-minute seminars, 10-minute talks, and posters. Same course as PLP 5870.

5992* Career Skills and Professionalism for Scientists. Prerequisite: graduate standing. For graduate students majoring in science-based fields, especially those nearing graduation. Skills needed for effective job application and interviewing, career development and advancement, communication with professional colleagues and the public, and personal professional development. Same course as PLP 5992.

6000* Doctoral Research and Dissertation. 1-9 credits, maximum 20. Prerequisite: M.S. in entomology or consent of major professor. Independent investigation under the direction and supervision of a major professor.

6100* Advanced Insect Physiology. 1-5 credits, maximum 5. Prerequisite: 4043. Special problems in advanced insect physiology.

Environmental Science (ENVR)

1113 Elements of Environmental Science. Application of biology, chemistry, ecology, economics, geology, hydrology, mathematics, physics, and other agricultural sciences to environmental problems. Same course as PLP 1010 for graduate students.

4016* Internships in Environmental Science. 1-6 credits, maximum 6. Prerequisite: junior standing in environmental science or consent of instructor. Supervised internships in business, industry, or governmental agencies in environmental assessment and remediation.

4500 Environmental Science Problems. 1-6 credits, maximum 6. Prerequisites: upper division standing, GPA of 2.50 or better, and consent of instructor. Individual or small group study of selected problems in environmental science. Course may be used twice for up to six credit hours to meet degree requirements.

4813 Environmental Science Applications and Problem Solving. Lab 2. Prerequisites: AGEC 3503, BISC 1004, FOR 4813, GEOL 3073, POLS 4363, senior standing, or consent of instructor. Integrated problem solving applied to environmental issues using physical, biological, economic, quantitative, policy and administrative principles. Primarily for environmental science majors.

5000* Research for Thesis or Report. 1-6 credits, maximum 6. Prerequisites: approval of advisory committee and departmental steering committee. Research leading to master's thesis or report.

5200* Special Topics in Environmental Science. 1-4 credits, maximum 10. Prerequisite: graduate standing. Topics and issues in the broad field of environmental science. Group discussions and projects not covered by existing courses such as ecological risk assessment, water chemistry and environmental law.

5300* Seminar in Environmental Science. 1-3 credits, maximum 3. Prerequisite: 3000 or 4000 level ecology course. Selected environmental problems, individual research, seminar reports and group discussion of reports.

5400* Environmental Problem Analysis. 1-3 credits, maximum 6. Prerequisite: 5300. Multidisciplinary team investigation of environmental problems. Problem formulation, review of applicable theory from different disciplines, data collection from field, laboratory, and mathematical modeling and application of appropriate techniques of analysis to selected environmental problems and environmental impact assessments.

5500 Environmental Management Problem Analysis. 1-3, maximum 6. Prerequisite: consent of director. Finding sustainable solutions to complex environmental, safety and health problems using an integrated team approach. Problem formulation and analysis integrated from different disciplines using technical, legal, economic and sociopolitical approaches. May be substituted for ENVR 5100 on plan-of-study Required for environmental management specialization.

5600* Environmental Management Internship and Report. 1-6 credits, maximum 12. Prerequisites: 5500 and consent of director. Internships on environmental problem solving project(s) and submission and approval of a formal report. Course must be completed within three consecutive semesters from date of initial enrollment.


6200* Seminar in Environmental Problems. 3 credits, maximum 6. Multidisciplinary investigations of a current environmental problem that may be either global or local in nature.

Family Relations and Child Development (FRCD)

2003 Dynamics of Family Relationships. An ecological approach to interpersonal relationships through study of the processes in the family that influence the way members relate to each other throughout their lives. Practice in application of principles is included.

2100 Preprofessional Laboratory Experience. 1-4 credits, maximum 4. Lab 2-8. Realistic experiences in different career areas, acquainting students with the diversity of roles and responsibilities as applied to the variety of audiences served. Professional behavior and ethics.
Human Development Within the Family: A Lifespan Perspective. Human development within the family described from a lifespan perspective. The principles of development and dynamics of behavior and relationships.

2213 Human Sexuality and the Family. Sexual development emphasizing personal adjustment and interaction with family and culture.

2413 Resource Management for Individual and Family. Principles and procedures of management and their relationships to human and material resources. Emphasis given to the consumer in the marketplace, financial management and time and energy management.

2613 The Professional in Individual, Family and Community Services. Skills in decision-making, priority-setting, self-assertion, and self-assessment. Volunteer and field experience options available in the field of family services.

3013 (S) Early Adulthood. Study of the unique characteristics of development during early adulthood. Theories of adult development with emphasis on application to program development and providing services for adults.

3023* Child and Parent in Social Context. Parenting philosophies and styles; programs for children, families, and caregivers; emphasis on effective ways for the home, school, workplace and community to work together to provide for optimum development of children of various cultures and ethnic groups.

3112 Parent-Child Relationship. For parents, teachers or others who expect to be responsible for young children. Increases understanding of the needs and feelings of both the developing child and the adult caregiver. A wide variety of philosophies and techniques explored out of which individuals can devise their own comfortable, effective, parenting styles.

3143 (S) Marriage. Consideration of courtship and marriage with special emphasis on building a healthy paired relationship; communication and decision making; and coping with such problems as money, sex, role taking, in-laws and children.

3213 (S) Social, Emotional and Language Development in Early Childhood. Study of appropriate experiences in social, emotional, and language development.


3253 Child Development and Guidance: School Age. Influence of family, schools, peers, and the community on the physical, cognitive, social and emotional development of children in the school years. Education as a profession, cultural pluralism in the schools, and school organization. Observation and application of principles of child development and guidance in experiences with school-age children.

3303 Development of Creative Expression, Play and Motor Skills in Early Childhood. Prerequisite: one course in child development. Consideration of appropriate experiences in the areas of play, art, music and motor skills for children. Observation and participation with children groups.

3333 (S) Child Development and Guidance: Adolescence. Development of the adolescent physically, socially, intellectually and emotionally with emphasis on the search for identity, sexuality, vocational choice and interpersonal relationships. Observation of adolescents.

3403 Literature and Literacy in Early Childhood. Consideration of appropriate experiences in the areas of literature and language arts.

3413 Family Economic Decision Making. Helping individuals make more effective choices as consumers. Relevant concepts, theories, and research from economics, family economics, marketing, and statistics. Information-imperfect markets, assessing consumer information, seeking redress, bargaining, inflation, decision-making models, the concept and measurement of quality and assessment of the performance of markets.

3433 Family Finance. Prerequisite: junior standing. Problems faced by consumers in the changing economy; impact of family financial decisions on a consumption-oriented society. Management of family resources including financial planning, credit, insurance, savings, investments, tax and estate planning.

3503 Cognitive Development in Early Childhood. Prerequisite: Junior standing. Study of major theories of cognitive development. Application to appropriate experiences in physical and natural sciences, mathematics and social studies.

3613 Professional Services for Children and Families. Study of current major issues and selected services for children and families.

3623 Fundamentals for the Helping Professional. Prerequisites: 2613, 3613. Development of fundamental skills and techniques used by those in various helping professions as viewed from the systems theory perspective. Observation and interviewing techniques, problem-solving and advocacy skills, and introduction to grant writing.

3753 (S) Family Development. Relationships over the life course within the American family. Variations in form and function of the family system related to cultural, economic, and social context.

3810 Practicum in FRCD. 1-9 credits, maximum 9. Prerequisites: 3213 and 3223, or 3613 and 3623. Observation and participation in programs for children, youth, adults and families. Supervision by FRCD faculty members or their designated representatives.

4000 Senior Thesis. 1-6 credits, maximum 6. Prerequisite: 4743, STAT 2103, senior standing, consent of instructor. Supervised research for the bachelor's degree.

4103 Managing Career Decisions. Applications of decision making models for career and life planning. Self-assessment, career alternatives, career mobility, work/family issues and resource identification. Student seeking teacher certification will complete a module on methods of teaching career education.


4123* Observation and Assessment of Family Interaction. Examination of family interaction through observation and assessment techniques. Focus on whole family functioning and the functioning of multiple family relationships.

4133 Organizing and Administering Programs for Families and Individuals. Development, management, and evaluation of programs serving families and individuals.

4203 Strategies for Teaching. Learning theories and strategies for planning, teaching and evaluating formal and nonformal programs. Not applicable for teaching licensure.

4213 Media, Materials and Techniques in Presentations. Lab 2. Application of educational principles to specific subject matter. Experience with a variety of technological aids for presentation, including multimedia and distance learning, computers and a variety of teaching aids. Development of proficiency in use of various media.

4220 Field Experience Preparation for Kindergarten and Primary. 1-4 credits, maximum 4. Prerequisite: admission to Teacher Education. Decision-making, priority-setting, self-assessment, classroom organization and management, selection of appropriate content, and teaching strategies in public schools and state accredited programs.

4252 History and Philosophy of Early Childhood Education. Prerequisites: courses in child development and early childhood education and senior or graduate standing. History of early childhood education; theoretical foundations and methods of early childhood curriculum models, including multicultural and nonsexist approaches; and current major issues in early childhood education.

4353 Strategies for Working with Adults in Community Services. Theories of adult development as they affect learning activities of adults in family-related programs. Implications are analyzed in relation to planning and selecting programs, media, and teaching strategies.

4413* Management of Volunteer Programs. Prerequisite: junior, senior or graduate standing. For family and human service professionals who will have responsibility for utilizing volunteer personnel in achieving program goals. Overview of issues in volunteerism, management and leadership strategies for maximizing volunteer effectiveness and strategies for evaluating volunteer service.

**Note:** The text above includes course descriptions, prerequisites, and offerings which are typical for a program in Family Relations and Child Development. The courses listed cover a range of topics from early childhood development, family finance, marriage, and family counseling to professional development and career planning. Each course is designed to provide students with a comprehensive understanding of various aspects of family and child development, preparing them for careers in family-related fields. The document highlights the interdisciplinary nature of the field, incorporating perspectives from sociology, economics, psychology, and education.
Internship in Early Childhood Education. 1-7 credits, maximum 12. Lab 3-21. Prerequisites: 2100, 3213, full admission to Teacher Education with written consent of the coordinators of Early Childhood Education and certification offices. Teaching experience in both infant-kindergarten and grades 1-3. Graded on a pass-fail basis.

Family Resource Management. Analysis of the time, human, environmental and financial resources of the family. Practical application of management principles in the development and utilization of family resources. Emphasis on professional competence.


Critical Issues in Family Relations and Child Development. Prerequisite: senior standing. An examination of the place of family relations and child development in the context of broader theoretical, cultural, societal, and national trends; examination of specific cultural and international family forms, their social issues and relevant services to meet their needs.

Seminar in Family Services. Pre-employment seminar. Individual competencies related to family services, career options, and the process of seeking employment.

Family Life Education. Philosophy and principles of family life education. Planning, implementing, and evaluating family life programs in community and education settings.

Special Unit Courses in Family Relations, Child Development and Early Childhood Education. 1-6 credits, maximum 6. Various units taught by specialists in the field.

Honors Creative Component. 1-3 credits, maximum 3. Prerequisite: College of Human Environment Honors Program participation, senior standing. Guided creative component for students completing requirements for College Honors in College of Human Environmental Sciences. Thesis, creative project or report under the direction of a faculty member in the major area, with second faculty reader and oral examination.

Master's Thesis. 1-6 credits, maximum 6. Research in FRCD for M.S. degree.

Directed Study in FRCD. 1-3 credits, maximum 3. Prerequisites: 5223 or 5522 and consent of instructor. Directed individual study in human development and family sciences.

Computer Applications in FRCD Research. Creating variable codebooks, coding data for analysis using the SPPS-X package. No computer experience necessary.

Research Methods in Family Relations and Child Development. Current problem areas and methodologies of research in human development and family sciences, followed by experiences in identifying researchable problems, planning a proposal, selecting appropriate procedures for carrying out studies and interpreting findings.

Methods of Teaching Child Development and Guidance. 1-3 credits, maximum 3. Prerequisites: 2113 and 3213 or equivalents. Content-related materials, learning experiences and methods of teaching child development in classes for youth and adults in secondary schools and colleges.

Teaching Practicum. 1-3 credits, maximum 3. Prerequisites: six hours of graduate course work and consent of instructor. Teaching human development and family sciences; content and techniques.

Child Behavior and Development. Prerequisite: consent of instructor. Current issues in child development beyond infancy explored within the context of recent research. Contrasting theoretical and methodological approaches critically evaluated.

Theories of Child Behavior and Development. Prerequisite: 6 credit hours at graduate level in child development or related areas. Major theories and supportive research that contribute to the understanding of child behavior and development.

Infant Behavior and Development. Prerequisite: 5223 or consent of instructor. Survey of research and theory pertaining to infant development, including behavioral genetics, perception, cognition and learning, social and emotional development, and assessment.

Assessment of Infant and Child Development. Prerequisite: consent of instructor. Study and application of formal evaluative methods for the investigation of infant and child development, including supervised practice in administration, scoring, and interpretation of individual tests of cognitive ability, adaptive behavior, language development, and psychomotor development.

Practicum. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Supervised experience in various settings relevant to human development and family sciences.

Early Childhood Education: Curriculum. Implications of child development theory and research for planning educational programs and learning experiences appropriate for young children.

Advanced Concepts in Early Childhood Programming. Prerequisites: 5213; 5223 or consent of instructor. Exploration and critical review of the state of early childhood programming with emphasis on research, theory, and policy making that bear on current practice. Topics include anti-bias curriculum, family participation in early education, multi-cultural issues, and programs for infants and toddlers.

Early Childhood Theory, Practice and Evaluation. Prerequisites: 5213, 5223 or consent of instructor. Curriculum development and program models for children under six emphasizing individual differences, equipment and materials, physical facilities and space, teacher roles and philosophical objectives.

Early Childhood Administration, Policy Analysis and Advocacy. Prerequisites: 5213, 5223 or consent of instructor. Examination of the administration of programs for young children as well as policy evaluation and advocacy. Legal, social and economic conditions as they affect the welfare of individuals and families.


Developments and Innovations in Family Relations, Child Development and Early Childhood. 1-9 credits, maximum 9. Analysis of current developments and innovative practices in one or more of the specified areas. Emphasis upon learning, teaching concepts with implications for programs serving societal needs in these areas.

Issues in Family Science. Current and classic literature in family studies. Consideration of philosophical bases and current research issues relevant to the family as a field of study.

5543  Coping with Family Crises. Strategies for helping families deal with various family crises including illness, death and divorce. Focus on dealing with these from a family systems approach.

5553  Marital and Premarital Enrichment Education. Analysis of educational models and processes that relate to enriching couple relationships. Approaches to facilitating premarital and marital enrichment, emphasizing program development, implementation and evaluation.

5573  Adolescent in Family Context. Physical, social, emotional and intellectual development of adolescents within the context of family relationships. Exploration of research and theory as it relates to adolescent development and parent-adolescent relationships.

5583  Human Sexuality. Multiple aspects of human sexuality including physiological and psychosocial development and response, sexual relationships, and sexual dysfunction.

5611  Marriage and Family Therapy Pre-practicum. Pre-clinical experience for students in the marriage and family therapy (MFT) specialization, emphasizing counseling skills and structured observations.

5613  Introduction to Marriage and Family Therapy. Prerequisite: graduate standing or consent of instructor. Historical context of family therapy. Overview of the major schools of family therapy and basic clinical skills necessary for the formation of a helping relationship.

5623  Systems Theory and Applications to the Family. Examination of the cybernetic roots and terminology used with general systems theory providing an understanding, appreciation and integration of the role of “systems” approaches to family theory and clinical practice.

5643  Models and Strategies in Marriage and Family Therapy. Exposure to the dominant models used in marriage and family therapy. Emphasis on theoretically appropriate strategies of intervention applied to the treatment of couples and families from an ecosystemic perspective.

5653  Diagnostic Assessment in Marriage and Family Therapy. Prerequisites: 5623; admission to marriage and family therapy specialization or consent of instructor. Recognition of the most relevant dimensions of family, systems, the array of diagnostic tools available, and measurement theory to enhance the probability of meeting the therapeutic needs of troubled couples and families.

5663  Professionalism and Ethics in Marriage and Family Therapy. Prerequisites: graduate standing and consent of instructor. The development of the professional attitude and identity of in marriage and family therapist. The AAMFT Code of Ethics, family law, ethnicity, and gender issues, as related to the practice and profession of marriage and family therapy.

5690  Marriage and Family Therapy Practicum. 1-3 credits, maximum 18. Prerequisite: admission to marriage and family therapy specialization. Supervised clinical experience for students in the marriage and family therapy specialization.

5743  Management of Family and Community Service Programs. Prerequisites: graduate standing and one year work experience. Planning, personnel development, resource development, management and evaluation of community service.


5843  Family Policy Issues. Prerequisite: senior or graduate standing. Identification and assessment of the effects of federal and state legislation on families and consumers. Effects of policies in areas of income maintenance, housing, health, education, social services, employment and contract law.

5933  Evaluation Design. Fundamental principles of evaluation, emphasis on instrumentation.

6000  Doctoral Thesis. 1-12 credits, maximum 30. Prerequisite: consent of instructor. Research in human environmental sciences for the Ph.D. degree under supervision of a graduate faculty member.

6110  Directed Study in FRCD. 1-9 credits, maximum 9. Prerequisites: 5523 or 5223 and consent of instructor. Doctoral level directed individual study in human development and family sciences.

6133  Advanced Research Methods in Family Relations and Child Development. Prerequisites: one course in research methods and one in statistical data analysis appropriate to the areas of family relations and child development.

6190  Research Internship. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Special research studies under the supervision of a graduate faculty member.

6223  Analysis and Application of Child Development Theory. Prerequisite: 5223. Critical analysis of selected child development theories using primary source material with demonstration of application to development, research and practice.

6243  Theory and Research in Early Cognitive Development. Prerequisites: 5213, 5223 or consent of instructor. Critical examination of the concepts and principles derived from cognitive development theory with special emphasis on research and methodological literature.

6250  Seminar in Child Development. 1-6 credits, maximum 6. Prerequisite: 5223 or equivalent. Selected topics in child development with special attention given to recent research literature and current theory.

6253  Theory and Research in Early Social Development. Prerequisites: 5213, 5223 or consent of instructor. Research and theory pertaining to social and emotional development, including attachment, social interaction, friendships and temperament.

6383  Theories and Research in Early Communication Development. Prerequisites: 5213, 5223 or consent of instructor. Recent theories and research in language communication development, including receptive and active language and the relationship of language to early social and cognitive development.

6523  Analysis and Application of Family Theory. Prerequisite: 5523. Family theory process, including logic, theory construction, and relating conceptual orientations to current research areas.

6580  Seminar in Family Sciences. 1-6 credits, maximum 6. Prerequisites: 5513 or consent of instructor. Current research and theory in the family area; selected topics.

6613  Contemporary Issues in Marriage and Family Therapy. Prerequisite: admission to marriage and family therapy specialization. Critical issues facing students in the marriage and family therapy (MFT) specialization, while taking advantage of the unique expertise of clinical faculty. Professional seminar on dialogue with participants taking an active role in the learning process.

6843  Economic and Social Foundations of Family Economics. Prerequisites: graduate standing, consent of instructor. The lives, times and ideas of great economic and social thinkers and how their influence on the economic and social development of our society affects the economics of family living.

Finance (FIN)

2123  Personal Finance. A first course in the management of the individual's financial affairs. Budgeting, use of credit, mortgage financing, investment and estate planning.

3113  Finance. Prerequisites: ACCT 2203, ECON 2023, STAT 2023. Operational and strategic financial problems including allocation of funds, asset management, financial information systems, financial structure, policy determination and analysis of the financial environment.

3613  General Insurance. Introduction to the theory and general principles of insurance. A broad analysis of the elements and operation of property, casualty, health and life insurance.

3623  Property and Casualty Insurance. Prerequisite: 3613. Emphasis on loss and the insurance contract from fire, marine, property damage, automobile and other liability and loss adjustment. Rate formulation, social implications, government regulations and government regulation of the insurance industry.

3633  Life and Group Insurance. Prerequisite: 3613. Principles of insurance applied to life and health values. Group plans in industry, with coverage emphasizing the managerial point of view.
Financial Futures and Options Markets. Prerequisite: 4223. Topics include: derivatives and their uses; options, forwards, futures, and swaps; the use of financial derivatives in risk management; and applications in finance and economics.

5213 International Business Finance. Prerequisite: 5053. Topics include: international financial markets, foreign exchange, and financial management in multinational corporations.

5223 Investment Theory and Strategy. Prerequisite: 5053. Topics include: portfolio theory, asset pricing, and portfolio construction.

5243 Financial Markets. Prerequisite: 5053. Topics include: financial markets, price determination, and asset pricing.

5613 Corporate Financial Planning. Prerequisite: 5053. Topics include: financial planning, capital budgeting, and financial forecasting.

5633 Financial Futures and Options Markets. Prerequisite: 4223. Topics include: futures and options contracts, hedging, arbitrage, and market efficiency.

5763 Derivative Securities and the Management of Financial Risk. Prerequisite: 5053. Topics include: derivative securities, risk management, and financial decision making.

6660 Seminar in Finance. 3-6 credits, maximum 12. Prerequisite: consent of instructor. Topics vary by seminar.


1251 Advanced Extinguishing Systems Design and Analysis. Lab 3. 3 credits, maximum 6. Advanced problems in design and analysis of fire extinguishing systems. Topics include: system design, component selection, and system integration.


2023 Introduction to Occupational Safety Techniques. Lab 3. Occupational safety and health programs. Topics include: hazards, controls, and regulatory compliance.

2243 Design and Analysis of Sprinkler Systems. Lab 3. 3 credits, maximum 6. Analysis and design of automatic fire suppression systems. Topics include: sprinkler system design, system evaluation, and system performance.

2344 Elements of Industrial Hygiene. Lab 3. 3 credits, maximum 6. Elements of industrial hygiene. Topics include: industrial hygiene, environmental studies, and worker health.

2483 Fire Protection Hydraulics and Water Supply Analysis. Lab 3. 3 credits, maximum 6. Analysis of fire protection systems and water supply systems. Topics include: fire protection systems, fire detection, and fire suppression systems.

2650 Technical Problems and Projects. 1-4 credits, maximum 4. Projects in applied research. Projects are assigned by the instructor and are approved by the student's department head. A comprehensive written report is required.

3113 Advanced Extinguishing Systems Design and Analysis. Prerequisites: 2483, 2243. Advanced problems in design and analysis of fire extinguishing systems and water supply systems. Emphasis on computer assistance in design of existing programs.
Structural Designs for Fire and Life Safety. Lab 3. Prerequisites: 1213, 1373, 2243. Building construction standards and codes to assure maximum life and property safety from fires, explosions and natural disaster. Egress design specifications, occupancy and construction classifications and fire protection requirements for building construction and materials.

Radiological Safety. Lab 2. Ionizing radiation problems: detection and measurement, shielding and exposure limiting, radiation health aspects, storage, handling and disposal.

Hydraulic Design of Automatic Sprinkler Systems. Prerequisites: 1373, 2483, MATH 1513. Hydraulic calculation technique for the design and analysis of automatic sprinkler fire extinguishing systems.

Industrial Fire Pump Installations. Prerequisites: 2243, MATH 1513. Applications, design and analysis of industrial fire pump installations. Graphical analysis of fire pump contributions to existing fire protection water supply systems emphasized.

Sprinkler System Design for High Piled and Rack Storage. Prerequisites: 2243, MATH 1513. Specific design techniques for sprinkler system protection of commodities stored in solid piles or racks over 12 feet in height.

Special Problems in Loss Control. 1-4 credits, maximum 6. Prerequisite: consent of department head. Special technical problems in fire protection and safety.

Industrial Hygiene Instrumentation. Lab 3. Prerequisites: 2344, CHEM 1225, PHYS 1114. Description, operation and application of quantitative instruments in general use in industrial hygiene.

Issues in Local Government and Fire Services. Prerequisites: 2153, MGMT 3013. Issues relating to the proper operation of a fire department and the fire department's role within the structure of local government.


Fire Dynamics. Prerequisites: CHEM 1515 or 1225 and ENSCI 2213 or MPT 3433. Fundamental thermodynamics of combustion, fire chemistry and fire behavior. The physical evidence left by fire for investigation. Use of computer models to study fire behavior.


Industrial Loss Prevention. Lab 3. Prerequisites: prior or concurrent enrollment in all other required FPST courses and ENGL 3323 or consent of instructor. Specific industrial processes, equipment, facilities and work practices for detection and controlling potential hazards.

Advanced Fire and Safety Problems. Prerequisites: prior or concurrent enrollment in all other required FPST courses. Selected problems in the fire, occupational safety, occupational health and industrial security areas. Research or state-of-the-art technologies to prevent or correct such problems.

Foreign Languages and Literatures (FLL)

The Department of Foreign Languages and Literatures offers courses under the prefix FLL, and in the following languages each of which has its own prefix: French, German, Greek, Japanese, Latin, Russian and Spanish. These languages are listed in alphabetical order.

Special Studies in Foreign Languages and Literatures. 1-10 credits, maximum 10. Special studies in areas not regularly offered; basic level.

Special Study in Foreign Languages and Literatures: Intermediate. 1-5 credits, maximum 10. Prerequisite: 10 hours or equivalent in target language (applies only to language course). Special study in areas other than those offered in regular program; intermediate level.

Masterworks of Western Culture: Ancient and Medieval. Ideas and values of Western culture as revealed through literary, artistic, historical, and philosophical contexts from Greek, Roman, and Medieval periods.

Masterworks of Western Culture: Modern. Ideas and values of Western culture as revealed through literary, artistic, historical, and philosophical contexts from the Renaissance to the Modern period.

Languages of the World. A comprehensive survey of world languages. The essential structural and historical organization of languages. The process of languages as a basic human function. Same course as ENGL 2443.

Specialized Study in a Modern Foreign Language. 1-20 credits, maximum 20. Lab 1-5. Prerequisite: consent of instructor. Instruction and/or tutorial work in a modern foreign language other than those offered in a major program.

Asian Humanities: China and Japan. The many-faceted cultures of China and Japan from the first expression in poetry and philosophy through popular stories, plays and novels of later times, with continuing attention to music and art.

Specialized Studies in Foreign Languages and Literatures. 1-9 credits, maximum 9. Lab 1-9. Prerequisite: junior standing or consent of instructor. Individual guided study, tutorial or seminar on specially selected topics in a foreign language or literature.

Forestry (FOR)

Elements of Forestry. Lab 3. Survey of forestry as an art, science and profession including forestry and natural resource management theory, forest resource distribution and ownership, historical development, administrative agencies, forest protection, wildlife interactions, forest recreation, and career opportunities; lab fieldwork in wood science, tree identification, land and tree measurements, and mapping. One required three-day field trip.

History and Issues of Forest Policy. Introduction to forest resources policy development in the United States and the effects of policy on the administration and management of forest resources. Discussion of policy implications of some current resource management issues.

Timber Harvest Planning. Theory and strategies of planning and management of timber harvesting operations, including methodology, techniques, equipment, environmental quality and safety elements.

Forest Mensuration I. Lab 3. Prerequisites: 1123; MATH 1715 (or MATH 1513 and 1613); STAT 2013 (or concurrent). An introduction to the measurements of forests, forest products, standing trees, growth, and the application of mensurational techniques to timber valuation and analysis. Measurement techniques of non-timber components of forest resources.


Dendrology. Lab 4. Identification, taxonomy and distribution of forest trees and shrubs of the United States; their environmental requirements and utilization.

Multiple Use and Values of Forest Resources. Lab 3. One-week segment of an eight-week summer field session. Use, values and management of forests and associated natural resources including wildlife, watershed, recreation, range, wilderness, minerals and timber. Visits to natural resource agency lands and projects.

Forest Mensuration II. Lab 8. Prerequisite: 2003. Three-week segment of an eight-week summer field session. Field study on use and care of measurement equipment, the statistical and physical design of forest sampling methods, and special topics in individual tree and stand-level mensuration.
3113 Wood Properties. Lab 2. Prerequisite: 2114. Mechanical and physical property response of wood as structural members. Philosophy and methodology of use of wood products in design and construction of wood structures and components.

3213 Forest Ecology. Lab 3. Prerequisites: BIOL 1304 and 1403 or consent of instructor. Study of the forest ecosystem, its structure and function, physical environment, biotic component, and change over time and its management implications. Two weekend field trips required.

3223 Silviculture. Lab 3. Prerequisite: 3213. Principles and techniques of natural and artificial regeneration, intermediate forest treatments, and silvicultural systems applicable in various forest cover types. Two-day field trip may be required.

3643 (N)Forest Environmental Science. Overview and analysis of forests, their related environments, their associated natural resources, and their tangible and intangible values, emphasizing basic principles of scientific forest management, the use of forest resources by society, natural resource administration and policy, and current issues in forestry. No credit for forestry majors.

3663 Forest Biometrics. Lab 2. Prerequisites: 3003; MATH 2103. The application of statistical methods to forestry problems including stand volume estimation, growth measurement, and volume table construction. Introduction to the use and significance of forest yield tables in forest management. Applications of microcomputing to analysis of forestry data.

3893 Forest Economics and Finance. Prerequisites: 3223 or concurrent enrollment, 3663; AGEC 1114; MATH 2103. Economic factors and analytical methods influencing decisions in forest resource management; factors affecting the production of wood products; arithmetic of interest and investment criteria; economics of nonmarket goods.

4113 Timber Manufacturing. Lab 2. Prerequisite: 3113. Mechanical wood processing from logs to consumer products. Relationship between wood properties, ties and product quality coupled with equipment mill design, and processing efficiency of solid wood and composites manufacturing.

4223 Management. Lab 2. Prerequisites: 3223, 3993. Regulation of forest growing stock to meet management objectives. Land and timber appraisal. Organization of the forest enterprise to meet financial objectives of management. Four-day field trip may be required.

4333 Forest Resource Management: Planning and Decision Making. Lab 2. Prerequisites: 3223, 4223, and any computer science course, senior standing or consent of instructor. Integrated problem solving, to apply biological, quantitative, economic, political, and administrative principles in solving forest resource management problems.

4443 Forest Administration and Policy. Prerequisite: senior standing. Forest policy and legislation; personnel matters, organization, supervision and financing of federal, state and private forest enterprises.

4500 Forest Problems. 1-3 credits, maximum 3. Prerequisites: upper-division standing, GPA of 2.50 or better and consent of instructor. Selected problems in forestry.

4553 Forest Recreation. An analysis of planning, management, administration and use of forests and related wildlands for recreation, including an overview of public agency and private sector recreation resources, programs, and policy; social foundations of recreation; measurement and evaluation of recreation resource settings, activities, experiences, and user impacts; recreation resource operations and interpretive services; and wilderness management. One required three-day field trip.

4563 Forest Ecophysiology. Prerequisite: BIOL 1403. The growth and response of trees and forests to environmental, cultural and genetic factors. Application of physiological principles in predicting the effects of cultural practices on tree growth.

4601 Contemporary Issues in Forestry and Natural Resources. Prerequisite: senior standing. Exploration and discussion of current issues related to the values, use, and management of forests, natural resources, and the natural environment.

French (FREN)

1115 Elementary French I. Lab 1 1/2. Main elements of grammar and pronunciation, with work on the four basic skills of listening comprehension, speaking, reading and writing.

1225 Elementary French II. Lab 1 1/2. Prerequisite: 1115 or equivalent. Continuation of 1115.


2112 (I)Intermediate Reading and Conversation I. Lab 1. Prerequisite: 1225 or equivalent competence. (May have been gained in high school.) Review and further presentation of grammar and pronunciation; consolidation of basic skills, with additional emphasis on writing. May be taken concurrently with other 2000-level French courses.

2113 (I)Intermediate French I. Lab 1. Prerequisite: 1225 or equivalent competence. (May have been gained in high school.) Reading and discussion of simpler French texts, mostly cultural. May be taken concurrently with other 2000-level French courses.

2232 (I)Intermediate Reading and Conversation II. Lab 1. Prerequisite: 2112 or equivalent competence. (May have been gained in high school.) Reading and discussion of more advanced French texts, mostly literary. May be taken concurrently with other 2000-level French courses.

2233 (I)Intermediate French II. Lab 1. Prerequisite: 2113 or equivalent competence. (May have been gained in high school.) Continuation of 2113. May be taken concurrently with other 2000-level French courses.

3073 (I)French Conversation. Prerequisite: 2232 and 2233 or equivalent. Colloquial speech, with discussion of French newspapers and magazines. Practice in brief public address in French.

3203 (I)Advanced Written Expression. Lab 1. Prerequisite: 2232 and 2233 or equivalent. Practice in composition and stylistics, designed to bring students up to a high level of proficiency in writing. May be taken before or after 3213.

3213 (I)Advanced Grammar. Lab 1. Prerequisite: 2232 and 2233 or equivalent. May be taken before or after 3203.

3343 (I)Business French. Prerequisite: 2232 and 2233 or equivalent. Applied French for students in commercial and technical fields. Overview and view of strategies of business and economic climate in France.

3463 (I)Advanced Diction and Phonetics. Lab 1. Prerequisite: 2232 and 2233 or equivalent. Required course for teacher certification. French speech sounds and intonation patterns, with practice to improve the student’s pronunciation.

3802 (I)Orientation to Internship Abroad. Prerequisites: 2232 and 2233 or equivalent. Preparatory course for summer practicum in French-speaking country.

3902 (I)Internship Abroad. Prerequisite: 2232 and 2233 or equivalent. Practical studies in a French-speaking country. Supervised research papers and reports, and oral testing, during and following the practicum.

4153 (H,I)History of French Literature I. Prerequisite: 2232 and 2233 or equivalent. Historical survey of French literature before 1700, with reading of representative texts.

4163 (H,I)History of French Literature II. Prerequisite: 2232 and 2233 or equivalent. Historical survey of French literature of the eighteenth century, with reading of representative texts.

4173 (H,I)History of French Literature III. Prerequisite: 2232 and 2233 or equivalent. Historical survey of French literature of the nineteenth century, with reading of representative texts.

4183 (H,I)History of French Literature IV. Prerequisite: 2232 and 2233 or equivalent. Historical survey of French literature of the twentieth century, with reading of representative texts.

4333 (H)Background of Modern French Civilization. Prerequisite: 20 credit hours of French or equivalent. Capstone course.

4550 (I)Directed Studies in French. 1-3 credits, maximum 9. Lab 1-2. Prerequisite: 20 credit hours of French or equivalent. Group study of French language or literature.

4573 (H,I)Modern French Theater. Prerequisite: 20 credit hours of French or equivalent. Analysis of French plays from the 19th and 20th centuries.

5110 Advanced Studies in French. 1-3 credits, maximum 9. Prerequisite: 15 credit hours of upper-division French. Discussion or research in specialized topics.
**Technical Projects.** 1-4 credits, maximum 4. Prerequisite: completion of three semesters’ work in a technical institute curriculum. Special projects assigned by advisers with the approval of the director. A comprehensive written report must be prepared and an oral examination may also be required.

3113 **Principles of Supervision.** Prerequisite: junior standing. A study of the fundamental principles of organizing, planning, staffing, controlling and directing as applied to first-line supervisory roles in industry.

3123 **Applied Analysis for Technology.** Prerequisite: MATH 2133 or equivalent. Applications of elements of matrix algebra, ordinary differential equations, and infinite series to problems in engineering technology.

3323 **Strength of Materials.** Prerequisites: GENT 2323 and MATH 2123. Stress and strain and their relation to loads. Axial, torsional and bending loads, beam deflection, columns and combined stresses. Applications emphasized.

4333 **Basic Thermodynamics.** Prerequisite: MATH 2123. Basic scientific principles of energy and the behavior of substances as related to engines and systems. Gas laws, vapors and engine cycles.


**Genetics (GENE)**

5102* **Molecular Genetics.** Prerequisites: BIOC 3653 or BIOL 3014 and one course in genetics or consent of instructor. An introduction to molecular genetics on the graduate level.

**Geography (GEOG)**

1113 (I,S) **Introduction to Cultural Geography.** A thematic approach to the study of human groups and activities around the world, including agricultural practices, demographic trends, political behavior, religious beliefs, language patterns, folk and popular cultures, ethnicity and ethnic landscapes, urbanization, and industrialization.

1114 (L,N) **Physical Geography.** Distribution and analysis of natural features of the earth. Landforms, soils, minerals, water, climates, flora and fauna. Emphasis on human-environment relations where appropriate.

2253 (I,S) **World Regional Geography.** The world’s major culture regions, with emphasis on geographic aspects of contemporary economic, social and political relationships with the physical environment.

2343 **Introduction to Geographic Information Systems.** Lab 2. Survey of a variety of resource management and socioeconomic applications using geographic information systems (GIS) technology.

2032 (N) **Climatology.** Characteristics and distribution of the world’s climate. Patterns and associations of temperature, precipitation, pressure and winds. Regional climates of Earth. Climate change.

3033 (N) **Meteorology.** A non-quantitative introduction to weather. Physical elements that cause and influence weather. Interpretation of weather maps and satellite imagery.

3123 (S) **Urban Geography.** Locational aspects of urbanization: functions of and relations among cities and between cities and rural areas; internal structure of urban areas.

3133 (I,S) **Political Geography.** Political structures, relationships and geopolitical implications of location, boundaries, culture and the natural environment of nations and states. Global patterns of political behavior, political history, international law and geostrategy.

3153 (S) **Conservation of Natural Resources.** Problems and corrective methods of conservation of land, water, forests, wildlife, minerals and plants.

3653 **Economic Geography.** Processes significant to the spatial structure of economic systems. Production, consumption and exchange activities examined in regard to location, distribution, aerial differentiation and spatial interaction patterns. Attention given to processes of change as well as to steady states.

3713 (S) **Cultural Geography.** Geographic impact of human cultures. Emphasis on the concepts of social space, density, crowding, territoriality, diffusion, migration, environmental perception and cultural landscape.

3333 **Spatial Analysis.** Prerequisite: STAT 2013. The utility and application of modeling and statistics to spatial problem solving. The role of quantitative methods in geographic research.

3783 **Geography of South America.** A regional analysis of the Arab, Persian and Turkiic lands, including the bio-physical environment, agriculture, resource use, cultural patterns, urbanization, economic development, hydropolitics and conflict.

4133* **Geography of Australia and the Pacific Realm.** Systematic survey of Australia, New Zealand, and the island regions of Micronesia, Melanesia, and Polynesia including a study of human and environmental relations, factors affecting the spatial distribution of human groups and the activities, cultural diversity, and the way in which external involvement, both in the past and present, has shaped this region.

4103 **Applied Geographical Topics.** 1-3 credits, maximum 6. Specialized physical, human, regional, or technical issues and trends in geography.

4043* **Applied Climatology.** Prerequisite: 3023, 3033 or consent of instructor. Applications of atmospheric knowledge to human endeavors such as agriculture, water management, and architecture. Use of real-time atmospheric data to solve problems.

4053 **Geography of Biotic Resources.** Prerequisites: 1114 or BIOL 1404, 1604. Distribution of plants and animals and processes causing distribution. Human impact on biotic resources considered along with policy and management practices.

4103 (H) **Historical Geography of the United States.** Examination of the spatial dynamics of frontier encounter and settlement, regional development, and cultural landscape evolution in the United States from pre-European to modern times.

4113 **Cultural Ecology.** Prerequisite: junior or senior standing or consent of instructor. A study in human-environment interaction addressing the processes and patterns of human coping behavior from prehistoric to contemporary periods. Focus on the processes involved in the transformation of cultural and natural landscapes by systematically exploring how culture works to socially and technologically adapt to environmental opportunities and limitations in arctic, alpine, grassland, arid, and tropical environments.

4123* **Geographic Aspects of Urban Planning.** Prerequisite: 3123. Spatial aspects of urban planning: development of planning theory, various planning tools, and specific problem areas such as urban renewal and urban transportation.

4133* **Land and Resource Regulation.** Private and public land use controls, water law, mineral law, public land law and legal issues related to resource development.
4143^ Geography of Travel and Tourism. A systematic and comprehensive analysis of the geographical dimensions of tourism, illustrating the relevance of a spatial perspective to tourism planning, development, and management. Economic, social, and environmental impact of both domestic and international tourism considered.

415^ Geography of Outdoor Recreation. Analysis of patterns of outdoor recreation with an emphasis on land-use planning in park and wildland areas. Demand forecasting methods, the analysis of the socioeconomic and spatial impacts of recreation facilities provision and visitor management practices.

4213 (S)Geography of Sport. Spatial analysis of sport; its origin and diffusion, geographical organization and regional variation. Geographical movements and interaction associated with sport. Application of geographical solutions for reorganization and reform. Focus on both U.S. and international scene.

4223 (H)Geography of Music. Geographical and historical analysis of music as a cultural trait. The cultural significance of music and how it varies from place to place as well as how it helps shape the character of a place.


431^ Field Techniques and Geodata Collection. Modern concepts and techniques for geographical analysis and research including data acquisition and manipulation from field and secondary sources. Field trips.

432^ Computer Cartography. Lab 2. Fundamentals of map compilation and design using computers. Thematic mapping of both socioeconomic and natural resource information. Discussion and application of various map input techniques involving digitizers, scanners, and global positioning system receivers. 2-D and 3-D terrain representation.

433^ Remote Sensing. Lab 2. Prerequisite: junior standing. Use of several types of sensors and imagery solving problems. LANDSAT imagery use. Uses and limitations of data extraction techniques, manual and computer-assisted. Applications to a variety of specific problems.

434^ Geographic Information Systems: Resource Management. Lab 2. Prerequisite: 2343 or 4333 or consent of instructor. Theory and principles of geographic information systems (GIS) applied to resource management problems using both raster and vector data structures. GIS and remote sensing integration.

435^ Geographic Information Systems: Socioeconomic Applications. Lab 2. Prerequisite: 2343 or 4323 or consent of instructor. Theory and principles of geographic information systems (GIS) applied to socioeconomic problems including location-allocation, market area determination, network analysis, and analysis of demographic characteristics.

4413 History and Philosophy of Geography. Historical research questions and techniques, the structure of contemporary geography and its relations to other fields of study, and future prospects of geography.

4510 Senior Project. 1-3 credits, maximum 3. Lab 1-3. Prerequisites: senior standing and consent of instructor. Individually designed projects involving laboratory work, field work, library research, or a combination of these.

4700 Geographic Regions. 1-6 credits, maximum 6.Prerequisite: consent of instructor. Specialized study of specific local and foreign regions.

4910^ Topics in Geography. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Specialized physical, social and methodological topics in geography.

4930^ Readings in Geography. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Directed readings on selected topics, regions or methods in geography.

494^ Undergraduate Cooperative Education Internship. 1-3 credits, maximum 3. Prerequisites: consent of departmental adviser and consent of instructor. Practical experience in applying geographical concepts to societal problems. Students work with both agency representatives and faculty members.

499^ Senior Honors Thesis. Prerequisites: departmental invitation, senior standing, Honors Program participation. A guided reading and research program ending with an honors thesis under the direction of a senior faculty member, with second faculty reader, both of whom will be present at an oral defense of the thesis. Required for graduation with honors in geography.

5000^ Thesis. 1-6 credits, maximum 6. Prerequisite: consent of adviser or major professor. Open only to students working on the master's degree in geography.

5113^ Landscape Ecology. Prerequisite: graduate standing and BIOL 3034 or consent of instructor. Principles of landscape ecology, including structure and function of landscape elements such as patch, corridor, boundary, and matrix. Role of ecological processes, climate, biota, disturbance, and human influences in landscape structure and function. Integration among landscape elements and role of landscape structure in ecosystem and landscape dynamics. Applications of landscape ecology to biodiversity conservation, wildlife management, and landscape planning. Survey of quantitative methods used in landscape ecology.

5130^ International Resource Management. 1-3 credits, maximum 3. Prerequisite: graduate standing. Spatial perspectives on the assessment and management of natural resources. The role of resources in world trade, security and international environmental concerns.

514^ Cultural and Historical Geography Seminar. 1-3 credits, maximum 9. Prerequisite: consent of instructor. Development and critical analysis of research and theory in cultural and historical geography.

515^ Geography of Sport, Recreation and Leisure Seminar. 1-3 credits, maximum 9. Prerequisite: consent of instructor. Spatial perspectives of topics selected in sport, recreation, and leisure geography.

531^ Geographical Analysis. Prerequisite: one course in statistics. Application of models and statistics to geographic problem solving.

533^ Advanced Geographic Information Systems. Lab 2. Prerequisite: 4343 or 4353. Theory and methods of design, development, implementation, and applications of geographic information systems.

540^ Current Geographic Research. Prerequisite: graduate standing in geography. Review of recent literature in light of current human and physical geography research themes.

541^ History and Philosophy of Geography. Prerequisite: graduate standing in geography. Identification and evaluation of major themes in geographical research and teaching.

543^ Geographic Education. For both prospective and experienced teachers of geography. Geography's role in the social and behavioral sciences; analysis of geography curricula, comparison of various instructional approaches (traditional and experimental); and examination of current research in geographic education.

545^ Seminar in Geography. 1-3 credits, maximum 7. Prerequisite: graduate standing in geography or consent of instructor. Specialized topics in geography.

551^ Research Problems in Geography. 1-3 credits, maximum 6. Prerequisite: consent of instructor.

594^ Graduate Cooperative Education Internship. 1-6 credits, maximum 6. Prerequisites: consent of departmental adviser and consent of instructor. Practical experience in applying geographical concepts to societal problems. Emphasis on programs in planning and geographic education.

600^ Doctoral Dissertation Research. 1-12 credits, maximum 30. Prerequisites: admission to candidacy and consent of major professor.

Geology (GEOL)


1114 (L,N)Physical Geology. Lab 2. Composition and structure of the earth and the modification of its surface by internal and external processes. Mineral resources, sources of energy, and environmental aspects of geology. A background in physics, topography, and math is recommended. Field trip required.

1224 (L,N)Prehistoric Life and Development of the Continents. Lab 2. Earth formation and the development of continents, including the origin and evolution of life. Field trips required.
2031 Geologic Field Investigation. Prerequisite: Introduction to geology. One week of required field study at sites of geological interest and significance.

2253 Practical Mineralogy. Lab 3. Prerequisite: 1014 or 1114. Hand-specimen identification of minerals. Society’s dependence on and utilization of mineral resources. Field trips required.

2364 Elementary Petrology. Lab 3. Prerequisite: 2254. Origin, occurrence and classification of rocks; hand specimen identification. Field trips required.

3004 Earth Science for Teachers. Prerequisite: 1114. Teaching natural earth systems and their environmental impact. Use of an adaptation approach in organizing, presenting, and evaluating earth science concepts in the curriculum.

3014 Structural Geology. Lab 3. Prerequisites: 1224, PHYS 1114 or consent of instructor. Behavior of earth materials during various deformational processes and analysis of the resulting structural features such as folds, faults and fractures. Field trips required.

3024 Principles of Stratigraphy and Sedimentology. Lab 3. Prerequisite: 1224. Principles of stratigraphy and their applications. Laboratory emphasizes realistic practical problems undertaken in the field and in the laboratory. Field trips required. Nonmajors may receive graduate credit.

3034 (N)Scenic Geologic Regions. Prerequisite: 1014 or equivalent recommended. The geologic characteristics of national parks and scenic regions in North America and throughout the world.

3073* Geomorphology. Lab 2. Prerequisite: 1114 or consent of instructor. Study of land forms and the processes that form them, using topographic maps, air photos, remotely-sensed images, soils maps and field techniques. Field trips required.

3103 (N)Paleontology. Lab 3. Prerequisite: 1224 or consent of instructor. Basic principles of paleontology involving invertebrates, vertebrates and plants. Lab focused on the morphology, identification, paleoecology and biostratigraphy of marine invertebrates. Field trips required.


3503 Environmental Geology. Prerequisite: 1114 or consent of instructor. Application of geologic principles to environmental issues, including human use of the surface and subsurface of the earth and human interaction with extreme natural events such as earthquakes, floods and landslides. Field trip is required.

3546* Field Geology. Lab 6. Prerequisites: 2364, 3014, 3033, 3073. Six weeks of field methods in geology. Required of all geology majors. Transportation and room and board fees required.

4023 Petroleum Geology. Prerequisites: 3014 and 3033. Origin, migration and accumulation of petroleum, requirements for source rock, reservoir rock and traps. Structure and stratigraphy of selected oil fields. Field trips required.

4213 Plate Tectonics. Prerequisite: 1114. Principles and major concepts of plate tectonics, the unifying theory of study projects involving Geology and plate tectonics evolution of the major mountain chains of North America; Ouachitas, Appalachians, and Cordilleras. Field trip required.

4403 Geochemistry. Prerequisite: general chemistry. Application of chemical principles to geological processes. Processes affecting the composition of surface and ground waters.

4453 Hydrogeology I. The water cycle and ground-water systems as well as general problems related to ground-water occurrence, quantity, quality and pollution. Field trip required.

4463 Hydrogeology II. Lab 3. Prerequisite: 4453 or consent of instructor. Physical ground-water systems. Realistic problems to acquaint student with ground-water occurrence and movement. Geologic, geophysical, hydraulic testing and modeling techniques used to define an actual ground-water system. Ground-water regulations. Field trips required.

4563 Sedimentology. Lab 3. Prerequisites: 3546, senior standing. Sediments, sedimentary processes and sedimentary environments, geometry and internal features of sediments. Field trips required.

4663 (I)Global Geologic Resources. Distribution and analysis of global mineral, energy and water resources. Economic, environmental, social and political impact of selected resources on local to global scales.

4900 Special Problems in Earth Science. 1-8 credits. Maximum 8. Prerequisites: 25 hours of geology and permission of instructor. Individualized design study projects involving assigned reading, library work, field work, laboratory work or a combination of these. Field trips may be required.

4993 Senior Honors Thesis. Prerequisites: departmental invitation, senior standing. Honors Program participation. A guided reading and research program ending with an honors thesis under the direction of a senior faculty member, with second faculty reader and oral examination. Required for graduation with departmental honors in geology.

5000* Thesis. 1-6 credits, maximum 6. Prerequisite: approval of graduate committee. Work toward master’s thesis in geology.

5001 Problems in Economic Geology. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Individually-designed problems in economic geology. Field trips may be required.

5100 Problems in Hydrogeology. 1-4 credits, maximum 6. Prerequisite: 4453. Advanced problems in hydrogeology with emphasis on quantitative methods. Field trips may be required.

5150* Problems in Engineering Geophysics. 1-3 credits, maximum 3. Prerequisite: consent of instructor. Advanced problems in engineering geophysics with emphasis on problem solving. Field trips may be required.

5183* Advanced Paleontology. Lab 3. Prerequisite: 3103 or equivalent. In depth study of selected fossil groups with emphasis on marine micro-paleontology. Student projects on assigned fossil groups with presentation of results both orally and in writing. Field trips required.

5203* Advanced Structural Geology. Lab 3. Prerequisite: 3014. Theoretical, experimental and descriptive approach to structural geology; formation and analysis of rock fractures, and structural geometry. Field trips required.

5223* Advanced Methods in Structural Geology. Lab 3. Prerequisite: 3014. Advanced geometrical techniques and analysis of complex structural terrains. Elucidation of geometry and history of geological structures by interpreting seismic reflection profiles and constructing balanced cross-sections. Field trips required.

5233* Trace Elements in Hydrogeology. Lab 2. Prerequisite: CHEM 1515. Examination of the behavior of various trace elements in the aqueous environment. Availability and mobility of selected trace elements, the characterization of geochemical environments, pH stability fields, adsorption and other parameters that affect element mobility. Introduction to thermodynamic water-equilibrium computer programs.

5253* Characterization of Clastic Rocks. Lab 3. Prerequisite: 3014, 3033. Use of subsurface geochemical information from cores and well logs to prepare maps and identify oil and gas prospects. Field trips required.


5333* Advanced Well Log Analysis. Lab 3. Prerequisite: 3033. The geologic interpretation of a variety of well logs, emphasized as well as quantitative methods. Some exercises involve concurrent interpretation of well logs and core samples, or well logs and bit cuttings.


5383* Sequence Stratigraphy. Lab 2. Prerequisites: 2253, 2364. Examination of stratigraphic successions dominated by carbonate and siliciclastic dominated intracratonic basins. Integration of surface and subsurface data in projects. Field trips required.
### German (GRMN)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1115</td>
<td>Elementary German I</td>
<td>Lab 1 1/2. Main elements of grammar and pronunciation, with work on the four basic skills of listening comprehension, speaking, reading and writing.</td>
<td></td>
</tr>
<tr>
<td>1225</td>
<td>Elementary German II</td>
<td>Lab 1 1/2. Prerequisite: 1115 or equivalent. Continuation of 1115.</td>
<td></td>
</tr>
<tr>
<td>2112</td>
<td>Intermediate Conversation and Composition II</td>
<td>Lab 1. Prerequisite: 2111 or equivalent competence. (May have been gained in high school.) Continuation of 2112, with further work in composition, conversation and grammar. May be taken concurrently with other 2000-level German courses.</td>
<td></td>
</tr>
<tr>
<td>2113</td>
<td>First Readings in German</td>
<td>Prerequisite: 2225 or equivalent competence. (May have been gained in high school.) Selections from German newspapers and other contemporary material. May be taken concurrently with other 2000-level German courses.</td>
<td></td>
</tr>
<tr>
<td>2222</td>
<td>Intermediate Conversation and Composition II</td>
<td>Lab 1. Prerequisite: 2112 or equivalent competence. (May have been gained in high school.) Continuation of 2112, with further work in composition, conversation and grammar. May be taken concurrently with other 2000-level German courses.</td>
<td></td>
</tr>
<tr>
<td>2223</td>
<td>Introduction to German Literature</td>
<td>Prerequisite: 1225 or equivalent competence. (May have been gained in high school.) Reading and analysis of prose, drama and poetry; literary appreciation. May be taken concurrently with other 2000-level German courses.</td>
<td></td>
</tr>
<tr>
<td>3013</td>
<td>German for Reading Requirements I</td>
<td>Reading in the humanities and the sciences. Translation from German to English.</td>
<td></td>
</tr>
<tr>
<td>3023</td>
<td>German for Reading Requirements II</td>
<td>Prerequisite: 3013 or equivalent. Intermediate and advanced reading in the humanities and sciences. Translation from German to English.</td>
<td></td>
</tr>
<tr>
<td>3343</td>
<td>Business German</td>
<td>Lab 1. Prerequisite: 2222 and 2223 or equivalent. Introduction to business practices and economic environment in Germany. Study of specialized vocabulary.</td>
<td></td>
</tr>
<tr>
<td>3463</td>
<td>Advanced Dictation and Phonetics</td>
<td>Lab 1. Prerequisite: 2222 and 2223 or equivalent. Required course for teacher certification. German speech sounds and intonation patterns. Practice to improve the student's pronunciation.</td>
<td></td>
</tr>
<tr>
<td>3803</td>
<td>Advanced Conversation</td>
<td>Lab 1. Prerequisite: 2222 and 2223 or equivalent. Colloquial speech forms and sentence structure. Practice in oral public address in German.</td>
<td></td>
</tr>
<tr>
<td>3813</td>
<td>Advanced Grammar and Composition</td>
<td>Lab 1. Prerequisite: 2222 and 2223 or equivalent. Practice in original composition in German. Problematic points of German grammar and stylistics.</td>
<td></td>
</tr>
<tr>
<td>4333</td>
<td>Backgrounds of Modern German Civilization</td>
<td>Prerequisite: 20 credit hours of German or equivalent. Historical, cultural, political and literary trends in the formation of German civilization. Capstone course.</td>
<td></td>
</tr>
<tr>
<td>4513</td>
<td>The Age of Goethe</td>
<td>Prerequisite: 20 credit hours of German or equivalent. Principal figures of German Classicism and Romanticism.</td>
<td></td>
</tr>
</tbody>
</table>

### Greek (GREK)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>5443</td>
<td>Engineering Geophysics</td>
<td>Lab 3. Prerequisites: 1114 or 3021. PHY 1214 or equivalent. Geologic aspects of problems associated with environmental engineering, ground-water pollution and regional and urban planning. Problem assessment and field methods. Two required field projects include geophysical surveys using resistivity and seismic refraction methods. Field trip required.</td>
</tr>
<tr>
<td>5453</td>
<td>Advanced Hydrogeology</td>
<td>Lab 3. Prerequisites: 4453, CS 2113 or equivalent. MATH 2145 and 2155 or equivalent. Advanced quantitative techniques used to address ground-water management and pollution. Advanced field and laboratory techniques as well as management and chemical transport models applied to actual field problems and case studies. Field trips required.</td>
</tr>
<tr>
<td>5523</td>
<td>Organic Geochemistry</td>
<td>Lab 3. Prerequisite: 4505 or consent of instructor. Utilization of geologic principles to resolve environmental issues in land use, land management and development. Methods of acquiring, compiling, and applying geologic information for site assessment and environmental impact. Application of these methods to an interdisciplinary project. Field trips required.</td>
</tr>
<tr>
<td>5603</td>
<td>Basin Analysis</td>
<td>Lab 1. Prerequisites: 3546, 5203, 5223, 5253, 5363. Team-taught course. Interpretations of the evolution of selected sedimentary basins. Emphasis on facies analysis, petrography, diagenesis, and structural evolution. Field trips required.</td>
</tr>
<tr>
<td>5710</td>
<td>Advanced Studies in Geology</td>
<td>1-4 credits, maximum 8. Prerequisite: consent of instructor. Individual library, laboratory and/or field projects on facets of geology not covered by existing courses. Field trips may be required.</td>
</tr>
</tbody>
</table>

### Graduate (GRAD)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>5880</td>
<td>Graduate Traveling Scholar</td>
<td>1-24 credits, maximum 24. Prerequisite: graduate degree candidate. Credit will vary depending on the program of each traveling scholar. Enrollment of graduate traveling scholars in academic or research courses.</td>
<td></td>
</tr>
<tr>
<td>5883</td>
<td>Orientation to Gerontology</td>
<td>Prerequisite: graduate standing. Interdisciplinary introduction to the field of gerontology with particular focus on biological, psychological and sociological theories of aging.</td>
<td></td>
</tr>
<tr>
<td>5990</td>
<td>Graduate Research and Teaching Practicum</td>
<td>1-6 credits, maximum 12. Prerequisite: graduate standing. Graduate-level internship program in research and teaching techniques and procedures. Graded on pass-fail basis.</td>
<td></td>
</tr>
<tr>
<td>6010</td>
<td>Research or Intern Practicum</td>
<td>1-9 credits, maximum 12. Prerequisite: graduate standing. Graduate-level internship program for public administration, service or research. Blends the theoretical and absolute phase of the academic with practical on-the-job experience.</td>
<td></td>
</tr>
</tbody>
</table>
Health and Human Performance (HHP)

1753 Introduction to Physical Education. The nature, scope and significance of physical education. Historical and philosophical foundations, major sub-disciplines and their interrelationships, and career opportunities.

1812 Pedagogy of Outdoor Activities. Prerequisite: HHP and LEIS majors and minors only. Introduction of selected motor skills, activities, methods and theories within outdoor activities. Analysis of skills, concepts, terms, safety issues, teaching strategies and developmental appropriateness.

1822 Pedagogy of Rhythm and Movement. Prerequisites: HHP and LEIS majors and minors only. Introduction of basic fundamentals and methods of movement skills for rhythms including social, creative, developmental, and multicultural dance and activities. Analysis of skills, concepts, terms, safety issues, teaching strategies and developmental appropriateness.

1832 Pedagogy of Sports Skills. Prerequisite: HHP and LEIS majors and minors only. Introduction of selected motor skills, activities, methods and theories of individual, dual and team sports. Analysis of skills, concepts, terms, safety issues, teaching strategies, and developmental appropriateness.

1842 Pedagogy of Fitness and Wellness. Prerequisite: HHP and LEIS majors and minors only. Introduction of health promotion focusing on health principles, theories, career opportunities and a field experience.

2480 Clinical Experience in Health and Human Performance I. 2-4 credits, maximum 6. Directed observation in supervised laboratory and clinical experiences in appropriate health and human performance areas. Graded on a pass-fail basis.


2603 Total Wellness. Overview of individual, interpersonal, and socio-cultural issues that have impact on health. Behavioral decision making, social relations, cultural diversity and environmental sensitivity.

2653 Applied Anatomy. Action and location of individual muscles and muscle groups. Anatomy as applied to a living person. Common anatomical injuries and diseases will be presented with each joint structure.

2663 Care and Prevention of Athletic Injuries. Prerequisite: 2653. Symptoms of common athletic injuries, their immediate treatment and care.

2712 Psychomotor Development. Prerequisite: HHP and LEIS majors and minors only. Fundamental aspects of motor development for infants, children, youth and adults.

3110 Health and Human Performance Workshop. 1-3 credits, maximum 6. Concentrated study of selected areas of health and human performance, including problems in instruction and administration not usually addressed in the undergraduate curriculum.

3113 Physiology of Exercise. Lab 2. Prerequisite: MATH 1513. A study of the various bodily systems, including major organs and tissues, and how they respond to acute and chronic exercise of varying intensity, duration and frequency.


3430 Early Laboratory and Clinical Experiences in Physical Education. 1-2 credits, maximum 4. Prerequisites: 1753 and declaration of intention to pursue a program in Teacher Education. The initial preprofessional clinical experience for schools, kindergarten through grade twelve with primary duties including instruction in physical education. Required for full admission to Teacher Education. Graded on a pass-fail basis.

3480 Clinical Experience in Health and Human Performance II. 1-4 credits, maximum 6. Prerequisite: 2480. Directed observation in supervised laboratory and clinical experiences in appropriate health and human performance areas.

3613 Community Health. A survey of issues impacting the health of populations from a community health perspective.

3623 School Health Programs. Prerequisite: 2603. The identity and relationships of school health instruction, services and environments.

3653 Advanced Care and Prevention of Athletic Injuries. Lab 2. Prerequisite: 2653. Advanced techniques applied to athletic injuries.

3663 Biomechanics. Prerequisite: 2653. The study of anatomical mechanical phenomena underlying human motion. Application of biomechanical concepts to a wide variety of exercise, fundamental movement, sport and physical activity.


3713 Principles of Epidemiology. Prerequisites: 2213, 2603. Survey of epidemiological principles as they relate to the planning of both community and consumer-focused health promotion and disease prevention programs.

3753 Methods in Teaching Elementary Physical Education. Prerequisites: 1753, 2712, 3430 and any two of 1812, 1822, 1832, 1842. Theory and practical experience of physical education in the elementary school. Teaching styles and activities needed to meet the needs of children from kindergarten through grade five.

3763 Health and Physical Education for Elementary Age Children. Methods of teaching health and physical education to elementary age children. Theory and practical experience of health behavior, movement skills and physical fitness.

3773 Methods in Teaching Secondary Physical Education. Lab 2. Prerequisites: 1753, 3430 and any two of 1812, 1822, 1832, 1842. Instructional styles, implementation of behavioral goals and objectives through unit and lesson preparation, teaching methods, and classroom management.

4010 Directed Study. 1-3 credits, maximum 6. Prerequisite: written approval by department head. Supervised readings, research or independent study of trends and issues related to the area of health, physical education or leisure services.

4033 Alcohol and Drug Education. Prerequisites: 2603, junior standing or consent of instructor. Examination of pathological and socio-behavioral aspects of drug use, misuse and abuse across an array of populations and social contexts.

4433* Program Design in Health Promotion. Prerequisites: 2603, 3613. A survey of program design principles including theoretical foundation, planning, marketing, delivering and evaluating.

4480 Internship in Health and Human Performance. 1-12 credits, maximum 12. Prerequisites: last semester senior standing with cumulative GPA of 2.50. Supervised experience in school (physical education and health), community, workplace or athletic training settings in order to qualify or prepare for appropriate teaching and professional certification. Graded on a pass-fail basis.

4503* Applied Health Behavior. Prerequisite: senior standing or consent of instructor. Health assessment and intervention strategies with focus on diet, weight management, stress, substance abuse, consumer health and other current health issues.

4533 Psychosocial Issues in Health Promotion. Prerequisites: 2213, 2603. Survey of psychosocial issues as they relate to the practice of health promotion.

4643 Methods in School and Community Health Education. Prerequisites: 3623; full admission to Teacher Education. Conceptual approach to health education through a variety of teaching methodologies.

4702 Pre-internship Seminar. Prerequisite: junior standing. Capstone course for the health promotion program. Preparation for the health internship experience.

4723 Measurement and Evaluation in Health and Physical Education. Prerequisite: full admission to teacher education. Evaluation techniques commonly used by physical educators and health professionals to measure knowledge, attitudes, sport skill proficiency, and physical fitness.

4733 Administration and Program Design in Physical Education and Athletics. Prerequisites: 2603, 3773 or concurrent enrollment; full admission to teacher education. Development and management of physical education (K-12) and athletic programs.
4773 Principles of Exercise Testing and Prescription. Prerequisite: 3114. Study of principles of exercise testing including submaximal and maximal tests, exercise and basic electrocardiography, and guidelines for recommending exercise as related to health promotion and exercise science.

4783* Health Issues in Gerontology. Prerequisite: 2603, or consent of instructor. An in-depth study of physiological aspects, special health concerns, chronic illnesses and services as applied to gerontology.

4793* Adapted Physical Education. Prerequisites: 3753, 3773, full admission to Professional Education. Cognitive and psychomotor characteristics of disabling conditions, needs and challenges of educating the exceptional learner in the regular physical education program.

4853 Theory of Coaching. Prerequisite: junior standing or 45 hours with 3.25 GPA. The role of coaching, including practical aspects of performance, management and relationships, and management concerns such as drug abuse, stress, academic requirements and legal issues.

4903 Therapeutic Modalities for Athletic Injuries. Lab 1. Prerequisite: 2663. Discussion and application of common electronic and physiologic devices used in the treatment of acute and chronic athletic injuries to the musculoskeletal systems.


4933* Administration and Organization of Athletic Training Programs. Prerequisites: 3653, 4902, 4922. The administration and organization of athletic training programs including planning and implementation, certification procedures, code of professional practice, safety standards, and resource management.

4983* Current Issues in Athletic Training. Prerequisites: 3663 and admission to athletic training program. Development of competencies set by the National Athletic Trainers Association Board of Certification. Current issues facing athletic trainers and the role in today's health care systems.

4993* Health and Human Sexuality. Prerequisite: 2603 or consent of instructor. The study of human sexuality as it relates to the health and well-being of individuals in the community, worksite, college and school setting.

5000* Master's Thesis. 1-6 credits, maximum 6. Independent research required of candidates for master's degree. Credit awarded upon completion of thesis.

5010* Seminar. 1-2 credits, maximum 4. Selected topics from the profession not covered in other courses. Presentation and critique of research proposals and results.


5023* Legal Aspects of Health, Physical Education and Leisure Sciences. The law: its application and interpretation as it applies to teachers, coaches and administrators of health, physical education and leisure sciences programs.

5030 Field Problems in Health and Human Performance. 1-3 credits, maximum 6. Individual investigations of issues in the areas of health and human performance.


5073* Sport: Psychological Aspects. Psychological foundations of sport emphasizing performance enhancement by athletes through psychological training techniques.

5143 Health Promotion Program Implementation and Evaluation. Prerequisite: 4433 or consent of instructor. An intensive overview of principles of health promotion program planning, implementation, and evaluation, with special emphasis on application.

5523* Current Readings in Health. Contemporary research, literature, projections and views as applied to total health and well-being.

5553* Psychomotor Development and Assessment. Analysis and assessment of typical and atypical psychomotor development. Theoretical knowledge and practical experience in understanding and assessing psychomotor development and function.

5593* Human Electrocardiographic Interpretation. Prerequisites: 3114 and 4773 or consent of instructor. Knowledge concerning the collection and interpretation of the electrocardiogram (EKG) and its relationship to heart anatomy, physiology and electrophysiology.

5613* Cardiac Rehabilitation. Prerequisites: 2653 and 3114 or equivalent. Factors involved in cardiovascular disease. History, implementation and administration of cardiac rehabilitation programs.

5663* Physical Education for Students with Learning Disabilities. Characteristics, psychomotor development and functioning of students with learning disabilities. Knowledge base and practical experience for providing assessment, prescription and programming services for exceptional learners.

5723* Curriculum Development in Health and Physical Education. Identification and analysis of curriculum theories with emphasis on traditional and innovative approaches to curriculum design for programs in health and physical education.

5733* Motor Learning. Research in psychology and physical education relevant to the understanding of the nature and basis of motor skill learning.

5763* Administration of Health, Physical Education, Leisure and Sports Programs in Higher Education. Essential elements of administration and management including organizational structure and management styles, considerations and functions.

5773* Physical Education for Students with Physical Disabilities. Characteristics, psychomotor development and functioning of students with physical disabilities. Knowledge base and practical experience for providing assessment, prescription and programming services for learners with physical disabilities.

5793* Mechanical Analysis of Physical Education. Application of physical laws to physical education activities.

5823* Advanced Applied Anatomy. Prerequisite: 2653. Structure and movement of the human body with emphasis on the relationship of physical activity to musculoskeletal and neurological factors.

5833* Methods in Physical Education. Prerequisites: 3753 and 3773. Differentiation between teaching methods in physical education; advantages of the application of the individual methods to particular situations in teaching physical education.

5853Quantitative Biomechanics and Kinesiology. Prerequisite: 5823. Analytical approach to the study of human motion as applied to kinesiological description and kinematic and kinetic evaluation.


5863* Stress Testing and Exercise Prescription II. Prerequisite: 5853. Theoretical aspects of evaluating functional capacity through stress testing with the development of exercise prescription for special populations with physiological limitations imposed by age, disease, heredity and environment.

5873* Human Bioenergetics. Prerequisite: 3114. Human energy production, utilization and storage in response to exercise.

5883* Program Development for Adapted Physical Education. Strategies for designing and implementing adapted physical education programs in public schools. Inclusion of students with disabilities into the regular physical education program.

6000* Doctoral Dissertation. 1-10 credits, maximum 10. Independent research required of candidates for the Ed.D. in applied educational studies. Credit awarded upon completion of the thesis.

6010* Independent Study in Health and Human Performance. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Supervised readings, research or independent study of trends and issues related to the areas of health and human performance.

6020* Research Colloquium. 1-3 credits, maximum 3. Exploration and presentation of selected topics and research in health and human performance.

6053* Advanced Research in Health and Human Performance. Prerequisite: graduate elementary statistical methods course. Indepth study of selected surveys and experimental research in HHP, including questionnaire development, survey methodology and analysis of data.
6060 Statistical Computing and Proposal Writing. 1-3 credits, maximum 3. Prerequisite: consent of instructor. Instruction in the use of SPSS using a personal computer. Preparation of research proposals.

History (HIST)

1010 Studies in American History. 1-2 credits, maximum 2. Special study in American history to allow transfer students to fulfill general education requirements as established by Regents' policy.

1103 Survey of American History. Meaning, vitality, and uniqueness of United States history since 1492 through a thematic examination of the nation's past. Satisfies, with POLS 1113, the State Regents requirement of six credit hours of American history and American government before graduation. No credit for students with prior credit in HIST 1483 or 1493.

1483 American History to 1865. From European background through the Civil War. Satisfies, with POLS 1113, State Regents requirement of six credit hours of American history and American government before graduation. No credit for students with credit in HIST 1103.

1493 American History Since 1865. May be taken independently of HIST 1483. Development of the United States including the growth of industry and its impact on society and foreign affairs. Satisfies, with POLS 1113, State Regents requirement of six credit hours of American history and American government before graduation. No credit for students with credit in HIST 1103.

1613 (H) Western Civilization to 1500. Lab 1. History of western civilization from ancient world to Reformation. Laboratory discussion sessions on interpretation of primary sources in translation.

1623 (H) Western Civilization After 1500. Lab 1. History of western civilization from Reformation to present. Laboratory discussion sessions on interpretation of primary sources in translation.

1713 (H) Survey of Eastern Civilization. History of three eastern civilizations (East Asia, South Asia and West Asia) from pre-history to the 18th century. Special attention to their origins, development, and contributions to the evolution of world civilization.

2232 Oklahoma History. Early exploration and establishment of Indian Territory; the rise and demise of the Five Indian Nations; and the organization and development of the 41st state to the present. Required of all candidates for teacher's licensure/certification in social studies.

3003 (L,S) Soviet Union: History, Society and Culture. A comprehensive view of the Soviet Union, stressing those issues in the political, economic, technological, geographical and cultural spheres which are most relevant to the current situation. Accessible to beginning undergraduates. Same course as POLS 3003 and RUSS 3003.

3013 (H) Ancient Near East. The Ancient world from the beginnings of recorded history through the Egyptian, Mesopotamian, Hebrew and Persian civilizations, in addition to the minor civilizations of the area.

3023 (H) Ancient Greece. The Greek world from the Bronze Age through Alexander the Great with special emphasis on politics, culture and institutions of Classical Greece.

3033 (H) Ancient Rome. Political, social, economic, and cultural history of the Roman Republic and Empire.

3053 (L,S) Introduction to Central Asian Studies. A comprehensive view of newly-emerged Central Asian states examining the history, politics, economics, geography, and culture of such nations as Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan as reflected in their thoughts, religion, literature, and architecture, in the past, and the strategic importance of their natural wealth for the present and future. Same course as POLS 3053 and RUSS 3053.

3113 (L,S) Germany Since 1815. Creation of a centralized state in Germany; impact of World War I and the subsequent failure of the Weimar Republic; rise of national socialism, totalitarianism, and the Third Reich; German experience in World War II, repression of minorities, and the Holocaust; post-war Germany and modern reunification.

3153 (H) Russia to 1861. Political, institutional, societal and economic development of Russia from the Kievan period to the Great Reforms.

3163 (H) Russia Since 1861. Modernization of Russia in the 19th and 20th centuries. Great reforms and their effects and the 1917 revolutions and their consequences.

3173 (H) Eastern Europe, 1000-1800. Formation of the eastern European nations and the influence of Rome, Byzantium, the Ottoman Empire, Russia, Austria and Prussia on them.

3183 (H) Eastern Europe Since 1800. Formation and impact of nationalism, industrialization, and power politics on the peoples of eastern Europe.

3203 (H) Early Middle Ages, 325-1000. Economic, social, cultural and religious developments in Byzantium, Islam, and the Germanic West, which succeeded imperial Rome.

3223 (H) Medieval Europe, 1000-1350. High and Late Middle Ages in the West with emphasis on political, social, economic and intellectual development.

3243 (H) Renaissance and Reformation, 1350-1618. Social, cultural, intellectual, political, economic, and religious developments which led to the flowering of modern western civilization.

3253 (H) Early Modern Europe, 1618-1815. Economic, social, political, cultural and intellectual transformations of Europe from the opening of the Thirty Years War to the Congress of Vienna.

3263 (H) Modern Europe, 1815-1914. Impact of modernization on the character of European society. Factors that transformed the Continent into a battle ground in the 20th century.

3273 (H) Modern Europe Since 1914. Origins, character and impact of the first World War; emergence and consequences of the totalitarian state; nature of political and intellectual terrorism; effects of worldwide economic depression; dilemmas of modern democracies; political collapse of Europe as a consequence of World War II.


3323 (H) Modern France, 1815-Present. French politics, economy, society, and culture from the defeat of Napoleon to France's post-World War II "rebirth."

3333 (L,S) History of the Second World War. Problems leading to World War II with their international implications and consideration of the war years.

3343 (H) World War I in Modern European Culture. Analysis of the war as the principal event determining the course of twentieth century European history: battles, home fronts, personal, literary, and artistic expression.

3353 (H) Imperial Spain, 1450-1800. The rise and fall of the world's first modern imperial power. From Spain's emergence under the "Catholic kings" to its rejuvenation under the Bourbons, with topics on political, artistic, and cultural history.

3373 (S) Medieval England: 55 B.C.-1485 A.D. English history from Roman Britain to the beginning of the Tudor period. Development of the English constitution from the early Germanic state through feudalism to the New Monarchy.


3393 (S) Modern England: 1714-Present. English history from the arrival of the house of Hanover through the decline of British influence following the Second World War. Political, social, and economic problems encountered as a result of the creation of the first modern industrialized state.

3403 (H) East Asia to 1800. Traditional Chinese civilization and its impact on Japan, Korea and Southeast Asia.

3413 (H) East Asia Since 1800. Impact of the Occident on China, Japan and Southeast Asia. Problems of trade and diplomacy; political and industrial transformation of Japan; revolutionary processes in China; the rise of nationalism in Southeast Asia.

3423 (H) Modern Japan. Modernization process in Japan since 1868.

3433 (H) Modern China. Response of China to the West since 1840, with stress on economic, social and intellectual currents.
Reading Seminar in European and World History. 3 credits, maximum 15. Historiographical and bibliographical study of special areas of European and World history.

Research Seminar in American History. 3 credits; maximum 15. Research in selected problems in American history.

Research Seminar in European and World History. 3 credits; maximum 15. Research in selected problems in European and World history.

Doctoral Dissertation. 1-19 credits; maximum 30. Prerequisite: admission to candidacy. Advanced research in history.

Historiography. Major writers of history, historical schools and patterns of developments in historical interpretation from the earliest times to present.

Special Studies in History. 1-3 credits; maximum 36. The meaning and operation of the historical processes and develop capabilities for clarity of statement, investigation, and creative, critical attitude. Areas studied vary from semester to semester.

Honors (HONR)

1000 Introductory Honors Topics. 1-3 credits; maximum 6. Prerequisite: Honors Program participation. Introduction to topics in various disciplines by faculty from the undergraduate colleges for freshman and sophomore students in the University Honors Program.

1013 (H) The Ancient World. Prerequisite: Honors Program participation. Interdisciplinary study of art, history, philosophy and literature from ancient Greece and Rome as well as the religious ideas central to Judaism and Christianity. Team-taught by faculty from appropriate disciplines in a lecture and discussion format. For the Honors student. No credit for students with prior credit in HONR 2113.

1023 (H) The Middle Ages and Renaissance. Prerequisite: Honors Program participation. Interdisciplinary study of art, history, philosophy and literature from the Middle Ages to the early Renaissance. Team-taught by faculty from appropriate disciplines in a lecture and discussion format. For the Honors student. No credit for students with prior credit in HONR 2113.

1033 (H) The Early Modern World. Prerequisite: Honors Program participation. Interdisciplinary study of art, history, philosophy and literature from the late Renaissance to the mid-19th Century. Team-taught by faculty from appropriate disciplines in a lecture and discussion format. For the Honors student. No credit for students with prior credit in HONR 2223.

1093 Patterns and Symmetry in Mathematics. Prerequisite: Honors Program participation. Tesselations, or repetitive patterns in the plane and in space, and the symmetries, or rigid motions, that preserve them. Illustrations from art, architecture, science, and nature. For the Honors student.

2013 (S) Honors Law and Legal Institutions. Prerequisite: Honors Program participation. An introduction to law in American society with reference to its European origins; its political, economic, psychological, and sociological dimensions; and the substantive law in selected areas. Introduction to legal reasoning and legal research techniques. For the Honors student.

2031 (S) Honors Ethical Issues Across Cultural Perspectives. Prerequisite: Honors Program participation. An introduction to reasoned methods of evaluating ideas and arguments as they pertain to ethical issues from a global perspective. Concepts including obligation, justice, and ethnicity from Lao Tzu, Maimonides, Kant, and Indian wisdom stories. Environmentalism, technology, and cultural knowledge. Team-taught by faculty from appropriate disciplines in a lecture and discussion format. For the Honors student.

2514 (L, N) Honors Scientific Inquiry. Lab 2. Prerequisite: Honors Program participation. A team-taught interdisciplinary course dealing with philosophy of science and the application of the scientific method in the natural and social sciences. Selected topics that involve interdisciplinary scientific inquiry. For the Honors student.

2500 Advanced Honors Topics. 1-3 credits; maximum 6. Prerequisites: Honors Program participation, junior standing. Topical study in various disciplines taught by faculty from the undergraduate colleges for junior and senior students in the University Honors Program.

3013 (H) Holocaust Studies Seminar. Prerequisites: junior standing, Honors Program participation. An interdisciplinary study of one of the problematic events of human history—the Holocaust. Addresses questions of good and evil, divinity and humanity, and truth and responsibility that arise from this event. For the Honors student.

4993 Honors Creative Component. Prerequisites: Honors Program participation, senior standing. A guided creative component for students completing the requirements for college or departmental honors awards leading to an honors thesis, project or report under the direction of a faculty member from one of the undergraduate colleges, with a second faculty reader and oral examination.

Horticulture (HORT)

1003 Home Horticulture. Offered by correspondence only. An introduction to horticultural practices for the home gardener. Planning and care of home grounds, home orchards and vegetable gardens; selection, use and care of indoor plants. Non-majors only. Credit will not substitute for required courses.

1013 (N) Principles of Horticultural Science. Lab. Basic physical and physiological processes responsible for plant dormancy, growth, flowering, fruiting, and senescence with respect to the science and art of production, cultivation, utilization, and storage of horticultural plants. Current research associated with various horticultural commodity groups.

2010 Internship in Horticulture. 1-6 credits; maximum 6. Prerequisites: 24 credit hours and consent of adviser. Supervised work experience with approved public and private employers in horticulture and related fields. Credit will not substitute for required courses. Graded on a pass-fail basis.

2112 Indoor Plants and Interior Plantscaping. Lab 2. Prerequisites: 12 hours of horticulture, cultural requirements and use of ornamental foliage and flowering plants for indoor gardens.

2212 Herbaceous Ornamental Plants. Lab 2. Identification, cultural requirements and landscape value of ornamental flowering herbaceous plants. Discussions of design and installation of herbaceous beds and borders.

2313 Landscape Plant Materials I. Lab 2. Prerequisite: BIOL 1114 or 1403. Identification, adaptation, tolerance and use of deciduous trees, shrubs, vines and ground covers in the landscape.

2413 Landscape Plant Materials II. Lab 2. Prerequisites: 2313. Identification, adaptation, tolerance and use of evergreen trees, shrubs, vines and ground covers in the landscape.

2652 Basic Floral Design. Lab 2. Fundamentals of floral arrangement and design for the home and retail shop; basic skills useful to flower shop employment and operation.

3014 Business and Practice of Arboriculture. Lab 2. Prerequisites: 2313 and 2413 or FOR 2134, and SOIL 2124. Theory and practice of selecting, planting and maintaining trees, shrubs and vines. Basics of the landscape management business, including estimates for labor, equipment and plant materials; bidding; costs and record keeping; and employee safety.


3113 Greenhouse Management. Lab 3. Prerequisites: 1013, 2112, BIOL 1403 and MATH 1213. Commercial greenhouse operation with emphasis on floricultural plant production aspects; environment, growing media, fertilizers and application methods, watering, pest and disease control, chemical growth regulators, production costs.

3153 Turf Management. Prerequisites: 1013, SOIL 2124 and 2 hours plant science. Selection, establishment and maintenance of grass species and other plant materials for special use areas.

3213 Fruit and Nut Production. Prerequisite: BIOL 1403. Commercial production of fruits and nuts, with emphasis on pecan, apple, peach, strawberry, blackberry and blueberry. A two-day field trip is required.

3433 Commercial Vegetable Production. Prerequisites: 1013, SOIL 2124 and BIOL 1403. Commercial production and marketing of vegetable crops.
Nursery Production. Lab 2. Prerequisites: 2213, 2413, and SOIL 2124. The propagation, production, management and marketing of ornamental nursery stock.


Turfgrass Physiology and Ecology. Lab 2. Prerequisite: 3153. Investigation of physiological and ecological change in turf ecosystems because of environmental pressure. Particular attention to turfgrass management systems; why they are successful and how they can be improved to reduce environmental impact.

Horticultural Seminar. Prerequisite: junior standing or above. Contemporary problems and topics in horticulture, individual seminar reports, group discussion, career exploration, state, national and global horticultural issues and job placement.

Public Garden Management. Lab 4. Prerequisite: 1013. Issues and methods in public garden management including database management of collections, conservation of native species, grant writing, volunteer coordination, computerized mapping systems, master planning, and other topics pertaining to a career in commercial horticulture. Field trips required.

Applied Landscape Planning. Lab 6. Prerequisite: 2313 or 2413. Concepts in landscape planning and landscape business operations including site analysis, plant selection, surveying, graphic representation, and pricing. Emphasis on residential landscapes. No credit for students in the landscape architecture (B.L.A.) or landscape contracting programs.

Horticultural Problems. 1-6 credits. Maximum 6. Prerequisites: consent of instructor. Problems related to pomology, olivericulture, nursery production, landscape design, or the culture, sales and arrangement of flowers.

Research and Thesis. 2-6 credits, maximum 6. Research on thesis problems required of master’s degree candidates.

Advanced Horticultural Problems. 1-12 credits. Maximum 20. Selected research problems in horticulture, floriculture, landscape design; nursery production, olivericulture, and pomology.

Advances in Horticultural Science. The latest advances in horticultural science and technology affecting the vegetable, fruit and nut, turfgrass, nursery, and floriculture commodity areas. Areas of production systems, postharvest preservation, plant responses to the environment, and sound environmental practices.

Temperature Stress Physiology. Prerequisite: BOT 3653, BOT 3643 or consent of instructor. Effects of heat, chilling and freezing stress on plants. Responses to temperature extremes at the molecular to whole plant levels, with emphasis on mechanisms of injury and resistance.

Experimental Horticulture. Methods of conducting research with horticultural crops including controlled atmosphere treatment (precooling at harvest, controlled atmosphere storage, refrigeration, and packaging techniques). Commodity-specific postharvest phenomena.

Flowering and Fruiting in Horticultural Crops. Prerequisite: BOT 3463. Environmental, chemical and cultural factors affecting the flowering and fruiting of horticultural crops.

Postharvest Physiology. Prerequisites: BOT 3463 and 3460. Physiological causes for postharvest changes in horticultural crops (ripening and senescence) and the basis for certain postharvest treatments (precooling at harvest, controlled atmosphere storage, refrigeration, and packaging techniques). Commodity-specific postharvest phenomena.


Introduction to the Hospitality Industry. Career opportunities and the scope, development and history of the hospitality industry. The lodging and food service segments of the industry. Ethical issues for the industry.

Introduction to Professional Food Preparation. Lab 3. Functions of the nutrients in the human life process. Nutrient relationships based on food preparation systems. Techniques and theories of food preparation including use and selection of equipment, sanitation for quality, controls and guest accommodations.

Service Management in Hospitality Operations. Lab 4. Prerequisites: 1114 or NSCI 2114. Analysis and development of service management skills, including leadership behavior, motivation, communication, training, staffing and professional service staff behavior.

Special Topics in Hotel and Restaurant Administration. 1-3 credits, maximum 6. Study of specific issues or topics in hotel and restaurant administration.

Science of Food Production. Lab 3. Prerequisites: 1114, CHEM 1014 or 1215. Application of scientific principles to food preparation.

Management in Hospitality and Food Service Systems. Prerequisite: a course in economics. Function and methods of management as related to the hospitality and food service industries.


Hospitality Industry Internship. 1-6 credits, maximum 6. Prerequisites: 3213, consent of instructor. Supervised experience in an approved work setting related to a future career in the hospitality industry.

Mechanical Equipment and Building. Evaluation of illumination, electric wiring, plumbing, heating, ventilation, air conditioning, and equipment used in the hospitality industry. Maintenance, repair and functions.

Purchasing in Hospitality and Food Service Systems. Prerequisite: 1114. Procurement of food and nonfood materials in hospitality and related industries.

Legal Aspects of Hotel and Restaurant Management. Prerequisites: 3213 and BUSL 3213. Examination of the laws regulating the lodging and food service industry. Development of an appreciation of the interrelationships between law and industry. Exploration of how legal principles apply in a global environment.

Hotel and Restaurant Promotion and Sales. Prerequisite: 3213, Fundamentals of sales promotion, the sales department, publicity types, methods of soliciting group business, Versatility, cost, timing and results of use of the advertising media.

Food, Beverage and Labor Cost Controls. Prerequisites: ACCT 2203, junior standing. Menu analysis and food, beverage, labor cost controls associated with hospitality industry operations.

Quantity Food Production Management. Lab 5. Prerequisite: 3553. Organizing, purchasing, costing, preparation and service of food in a quantity food production setting.

Lodging Operation Systems Analysis. Prerequisite: 3363 or consent of instructor. Conceptual analysis of hospitality operation systems such as food and beverage service, housekeeping, sales, properties management, properties feasibility, personnel, accounting and front office. Investigation of inter- and intradepartmental functions.

Hospitality Layout, Equipment and Furnishings. Prerequisite: 3473. The planning process, space allocation and arrangement of furnishing equipment and utilities in a hospitality facility. Time and motion efficiency and equipment specifications.
Overview of societal issues and their application to the industry.

4523* Leadership in a Diverse Society. Comparison and critiquing leadership and diversity research, theories and practices in multiple aspects of society using an historical perspective. Utilization of case studies, focus groups, and experts from government, education, volunteerism, and the workplace to facilitate the development of a culturally inclusive professional practice that integrates leadership and diversity principles.

5453* Hospitality Customer Development Strategies. Examination of the role of the customer in the functioning of hospitality organizations. The concepts and strategies of hospitality customer development.

4570* Problems in the Hospitality Industry. Prerequisite: senior or graduate standing. Breadth of vision and broad perspective of contemporary issues in the management of hospitality industry organizations. Awareness of societal issues and their application to the industry.

5870* Doctoral Thesis. 1-12 credits, maximum 6. Prerequisite: consent of major professor. Research for hospitality administration for the Ph.D. degree.

6123* Tourism Policy and Planning. Overview and examination of current international and national tourism policies and an examination of the tourism site planning process for tourism and hospitality development perspective. The economic impact of policy and planning issues to the tourism and hospitality industry.

4633* Employee Development Issues in the Hospitality Industry. Prerequisites: two years of hospitality work experience and a course in human resources or personnel management. Developing and maintaining a productive workforce in the hospitality industry. Recent theories and research of training, development of internal customers, and the labor issues affecting the hiring and development process.

Human Environmental Sciences (HES)

1001 Seminar in Human Environmental Sciences. Mission of the College as a basis for value exploration and problem solving. Investigation of the integrative nature of the profession and general education. Required of all students in the College of Human Environmental Sciences.

1111 Discover Human Environmental Sciences. A survey of the majors and career opportunities in the various human environmental sciences departments. Transfers from high school to university life, awareness of campus and college resources, and enhancement of study skills and attitudes that contribute to academic success. Required of all first semester freshmen in the College of Human Environmental Sciences. Graded on a pass-fail basis.

2110 Career Exploration in Human Environmental Sciences. 1-3 credits, maximum 3. Acquisition of career information critical to individuals. Required of all students in the College of Human Environmental Sciences.

3002 Contemporary Issues in Human Environmental Sciences. Exploration of the mission of the College of Human Environmental Sciences and subject matter interrelationships; ethical issues and professionalism in the field; effect of global interdependence and public policy on individuals, families and professionals. Required of all students in the College of Human Environmental Sciences.

3090 Study Abroad. 1-18 credits, maximum 36. Prerequisites: consent of the Office of International Programs and associate dean of the College of Human Environmental Sciences. Participation in college sponsored programs spending a semester or year in full-time enrollment at a university outside the U.S.
Human Resources and Adult Education (HRAE)

4010* Occupational and Adult Education Workshop. 1-3 credits, maximum 6. Professional workshops of various topics and lengths. Each workshop focused on a particular topic from such areas as the development, use and evaluation of instructional methods and materials.


5000* Thesis or Report. 2-10 credits, maximum 10. Students studying for a master's degree may enroll in this course for a total of two credit hours if they write a report or six hours if they write a thesis. Students working on a specialist's degree may earn a maximum of 10 hours credit.

5010* Seminar. 1-3 credits, maximum 6. Graduate student seminars focusing on current and critical issues and common problems relevant to occupational and adult education.

5123* Program Evaluation in Occupational and Adult Education. The purpose of evaluation in occupational and adult education programs with specific attention given to the evaluation of program development in laboratory and shop instruction.

5203* Foundations of Adult and Continuing Education. Societal trends, issues and institutions which have influenced the development and current status of adult and continuing education. Analyses and critiques of contemporary adult and continuing education activities, materials and clientele groups served, and their implications for new and existing programs in the field.

5213* Characteristics of Adult Learners. Learning patterns, interests and participation patterns among adults in a variety of educational settings. Theories of learning and behavior modification for adults, with implications for adult and continuing education programs. Particular attention given to learners in occupational, adult basic, community junior college, extension and proprietary program settings.

5223* Organization and Administration of Adult Education. Organizational procedures and administrative practices for effective planning, implementation and management of adult and continuing education programs. Analyses of legislation, finance and community groups that influence and impact upon adult and continuing education programs.

5233* Needs Analysis. Techniques of conducting organizational analyses of human performance problems, including surveys, interviews, records analysis, group interaction, and task analysis.

5243* Advanced Project in Needs Analysis. Prerequisite: 5233. The conduct of an analysis of human performance problems in an organizational, agency, institutional or community setting, including need problem identification, investigation, clarification and resolution, and the development of a formal report and a presentation to management.

5253* Instructional Strategies for Adults. Prerequisite: graduate standing. An analysis and application of the various techniques and materials available to facilitate the learning process for adults. Concentration on the process of designing effective learning experiences for adults and the development of competencies of the facilitators of group and self-directed learning.

5340* Special Problems. 1-6 credits, maximum 6. Directed independent study of special topics involving assigned readings, library research, field work or a combination of these.

5423* Instructional Design for Training. Design and development of training to address performance problems in organizations, business and industry. Indepth study of a systematic approach to training for performance. Same course as ICED 5433.

5533* Human Resource Development. Introduction to training and development, including history and nature of the field, trainer roles, needs analysis, program development, evaluation, and techniques of conducting training.

5720 Workshop. 1-3 credits, maximum 10. Professional workshops of various topics and lengths. Each workshop designed to meet unique or special needs of individuals concerned with adult education and human resource development.

5730 Special Topics in Human Resource Development. 1-3 credits, maximum 6. The practice, theory and research related to a current topic in human resource development.

5833* Global Consulting. The consulting process, including contract, entry, diagnosis, response, disengagement, closure and ethical considerations. The competencies of successful consultants and trainers in the international environment, including cultural adaptations of self and training materials.

5880* Internship. 3-6 credits, maximum 6. Supervised experience working in business, industry, human service, or education settings.

5912* Organization and Administration of Adult Basic Education Programs. Organizing and administering adult basic education for occupational programs.

6000* Doctoral Dissertation. 2-10 credits, maximum 15. Required of all candidates for the Doctor of Education degree in adult education and human resource development.

6110* Graduate Readings in Adult Education and Human Resource Development. 1-6 credits, maximum 6. Prerequisite: consent of supervising professor. Supervised readings of significant literature not included in regularly scheduled courses.

6203* Managing Adult Education Research. Analysis and application of techniques necessary for managing research projects in diverse agencies with adult learners. Practice with computer-based programs. Data sets from adult education research projects.

6213* Aging, Learning and Work. An analysis of the nature of adult learning and work performance and their relationships to the aging process.

6223* Current Research in Adult Education. Analysis of the major research trends in the field of adult education. Recent research studies in the field.

6233* Critical Issues in Adult Education. Exploration of current issues of concern to adult educators from diverse settings.

6330* Special Topics in Adult Education. 1-3 credits, maximum 9. Prerequisites: 5203, 5213. Analysis and critique of the application of adult learning principles and methods in one of the numerous diverse settings in which adult education is practiced.

6340* Independent Study in HRAE. 1-3 credits, maximum 9. Directed independent study for doctoral students involved in a research-based project.

6533* Organization Development. Seminar examining the field of organization development. Emergence of the field, diagnosis, performance, change management, the client, and the consultation.

6633* Advanced Human Resource Development. Prerequisite: 5533. Scholarly critique of organizations as adaptive systems and the role human resource development plays in organizing, process and individual performance.

6871* Doctoral Seminar: Level 1. Orientation to doctoral program in HRAE. May be taken prior to program application; required of all applicants.
Industrial Engineering and Management (IEM)

2903 Introduction to Industrial and Systems Engineering. Lab 1. Prerequisites: ENGR 1111; MATH 2145. Industrial engineering concepts and techniques in production control, quality control, layout, methods engineering, material handling, mathematical programming, and engineering economy. Laboratory sessions provide additional learning experiences with these topics and with computer software used in industrial engineering analyses.

3303 Industrial Processes I. Lab 3. Prerequisites: ENGR 1332 and ENSC 3313. Manufacturing processes used to transform raw materials into finished goods. Near-shape processing and basic metal cutting theory, process selection, and planning. Field trips to manufacturing plants.

3313 Industrial Processes II. Lab 3. Prerequisite: 3303. Manufacturing processes in joining, finishing, metrology, nontraditional machining, tool design, electronics manufacturing assembly and numerical control. Field trips to manufacturing plants.

3503 Engineering Economic Analysis. Prerequisite: MATH 2155. Development and use of time value of money interest formulas. Bases for comparison of alternatives, including present worth, annual worth, rate of return and payout period methods. Decision making among independent, dependent, capital-constrained and unequal-lived projects. Replacement, break-even and minimum cost analyses. Depreciation and depletion methods and their effect on corporate income taxes, leading to after-tax cash flow analysis.


3514 Engineering Cost Information and Control Systems. Prerequisite: MATH 2145. Basic cost measurement and control concepts. How to measure and interpret cost data and define its use in planning, control and estimating. Role of accounting in cost control.

3703 Engineering Computation and Interactive Modeling. Prerequisites: ENGR 1412, MATH 2145. Using the computer for engineering problem solving through analysis, design and pseudocode. Applications using computer languages, spreadsheets, statistical packages and equation solvers.


4010* Industrial Engineering Projects. 1-3 credits, maximum 6. Prerequisite: consent of school head. Special undergraduate projects and independent study in industrial engineering.

4041* Operations Research. Prerequisites: 3703, MATH 2923, STAT 3333. Fundamentals methods, models, and computational techniques of operations research. Linear programming including transportation and assignment models. Network models, dynamic programming, decision theory, and queueing theory.

4023* Operations Research II. Prerequisites: MATH 2233, STAT 4033 and FORTRAN. Continued study of the fundamental methods of operations research; emphasis on nonlinear programming, dynamic programming, inventory theory and analysis, queueing theory and analysis and simulation.

4103* Industrial Quality Control. Prerequisite: STA 3333. Principles and practice of industrial control. Modern quality philosophy, including a process improvement strategy incorporating charter, documentation of knowledge and improve- ment cycle. Theory and use of statistical process control (SPC) tools for problem solving and continuous improvement. Variables and attributes control charts for both discrete and continuous flow/batch processes. Process capability and performance analysis including strengths and weaknesses of Cpk and Ppk indices. Introduction to acceptance sampling, including ANSi/ASQC Z1.4 standards.

4113* Industrial Experimentation. Prerequisite: 4103. Analytical methods for the purpose of continuous process improvement using the Deming approach. Experimentation driven by the Taguchi loss function, Taguchi arrays, linear graphs, triangular tables, and Taguchi’s concepts of parameter and tolerance design. Extensive use of factorial and fractional factorial designs for measurement and attributes data. Analysis of variance and graphical interpretation of significant factors and interactions. Wide variety of industrial applications.

4203* Facility Location and Layout and Material Handling Systems. Prerequisites: 3813, 4014 and senior standing. Design principles and analytical procedures for locating and developing an overall functional relationship plan and the methods for materials receipt, storage and movement for either an industrial or service oriented industry. Product-quantity analysis and material flow, and information routing warehouse design, various layout methodologies, and their measures of merit. Introduction to material handling methods and technologies including automated systems. Case studies and field trips are required.

4323* Manufacturing Systems Design. Prerequisites: 3313, 3503. Principles and procedures related to the design, implementation, documentation, and control of manufacturing systems. Consideration of transfer lines, numerical control, flexible automation, robotics, and manufacturing support activities such as cost, quality, and materials control. Introduction to basic computer-aided design and computer-aided manufacturing (CAD/CAM).


4613* Production Control. Prerequisite: 4014. Concepts of planning and control of production environments. Design of operation planning and control systems. Techniques used in demand forecasting, operations planning, inventory control, scheduling, and progress control. A production simulator is used to provide a realistic application experience.


4723* Information Systems for Management Decisions and Control. Prerequisite: 3703. Systems engineering methodology applied to the design of information systems for management of all types of organizations. Data base management systems. Distributed and centralized systems. Different phases of system design and implementation.

4823* Industrial Ergonomics. Lab 3. Prerequisite: 3813. Characteristics of humans, equipment, and work environment examined using a systems approach. Job designs that concurrently emphasize multiple goals of productivity, safety and employee satisfaction, investigation of psychological, social, safety, reward, training and ergonomic parameters that affect work life of both employee and supervisor.

4913 Senior Design Projects. Lab 6. Prerequisite: limited to students in the final semester of their professional program. Student teams work on professional-level engineering projects selected from a wide range of participating organizations. Projects are equivalent to those normally experienced by beginning professionals, and require both oral and written reports. (Open only to students in industrial engineering and management.)

4923* Energy and Water Management. Prerequisites: 3503, ENSC 2213, 2613. Design, implementation and management of energy and water management programs. Energy and water conservation, choice of energy sources, safety and security of fuel storage, continuity planning and use of standby fuels, and computer-aided rate schedules. Improvement of profits through optimal energy and water utilization outside speakers when appropriate.
4931 Industrial Engineering and Management Seminar. Prerequisite: senior standing. Designed to orient seniors to their professional work environment. Topics include placement procedures, resume construction, interviewing skills, professional dress, graduate school, professional societies and registration, personal management of time and money, and related expectations. Taught by senior faculty; utilizes outside speakers.

5000 Research and Thesis. 1-6 credits, maximum 6. Prerequisite: approval of major adviser. Research and thesis for master's students.

5003 Statistics and Research Methods. Prerequisite: STAT 4033. Statistical and research methods used in various areas of industrial engineering including problem definition, managing the research process statistical methods and analysis tools, survey vs. experimental research techniques.

5010 Industrial Engineering Projects. 1-2 credits, maximum 6. Prerequisites: consent of school head and approval of major adviser. Special graduate projects and independent study in industrial engineering.

5013 Linear Programming. Prerequisites: 4014, or 5003, or MATH 3013; FORTRAN. Simplex algorithm to solve deterministic linear optimization models considering maximization and minimization objectives. Degeneracy, alternative optima and no feasible solutions. Revised simplex procedures. Duality theory, economic interpretations, dual simplexing and complementary pivoting. Sensitivity analysis and parametric programming. Special cases of linear optimization problems and underlying mathematical foundations. Large-scale models including computational considerations. Same course as CS 5013.

5023 Optimization Applications. Prerequisite: graduate standing. A survey of various methods of unconstrained and constrained linear and non-linear optimization. Applications of these methodologies using hand-worked examples and computer packages. Intended for engineering and science students. Same course as CHE 5703, ECEN 5703 and MAE 5703.

5050 Engineering Practice. 1-9 credits, maximum 12. Prerequisite: approval of adviser. Professionally supervised experience in a real-life problem involving authentic projects for which the student assumes a degree of professional responsibility. Activities must be approved in advance by the student's adviser. May consist of full or part-time engineering experience, on-campus or in industry, or both, either individually or as a responsible group member. Periodic reports both oral and written required as specified by the adviser.

5053 Dynamic Programming. Prerequisites: 5013, STAT 4213 or equivalent. An introduction to dynamic programming. Formulating dynamic programming problems, computational techniques, control problems, and Markov decision problems, with applications to production control, transportation, inventory theory, and other areas.

5103 Advanced Industrial Quality Control. Prerequisites: 4103, STAT 4033. Modern quality philosophy and application. Theory and application of traditional and nontraditional control charting techniques. Special emphasis on underlying assumptions such as normality and error-free inspection. Oriented toward economically biased statistical monitoring of processes including optimization of decision variables such as sample size, frequency, and control limit spread.

5113 Total Quality Management. Prerequisite: graduate standing. Major categories of criteria for the Malcolm Baldrige National Quality Award, including leadership, information and analysis, strategic quality planning, human resource utilization, quality assurance, results, and customer satisfaction. Key concepts and tools: customer requirement determination, customer satisfaction measurement, cost of quality, quality planning, supplier relations, process improvement strategy, causes of variation, process stability and control, process capability, the use of SPC tools, and measures of performance. Emphasis on those activities that outstanding companies do well.

5133 Stochastic Processes. Prerequisites: MATH 2233, MATH 3013, STAT 4113. Definition of stochastic processes, probability structure, mean and covariance function, the set of sample functions. Renewal processes, counting processes, Markov chains, birth and death processes, stationary processes and their spectral analyses. Same course as STAT 5133 and MATH 5133.

5203 Advanced Facility Location and Layout and Material Handling Systems. Prerequisites: 3503, 4014, 4203. A continuation and expansion of topics covered in 4203 with an emphasis upon facility location and evaluating the effectiveness of production and/or service systems. Advanced analytical and computer techniques.

5303 Computer Integrated Manufacturing. Prerequisite: 4323. Focus on the design, development, implementation and operation of modern manufacturing systems. Understanding the sequence of engineering-related activities over the product life-cycle. Involvement of product and process design, compatibility and exchange of data and information, use of computer-aided (CAX) tools, design for (DFx) approaches, manufacturing philosophies, and volume dependent product costing.

5313 Robotics Application Issues. Lab 3. Prerequisite: graduate standing in engineering or consent of instructor. Role of robotics in modern manufacturing systems. Design and selection of appropriate end effectors and sensors to produce a reliable cost effective robotic application. Comparison of commercial and custom designs of end effectors and a study of industrial applications. Field trips to industry and work in the IE&M CAM/Robotics laboratory.

5350 Industrial Engineering Problems. 1-6 credits, maximum 6. Prerequisite: approval of major adviser. A detailed investigation into one area of industrial engineering with a required written report.


5603 Project Management. Prerequisite: 4413 or equivalent. A systems approach to planning, organizing, scheduling and controlling projects. The behavioral and quantitative aspects of project management. Importance of working with personnel as well as technology. Project management software utilized.


5653 Advanced Production Control. Prerequisite: 4014, 4613, corequisite: 5003. Advanced concepts and quantitative techniques used in production planning and control, including demand forecasting using regression, time series analyses and Box-Jenkins models, empirical mathematical programming approaches, to aggregate planning and disaggregation, static and dynamic scheduling of machines and cells, and independent demand inventory management. Deterministic and stochastic models and their relationship to Just-in-Time and Zero Inventory practices.

5643 Network Modeling and Analysis. Prerequisites: 4014, 4603, 5003. Network approach to the modeling and analysis of complex systems. Deterministic and stochastic network topics include PERT, CPM, decision trees, network flows, flow graphs, and GERT (Graphical Evaluation and Review Technique) models for practical problems. Systems analysis using network techniques and available computer programs.

5703 Discrete Systems Simulation. Prerequisite: 4713. Discrete-event systems via computer simulation models. Model building and the design and analysis of simulation experiments for complex systems. Application to a variety of problem areas. Use of ARENA simulation language.


5743 Information Systems and Technology. Prerequisite: graduate standing or consent of instructor. For current and potential engineering and technology managers. Knowledge of information systems and technology to lead the specification, selection, implementation, and integration of information technology in manufacturing and service organizations. Management issues involved in the use of information technology in organizations.

5803 Human Factors Engineering. Prerequisites: 4823, 4113 or equivalent. Basic consideration of the human factors in engineering systems with emphasis on the interface of man-machine systems. Development of human abilities and limitations in relation to equipment designs and work environments.

5813 Productivity Measurement and Improvement. Prerequisites: 3813 and 4413 concurrently. Productivity issues, concepts, theories and insights focusing on job and organizational design are explained, illustrated and discussed. Understanding the productivity improvement process. Development of productivity measurement systems. Designing organizational processes which improve productivity.

5913 Decision-making Models for Multi-objective Analysis. Prerequisite: 4014. Quantitative and qualitative aspects of multiple-criteria decision making. Dynamics of the decision process are examined and the multi-objective nature of most managerial decision problems is illustrated. General concepts and solution methodologies of the multi-objective problem. Multi-objective linear programming, goal programming, and compromise programming. Attribute importance, risk measurement, and utility measurement.

5923 Advanced Energy and Water Management. Prerequisite: 4923. Continuation of material covered in 4923. Emphasis on energy and water management on modern management techniques. Codetermination, energy management control systems, private purchases of gas, energy accounting. Significant case study or term paper required.

5943 Hazardous Material and Waste. Prerequisites: 3503 or equivalent, CHEM 1515. Management of hazardous materials and waste by the generator to reduce operating costs and protect environment on the basis of hazardous materials communication program, reducing volume and toxicity, and management activities.

6000 Research and Thesis. 1-15 credits, maximum 30. Prerequisites: approval of major adviser and advisory committee. Independent research for Ph.D. dissertation requirement under direction of a member of the Graduate Faculty.

6023 Nonlinear and Integer Optimization. Prerequisites: 4014 or 5013; FORTRAN or PASCAL. Technical aspects of non-linear and integer optimization. Development and application of nonlinear optimization techniques for unconstrained and constrained problems; sequential search, gradient, penalty and barrier, and projection methods. Development and application of integer and mixed integer techniques for unconstrained and constrained problems; interior point, branch and bound, and cutting methods. Same course as CS 6203.

6110 Special Problems in Industrial Engineering. 1-6 credits, maximum 12. Prerequisites: consent of school Head and approval of major adviser. Special problems in industrial engineering and management under supervision of a member of the Graduate Faculty.

6113 Reliability and Maintainability. Prerequisites: 5003, STAT 4033, FORTRAN. Probabilistic failure models of components and systems. Detailed study of reliability measures, and static and dynamic reliability models. Classical and Bayesian reliability testing for point and interval estimation of exponential and Weibull failure rates. Reliability optimization through allocation and redundancy. Fundamentals of maintainability.


6423 Engineering and Technical Consulting. Prerequisite: 5413 or consent of instructor. Theory and practice of internal and external engineering and technical consultations. Investigation of the engineering and technical client interface, effective engineer consultations in relationship to existing organizational cultures and practice, and the engineering and technical practitioner's impact on organizational improvement.

6513 Analysis of Decision Processes. Prerequisites: 5003, STAT 4113 or 4203; FORTRAN. Basic de monopoly, normative and positive decision making in industrial engineering and allied fields. Extensive and normal form analysis. Sufficient statistics, noninformative stopping and conjugate prior distributions. Additive utility, opportunity loss (regret) and value of information. Terminal analysis, preposterior analysis and optimal sampling. Applications using Bernoulli, Poisson and normal processes.

6713 Advanced Systems Modeling. Prerequisites: 4014; 5003; 4713 or 5703; FORTRAN 77, Pascal or C. Methodologies for the modeling, analysis, and optimization of large, complex systems. Modeling and performance analysis using Petri nets, object-oriented modeling, optimization using simulation, and continuous systems simulation.

International Studies (INTL)

5000 Thesis. 1-6 credits, maximum 6. Prerequisites: graduate standing and consent of adviser. For students studying for a master's degree in international studies under the thesis option.

5010 Contemporary Issues in International Studies. 1-6 credits, maximum 6. Prerequisite: graduate standing. Study of contemporary international issues including news reports, speeches from foreign dignitaries, political leaders and experts in selected international fields.

5110 International Studies Practicum. 1-6 credits, maximum 6. Prerequisite: graduate standing and consent of adviser. For students studying for a master's degree in international studies under the creative component option.

5213 International Relations, Affairs and Policy. Prerequisite: graduate standing. Research on the mechanics and theories of interaction between economic and political phenomena. Same course as POLS 5213.

5223 Culture, History and World Systems. Prerequisite: graduate standing. Study of the impact and influence of culture and history on the development of contemporary world systems with future projections.

5233 Global Competitive Environment. Prerequisite: graduate standing. Development of a global business strategy for the organization. Issues of highly diversified markets and business environments, global competition, financial markets, and complex organizational relationships. Same course as MBA 5233.

Japanese (JAPN)


2115 (I)Intermediate Japanese I. Prerequisite: 1115 or equivalent. Reading, the writing system, culture, grammar, conversation.


2310 (I)Intermediate Japanese III. Prerequisite: 123 or equivalent proficiency. A continuation of 2123.


3112 (I)Advanced Japanese Conversation II. Designed to increase facility and naturalness of delivery in dialogue. Development of general oral and aural proficiency.

3133 (I)Readings in Japanese I. Development of the student's competence in reading a wide variety of materials by contemporary Japanese writers. Designed to be taken concurrently with 3223.

3223 (I)Introduction to Business Japanese. Prerequisites: 2223 or equivalent; concurrent enrollment in 3133. Introduction to business vocabulary and writing of correspondence. Japanese business customs and practices.

3333 (I)Readings in Japanese II. Prerequisite: 313. A continuation of 3133.
Journalism and Broadcasting (JB)

1143 (S) Media and Society. An overview of the characteristics of newspapers, magazines, photojournalism, radio, television, film, advertising, public relations and interactive media, emphasizing the media's impact and role in American society.

2003 Mass Media Style and Structure. Lab 2. Prerequisites: ENGL 1113, CS 1002, or consent of instructor. Demonstrated computer and keyboarding proficiency or completion of CS 1002 is required. Elementary writing and editing techniques in print, broadcasting and other media.

2013 Principles of Advertising. Prerequisite: sophomore standing. Elements and purposes of advertising; media functions, economic aspects, budgets, appropriations, rate structures and terminology.

2183 Principles of Public Relations. An introduction to the history, development and current practice of public relations as a process in building relationships between organizations and publics.

3013 Advertising Media and Markets. Analysis and evaluation of mass media for advertising; media and market research; media plans, budgets and sales presentations; advertising law and ethics.

3153 Fundamentals of Audio and Video Production. Lab 2. Prerequisite: 2003. Theory and practice of basic audio and video production techniques leading to later applications in radio, television and multimedia production.

3173 History of Mass Communication. Growth and development of mass communication systems in America, with emphasis upon the economic, social and political interaction of the media.


3283 Public Relations Communications Methods. Prerequisite: 2183 or consent of instructor. An analysis and application course focused on the communications methods and techniques used in the practice of public relations.

3293 Visual Communication. Use of photographs, charts, graphs and other visual representations in the mass media; the language of pictures; theories of nonverbal communication; visual aids in education and other information systems.

3313 News Editing I. Lab 3. Prerequisite: 3263. News editing, design and headline writing for newspapers and magazines.

3383 Public Relations Management and Strategies. The practice and techniques of public relations as a management function in business, industry, agriculture, government, education and other fields. For both majors and non-majors.

3400 Journalism, Advertising and Public Relations Laboratory. 1-3 credits, maximum 3. Prerequisites: junior standing and consent of instructor. Laboratory and/or internship practice in audio and video production techniques with emphasis on radio coverage. Familiarization with news values, news services, broadcast equipment. Lab work in news reporting and writing.

3553 Radio and Television News Writing. Lab 3. Prerequisites: 3153, 3263. Broadcast news writing and reporting techniques with emphasis on radio coverage. Familiarization with news values, news services, broadcast equipment. Lab work in news reporting and writing.

3603 Advertising Copy and Layout. Lab 2. Prerequisite: 2013. Advertising copy and layout; modern merchandising methods; application emphasizing local and regional problems.

3753 Graphic Communication. Lab 3. Creative and practical aspects of typography, layout and design, and production of printed communication.

3823 Photography I. Lab 3. Taking and processing photographs; cameras, lenses, films, printing, and developing; essentials of good pictorial composition. For students who want an elementary understanding of photography, or to prepare for advanced work in photography or photojournalism.

3840 Sports Journalism. Lab 2. Prerequisite: 3263 or consent of instructor. Reporting skills to cover the sports beat and an understanding of the history of sports journalism and sports and culture in America. Reporting, feature writing and column writing in sports for print journalism.


3900 Radio-Television Laboratory. 1-3 credits, maximum 3. Lab 6. Prerequisites: 3153 and consent of instructor. Preparation and participation in all phases of radio-television and cable through active internship program.

3913 Television Production. Lab 3. Prerequisite: 3153. Television production techniques, including real audio, lighting, staging, producing, graphics and on-camera performance.

4033 Communication Technology. Overview of satellite delivery of print media, radio, television and cable program services, data services, computer technology; public relations and advertising uses of the new technologies.

4063 Supervision of High School Publications. Essential journalistic forms for high school publications; organizing and administering high school publications; intended to meet the requirements for the state teacher's licensure in language arts.

4163 Mass Communication Law. Statutes and case decisions in print and broadcast law, including government regulation of broadcasting by the FCC and media relations with other regulatory agencies.

4223 Broadcast Sales. Sales development, pricing, promotion and other aspects of broadcast sales and sales management.

4243 Programs and Audiences. Audience analysis, proper construction of programs for greatest appeal and use of appeals to attract the desired audience. Program types, rating systems, program selection and audience attention. Design and discussion of programs to reach specific audiences.

4253 International Mass Communications. Examination of the nature and flow of news and information within and among nations, states and societies from a theoretical vantage point grounded in region-specific realities. The political, economic, social, cultural and historical forces determining media practice in a global environment.

4263 Broadcast Management. Functions, structure and organization of the broadcasting industry; special problems in broadcast station management, including personnel, sales, programming and government regulations.

4313 Public Affairs Reporting. Lab 5. Prerequisite: 4393. Coverage of social problems, people and events in fields of government, business, science, sports and entertainment.

4360 Special Problems in Journalism and Broadcasting. 1-3 credits, maximum 6. Prerequisites: junior standing, a minimum of 3.00 GPA, or consent of instructor. Independent study and project development to fit the student's major or minor specialization.

4393 Computer-assisted Journalism. Lab 6. Prerequisites: 3263, STAT 2013. Access by news media and communication specialists to electronic resources of information primarily through the Internet. A skills course in understanding and applying ways to obtain and share information through computer access.

4413 Advanced Reporting and Writing. Lab 5. Prerequisite: 4313. Enhancement of writing style and reporting techniques; evaluation of sources and polling practices, and investigative coverage of newsmakers and events.

4423 News Editing II. Lab 6. Prerequisite: 3313. Advanced copy editing: ethics and legal considerations from an editor's viewpoint; design techniques for newspapers and magazines including picture editing, introduction to type, makeup and design practices, and special pages.

4433 Feature Writing for Newspapers and Magazines. Prerequisites: 15 credit hours of English or journalism. Newspaper features and special articles for general circulation magazines, business and trade journals; sources, materials, markets and other factors pertinent to content writing.

4453 Communications in Agriculture. Lab 2. Fundamentals of news-writing and other communication methods; the role of the news media in agriculture and related fields.

4493 Advanced Public Relations Media. Lab 6. Prerequisites: 3263, 3283 or consent of instructor. An advanced application course in planning, researching, writing, editing and designing of materials used in public relations communications.
4553 Advanced Radio-Television News Reporting. Lab 3. Prerequisites: 3153, 3553. Advanced broadcast news writing with emphasis on techniques of feature and in-depth reporting for radio, television and cable television.

4573 Broadcast Documentary. Lab 3. Prerequisites: 3553, 3913. Student-written and produced broadcast and cablecast mini-documentaries; analysis of selected programs.

4603 Integrated Marketing Communications. Prerequisite: 2013 or 2183 or MKTG 3213. Concept of planning recognizing the value of coordinating the various promotional mix elements within a communication campaign to create maximum clarity and impact. Examination of each of these communication elements in depth, including advertising, public relations, direct marketing and sales promotion and strategies for combining and integrating these into an effective campaign. Introduction to theories, models and tools to make better promotional communication decisions.

4623 Advertising Campaigns. Prerequisite: 3603. Planning, preparation and presentation of comprehensive advertising and marketing campaigns for national or local clients. Student teams produce all aspects of the campaign, from conception to presentation. Satisfies capstone requirement for advertising majors.

4653 Television and Radio Advertising. Lab 2. Prerequisite: 3603. Functions and characteristics of broadcast advertising; copywriting, scriptwriting, story boards, marketing plan; film and videotape commercial production.

4662 Professional Portfolio. Lab 2. Prerequisite: 2003 or consent of instructor. The advanced design skills necessary to compete in the creative sector of the advertising, graphic or other industry. Advanced theories of design in the construction of professional creative materials, and the elements of effective persuasive communication.

4843 Public Relations Programs. Prerequisite: 3283. Capstone course requiring public relations students to prepare a public relations campaign involving the public relations process: research, planning, communications and evaluation.

4953 Advanced Television Practices. Lab 3. Prerequisite: 3913. Advanced professional television production. Student produced and directed television programs, including "specials," for distribution on cable or other professional media.

4993 Senior Honors Thesis. Prerequisites: departmental invitation, senior standing, Honors Program participation. A guided reading and research program ending with an honors thesis under the direction of a senior faculty member, with second faculty reader and oral examination. Required for graduation with departmental honors in journalism and broadcasting.

Landscape Architecture (LA)

1013 Introduction to Landscape Architecture and Landscape Contracting. An overview of the field of landscape architecture and landscape contracting with emphasis on the role of the landscape architect/landscape contractor and the need for design and management of outdoor space and structures and the environment.


2213 Landscape Architectural Graphics I. Lab 6. Prerequisite: 3 hours credit in freehand drawing or drafting. Drafting and illustration techniques for developing and presenting landscape concepts and designs in black and white media. Computer graphics techniques, including illustration, typesetting, scanning and visualization techniques.

2223 Landscape Architectural Graphics II. Lab 6. Prerequisite: 2213. The application of multimedia color presentation and delineation techniques to more complex plans, drawings and programs.

3010 Internship in Landscape Architecture and Landscape Contracting. 1-6 credits, maximum 6. Prerequisites: 45 credit hours, consent of internship chairperson. Supervised work experience with approved public and private employers in landscape architecture, landscape contracting or related fields. May not be substituted for other required courses.

3112 Landscape Architecture Seminar I. Prerequisite: 3324. Professional analysis of various aspects of the landscape architecture profession and design, and in-state or regional field trips to completed projects. Required of fourth year students.

3314 Landscape Architectural Design I. Lab 8. Prerequisites: 1013, 1122 and 2223. Introduction to the principles of design, problem solving, site analysis, and the correlation of aesthetic concerns with functional solutions in small-scale landscape architecture design problems and computer-aided design applications.

3324 Landscape Architectural Design II. Lab 8. Prerequisite: 3314. The design of small to medium scale areas with an emphasis on design process, site analysis and computer-aided design applications.

3673 History and Theory of Landscape Architecture. History and historic styles and approaches to landscape architectural design. Past and present landscape design theory.


3894 Landscape Architectural Construction II. Lab 6. Prerequisite: 3884. Advanced grading, horizontal and vertical roadway alignment, site layout and grading plans, construction documents, cost estimating, overview of soils construction materials and specifications, site utilities, computer applications and calculations.


4112 Landscape Architecture Seminar II. Prerequisite: 4414. Topics in landscape architecture and related fields, career exploration and job placement. Out-of-state field trips to completed landscape architecture projects. Required of fifth year students.

4414* Landscape Architectural Design III. Lab 6. Prerequisites: 3324, 3884. Medium scale site development projects with an emphasis on landforms, structures and computer-aided design applications.

4424* Landscape Architectural Design IV. Lab 8. Prerequisite: 4414. Medium-scale complex landscape design projects with emphasis on arrangement and design of landscape elements that relate to function and aesthetic qualities. Integration of landscape construction detailing, drawings as part of design presentation, and computer-aided design applications.

4433* Land Use and Community Planning. Lab 3. Prerequisite: 3313. The inventory and analysis of natural and man-made landscape resources and their application to land use and community planning within the framework of a municipality's comprehensive plan and regulations.

4514* Landscape Architectural Design V. Lab 8. Prerequisites: 4424, 4894. The design of large-scale sites with an emphasis on mixed use developments and computer-aided design applications.

4524* Landscape Architectural Design VI. Lab 10. Prerequisite: 4514. A capstone course with a large scale development project in urban design/landscape architecture resource planning with computer-aided design applications, summarizing previous planning, design and construction course work.

4534* Landscape Architecture Vertical Design Studio. Lab 8. Prerequisite: 2223. Individual studio projects geared to design, course level. Offered on demand. Can be substituted for one landscape architecture design course (LA 3314, 3324, 4414, 4424, 4514, or 4524).

4573* Recreation Planning. Lab 6. Prerequisite: consent of instructor. Theory and methods for small and large scale area planning with emphasis on natural and cultural resources.
Leisure 275

Leisure (LEIS)

1212
Beginning Swimming. Lab 2. Theory and practice of swimming strokes; techniques and basic water safety skills.

1232
Beginning Golf. Lab 2. Theory and practice of basic skills, rules, terminology and etiquette.

1242
Beginning Tennis and Racketball. Lab 2. Theory and practice of tennis and racketball; basic skills, rules, terminology, and game strategy for singles and doubles play. No credit for students with credit in 1252.

1252
Beginning Tennis. Lab 2. Theory and practice of basic skills, rules, terminology and game strategy for singles and doubles play. No credit for students with credit in 1242.

1262

1282

1312
Archery and Riflery. Lab 2. Theory and practice of archery and riflery; basic skills of target shooting, scoring, care and selection of equipment, and safety rules.

1322
Bowling. Lab 2. Theory and practice of approaches, deliveries, releases and mechanical principles involved in aiming and follow through.

1342
Physical Fitness. Lab 2. Theory and practice of aerobic and weight training activities with learning experiences designed to promote physical fitness.

1352
Weight Training. Lab 2. Improvement of muscular strength and endurance in the major muscle groups of the body through progressive resistive exercise. Fundamental anatomy, physiology, mechanical principles, methods and techniques as applied to weight training programs.

1372
Self Defense. Lab 2. Theory and practice of self defense; scientific principles of gravity and body control over opposing forces, and principles of contest judo.

2112
Rock Climbing. Lab 2. Theory and practice in the basics of technical rock climbing, boulderinng and spelunking.

2122
Backpacking and Hiking. Lab 2. Theory and practice of outdoor skills and leadership techniques for executing and evaluating a wilderness activity.

2212

2222
Intermediate Tennis. Lab 2. Prerequisite: 1252. Theory and practice of advanced serves and strokes; strategy for singles and doubles play; rules and competitive tennis.

2252
Dance Production. Lab 2. Prerequisite: 2312 or consent of instructor. Advanced technique, composition and staging.

2272
Modem Ballet. Lab 2. Theory and practice of fundamental skills and techniques of ballet through the use of modern themes.

2292
Beginning Jazz and Tap Dance. Lab 2. Theory and practice of fundamental skills and techniques for jazz and tap dancing.
2312 Modern Dance. Lab 2. Theory and practice of basic skills and knowledge relating to the creative and technical aspects of modern dance.

2322 Recreational Dance. Lab 2. Theory and practice of traditional social dances and a variety of “free style” dance forms.


2413 Introduction to Leisure Services. The nature, scope and significance of leisure and recreation. Delivery systems for leisure services, major program areas and the interrelationship of special agencies and institutions serving the recreation needs of society.

2433 Introduction to Therapeutic Recreation. Theory and application of therapeutic recreation with emphasis on types of illnesses and disabilities, delivery systems, programming and services.

2443 Diversity in Leisure Services. An exploration of the primary and secondary dimensions of diversity and their impact on leisure. Responses of the leisure services profession to cultural diversity.

2462 Laboratory in Leisure Services. Lecture, discussion and experiential learning of recreation and leisure activity. Adapted activities, small and large group games, sports, arts and crafts, music, drama and cultural events. Fee required.

2473 Foundation of Leisure Service Leadership. Lab 2. Introduction to the principles and practical applications of group leadership techniques, problem solving, supervision and evaluation of personnel.

3010 Leisure Services Workshop. 1-3 credits, maximum 6. Intensive training program on a specialized topic in leisure services.

3212 Lifeguard Training. Lab 2. Prerequisites: 2312. Theory and practice of water safety and rescue skills essential for lifeguards. May obtain American Red Cross Lifeguard Training Certification.

3333 Outdoor Pursuits. Lab 1. Field based course to understand origins and components of involvement in outdoor pursuits. Numerous skills applied to various outdoor settings.

3430 Practicum in Leisure Services. 1-3 credits, maximum 3. Prerequisite: 2413. Supervised practical experience with leadership responsibilities for planning, conducting and evaluating activities and programs. Graded on a pass-fail basis.

3453 Advanced Practices in Leisure Services Leadership. Prerequisite: 2423. Advanced techniques in principles and practices of group leadership; problem solving; supervision and evaluation of personnel.

3463 Program Design in Leisure Services. Emphasis on organization, supervision, promotion and evaluation of programs.

3473 Evaluation of Leisure Services. Prerequisites: 2413, 3463 or consent of instructor. Methods, techniques and application of the evaluation process related to a wide variety of leisure service functions: clientele, programs, personnel, facilities and organization.

3483 Principles and Clinical Practices in Therapeutic Recreation. Prerequisite: 2433 or consent of instructor. Clinical intervention techniques and strategies, including treatment techniques, leisure education and role of recreation in the treatment process.

3491 Pre-internship in Leisure Services. Preparation for internship in therapeutic recreation and leisure services management.

4010 Directed Studies in Leisure. 1-3 credits, maximum 6. Prerequisites: consent of instructor and program head. Supervised readings, research or study of trends and issues related to leisure studies.

4213 Water Safety Instructorship. Lab 1. Methods of teaching swimming and aquatic safety with practical application of knowledge, principles and analysis of skills. May obtain American Red Cross Water Safety Instructor’s Certification (WSI).

4453* Outdoor Education. Development of a holistic approach to teaching and learning in the outdoors. Learning in, about, and for, the outdoors as a process for acquiring skills with which to enjoy outdoor pursuits.

4463* Areas and Facilities in Leisure Services. Prerequisites: 3463 or consent of instructor. Planning, design and development of areas and facilities in leisure service delivery systems.

4473* Outdoor Recreation. Theory and practical application of outdoor recreation concepts with emphasis on philosophies, principles, policies, economics, trends and problems.

4480 Internship in Leisure Services. 1-12 credits, maximum 12. Prerequisite: last semester senior year with cumulative GPA of 2.50. Supervised field work experience in leisure services management or therapeutic recreation. Graded on a pass-fail basis.

4482 Senior Seminar in Leisure Services. Prerequisite: LESI major. Culmination of course work in leisure studies. Examination of current issues, professional practices and personal philosophy of leisure.

4493 Administration of Leisure Services. Decision making, problem solving, personnel policies, legal issues, finance, and budget procedures related to the delivery of leisure services.

5000* Master’s Thesis. 1-6 credits, maximum 6. Prerequisite: consent of major professor. Research in leisure studies for master’s degree.

5020* Workshop in Leisure Studies. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Advanced instruction on specialized topic area in leisure studies.

5030* Field Problems in Leisure Studies. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Applied research within the practice of leisure studies.

5053* Research Design in Leisure, Health and Human Performance. Prerequisite: PSYC 5303 or STAT 5013 or equivalent. Research design with applicability toward leisure, health and human performance. Conceptual understanding of theory, tools and processes involved in designing research.

5403* Interpretation in Leisure Services. Organization and administration of visitor centers and interpretive naturalist programs, philosophic approaches, and methods for interpreting the natural and cultural history of public parks and recreation areas.

5413* Organization and Administration of Leisure Services. Systematic approach to problem solving and decision making for structure, personnel management, finance and program development for leisure service delivery systems.
543* History and Philosophy of Leisure. Contributions of recreation and leisure and its effect on humans throughout history. Additional philosophical foundations in relation to current times.

543* Social Psychology of Leisure. Inquiries into the understanding of human behaviors, thoughts and attitudes related to leisure, and the understanding of complex issues related to the social psychology of leisure.

546* Issues in Therapeutic Recreation. Prerequisite: LEIS 2433 or professional experience in therapeutic recreation. Current issues in therapeutic recreation with emphasis on accreditation, certification, licensure, quality assurance and ethics.

547* Leisure and Aging. Prerequisite: 2433 or consent of instructor. Overview of the life/stage needs and services for older adults, with emphasis on the delivery system and leisure interventions.

548* Therapeutic Recreation for Persons with Physical Disabilities. Prerequisite: 3483 or consent of instructor. Role of therapeutic recreation in the treatment and rehabilitation of individuals with physical disabilities, with emphasis on terminology, diagnosis, etiology of specific disabilities, program development and assessment.

549* Therapeutic Recreation in Mental Health and Mental Retardation. Prerequisite: 3483 or consent of instructor. Role of therapeutic recreation in mental health with emphasis upon client prognosis and methodologies of treatment programs.


6010* Independent Study in Leisure Studies. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Supervised readings, research or study of trends and issues related to leisure studies.

6210* Leisure Research Colloquium. 1-3 credits, maximum 6. Prerequisite: doctoral standing. Exploration and presentation of selected topics and research in leisure studies.


Library Science (LBSC)

1011 Library and Internet Information Competencies. Introduction to the organization, retrieval and evaluation of information found in research libraries and on the Internet. Development of information-seeking competencies using both print resources and electronic databases.

3050 The School Library and Learning Resources Center in the Curriculum. 2-5 credits, maximum 5. Lab I-3. Designed for teachers. Importance and effective utilization of the centralized school library media center in the teaching-learning process, evaluative selection tools of print and nonprint media, and reading guidance tools. Initial course is 2 credit hours. In addition, storytelling and field experience credits are available for 1-3 credit hours.

4113* Reference Materials. Selection, evaluation and use of basic reference materials most commonly used in all types of libraries; the organization of reference service; interpretation of reference questions.

4831* Young Adult Literature. Survey of print and non-print materials, including multicultural and multi-ethnic materials, for young adults from middle school through high school. History, criticism, selection and evaluation of young adult literature and exploration of its relation to the needs and interests of young people. Same course as CIED 4313.

4414* Introduction to Cataloging and Classification. Basic principles of cataloging with practice based on functional application of current codes and manuals recognized by the profession.

Management (MGMT)

3013 Fundamentals of Management. Management principles and techniques of analysis. Decision making as applied to management systems, organizations, interpersonal relationships and production. Does not apply to a College of Business Administration major.

3123 Managing Behavior and Organizations. Prerequisites: STAT 2023 or equivalent; junior standing. Managing behavior and organizations with an emphasis on performance. Process differences and performance expectations at the individual, team and organizational levels. Understanding of the components and dynamics of managerial and organizational behavior with the emphasis on management applications.

3133 Management Performance Development. Prerequisite: 3123. The study of personal, interpersonal and group factors relating to managerial performance. An integration of the theory and practice of management.

3313 Human Resource Management. Prerequisite: 3013. Policies and practices used in personnel management. Focuses upon the functions of a human resource management department.

4123* Labor Management Relations. Prerequisite: 3103. Labor relations and collective bargaining. Negotiation and administration of labor agreements and employee relations in nonunion organizations. Modes of impasse resolution.

4133* Compensation Administration. Prerequisites: 3113, STAT 2023. Introductory course. Fundamentals of compensation such as the legislative environment, compensation theories, job analysis, job evaluation, wage structures and indirect compensation programs.

4213* Managing Diversity in the Workplace. Diversity in the workplace as a business issue that affects performance. Companies’ adaptation and alignment to the population they serve and want to represent. The development of a cohesive work team made up of individuals who differ in gender, age, race and national origin.

4313* Organization Theory and Development. Prerequisite: 3123. The design of formal organizations with an emphasis on topics related to organizational and managerial effectiveness. Focus on what is known about managerial and organizational effectiveness and how this knowledge may be applied.

4413 Change Management. Prerequisite: 4313 or equivalent. Managing organizational change and redesign. The study of organizational change processes and the enhancement of performance through change management. Study of the body of knowledge and applications in this branch of organizational science.

4533* Leadership Dynamics. Prerequisite: MGMT 3123 or equivalent. Leadership applications in business management. Contemporary business challenges require managerial leadership of the highest order. Students will be exposed to the latest developments in leadership theory and research. A cornerstone of the course will be the emerging construct of transformational leadership. The course emphasizes readings, class discussions, experiential exercises, and group projects to facilitate learning.

4613 International Management. Prerequisite: 3013. Survey of the organization, planning and management of international operations of business firms. Exploration of major cultural, economic and political systems, and their effects on the management function.

4713* Conflict Resolution in Industry. Prerequisite: 3013. An integrated and interdisciplinary approach to the issues of industrial conflict and conflict resolution. An analytical development stressing both theory and empirical research. Models of conflict; conflict between the individual, the group and the organization; economic conflict and industrial conflict.

4813* Advanced Human Resource Management. Prerequisite: 3313. Management of human resources at the organization level including employee relations law and human resource planning.

5113* Management and Organization Theory. Prerequisite: admission to MBA program or consent of MBA director. Contemporary theories of organization. Structure and dynamics of organizational goals and environments.

5123* Organizational Design and Research. Prerequisite: admission to MBA program or consent of MBA director. An analysis of research which integrates theory and design of organizations. Reviews empirical research findings and stresses methods of organizational analysis; design and modification of organizations.

5121* Seminar in Organizational Behavior. Prerequisite: admission to MBA program or consent of MBA director. Current research on group behavior in organizations. Group processes and structural factors affecting the interaction process and intra- and intergroup performance characteristics. Laboratory simulation and team research projects used to pursue advanced topics.
Management Science and Information Systems (MSIS)

2103 Business Computer Concepts and Applications. Prerequisites: 30 credit hours and MATH 1513. Computer concepts, terminology, and software applications. Overview of hardware and software components, file structures, management information systems, futuristic trends, database management systems, systems analysis and design, and data communications. Introduction to database, spreadsheet, and word processing software application packages and application programming.

2203 Computer Programming for Business. Prerequisite: 2103 or CS 2113 or equivalent. Computer programs for business applications using the COBOL language. File structures, file updating techniques, sorting, report writing, magnetic tape and disk file handling.

3103 Management Information Systems. Prerequisite: 2103 or equivalent. Information technology (IT) management and the development and use of management information systems in today's business organizations. Use of global IT tools including on-line communication tools, software for data use and integration, and user interface and presentation tools.

3203 Advanced Computer Programming for Business. Prerequisite: 2203. Advanced programming features are examined with an emphasis on the development of computer programs for business application. File processing including magnetic tape sequential files, disk-indexed sequential files, and virtual storage applications are an integral part of the course. Subjects and techniques such as TSO, segmentation, debugging tools and procedures, and pertinent JCL are also studied and applied.

3223 Production and Operations Management. Prerequisite: MGMT 3013. Production and operations management utilizing a management decision-making approach. Management decision-making techniques and their application to problems in production and operations management. Examples of applicable techniques include linear programming and decision analysis.

3233 Management Science Methods. Prerequisite: 3223. Deterministic operations research techniques applied to the resource allocation and operational problems encountered in accounting, marketing, finance, economics and management. Linear programming and network models.

3243 Managerial Decision Theory. Prerequisite: 3223. Decision processes under risk and uncertainty. The use of models in business decisions with outcomes governed by probability distributions. Bayesian decision analysis, utility measurements, game theory, Markov chains, queuing, simulation probabilistic forecasting and inventory, network models, and dynamic programming.

3303 Business Systems Analysis. Prerequisites: 2103, 2203, ACCT 2203. Systems analysis as a profession and role of the systems analyst in the analysis, design, and implementation of computer-based business information systems. Current system documentation through use of classic and structured tools and techniques for designing flows, charts, data structures, file design, input and output design, the program specifications, information gathering and reporting activities and transition into system analysis and design.

3363 Advanced Management Information Systems Programming. Prerequisite: 2203 or equivalent. Programming tools with applications in industry. Advanced programming procedures, processes and algorithms.

3373 File and Data Management for Business. Prerequisite: 3363. A survey of business data storage methodologies and approaches and of file management methodologies for business enterprises.

4013 Data Base Management. Prerequisite: 2103 or equivalent. Theoretical aspects and management applications of data bases, file organization, and data models, with emphasis on hierarchical network and relational structures. Design of storage base by database administration, and the analysis, design and implementation of data base management systems.

4113 Systems Design and Development. Prerequisite: 3303, 4013. Business information systems design and development with coverage of essential systems analysis techniques. Theory and application of prototyping. Computer-aided software engineering (CASE) and four-generation language tools used to develop a functioning business information system. Project management and additional analysis, design and development topics.

4263 Applied Artificial Intelligence. Prerequisite: 2103 or equivalent. Managerial applications of artificial intelligence. Topics include an overview and survey of the major topics in artificial intelligence, such as neural networks, natural language processing, robotics, and vision; expert system concepts and strategies; evaluating tools and techniques; knowledge engineering methodology; building expert systems; project management for expert systems.

4363 Advanced Topics in Systems Development. Prerequisite: 4113. Advanced topics in management information systems development methodologies such as analysis and design of web-based information systems, development and administration of groupware systems, and advanced object-oriented system development methodologies.

4373 Advanced Topics in Management Information Systems. Prerequisite: 2103 or equivalent. Advanced topics such as advanced virtual network management, electronic commerce, international management information systems, and legal and regulatory issues in telecommunication.
4443* Computer-based Simulation Systems. Prerequisites: 3223, completion of rower/division mathematics requirements and a course in a scientific programming language such as FORTRAN, PL/1, or PASCAL. Discrete computer systems simulation using languages such as GPSS, GASP, or SLAM. Cases include queuing, layout planning and evaluation, and financial modeling.

4520* Data Communication Systems. Prerequisite: 3303. Management orientation to decisions necessary in the design, implementation and control of data communications. Transmission service and characteristics; character sets and protocols; network design principles; data communication software and federal regulatory policy affecting data communication.

5123* Enterprise Resource Planning. Prerequisites: graduate standing and ACC 5103, ACC 5113, MSIS 5643, or consent of director of MIS/AIS. Resource planning for today's global business organizations. Integrated data flow and computer software for enterprise resource planning. Integration of transactional analysis, fundamental accounting practice, financial planning, and supply chain analysis forming the basis for study in the integrated approach to enterprise resource planning. Same course as ACC 5123.

5223* Object-oriented Programming Applications for Business. Prerequisites: 5643, graduate standing and computer programming proficiency, or consent of director of MIS/AIS. Object-oriented programming concepts and applications for business in a global environment. Implementation through an appropriate object-oriented programming language.

5303* Quantitative Methods in Business. Prerequisites: admission to the MBA program or consent of MBA director; demonstrated calculus proficiency. Application of quantitative techniques to business problems. Linear programming, transportation and assignment models, goal programming, integer programming, and networks.

5313* Production Operations Management. Prerequisites: admission to MBA program or consent of MBA director; demonstrated calculus proficiency. The management of operations in manufacturing and service organizations. Production planning, facility location and layouts, inventory control, waiting line problems and simulation. Project management and quality control. Emphasis is on a management science approach.

5333* Advanced Decision Theory for Management. Prerequisite: admission to MBA program or consent of MBA director. Case studies and examples involving decision analysis. Studies taken from current literature.

5413* Advanced Management Science. Prerequisites: admission to MBA program or consent of MBA director. Advanced management science methods, with computer applications. Mathematical programming, simulation, forecasting, queuing, Markov processes.

5543* Advanced File and Data Management for Business. Prerequisites: 5223, or consent of director of M.S. in MIS/AIS program. Design and integration of business data storage methodologies, structures and approaches; and of file management techniques for business enterprises.

5600* Special Projects in Business Information Systems. 1-3 credits, maximum 3. Prerequisite: consent of the director of the M.S. in MIS/AIS program. Study of advanced topics not covered directly in other classes or directed study under the supervision of a faculty member.

5613* Advanced Production and Operations Management. Prerequisites: 5313 or equivalent; admission to MBA program or consent of MBA director. Production system, including a synthesis of production and management techniques used by operations managers. A computerized management simulation game provides decision-making experience.

5623* Advanced Applications in Management Information Systems. Prerequisite: 5643 or consent of director of MIS/AIS program. Design and use of management information systems in businesses and other organizations. Model building, information resource management and decision support systems.

5633* Decision Support and Expert Systems. Prerequisites: BADM 5003 or equivalent. Technical and managerial issues involved in the evaluation, acquisition and implementation of advanced technologies, such as decision support systems, expert systems, artificial intelligence, executive information systems, neural networks and others.

5643* Advanced Data Base Management. Prerequisites: 4253 or equivalent and admission to MBA program or consent of MBA director. Advanced theoretical and practical foundations. Brief review of classical issues surrounding design, analysis, and implementation of distributed data bases, the object oriented data model paradigm, the use and management of automated design and support tools (e.g., CASE) from a data base perspective, and data security.

5653* Advanced Systems Development. Prerequisites: 4363 and 5643 or equivalent, program status. A comprehensive discussion of application methods and skills in a business environment. Integration of knowledge through case study approach.

5900* FOX System in Management Information Systems. 1-3 credits, maximum 3. Prerequisites: consent of director of M.S. in MIS/AIS program. Theory and applications for business systems development from an enterprise-wide perspective.

6200* Advanced Topics in Management Information Systems. 3-6 credits, maximum 6. Prerequisites: doctoral student status and consent of instructor. Special advanced topics in management information systems for doctoral students.

Marketing (MKTG)

3213 Marketing. Marketing strategy and decision-making. Consumer behavior, marketing institutions, competition and the law.
4773
Services Marketing. Prerequisite: 3213. Conceptual and managerial tools for students who intend to be involved with the marketing of services. Characteristics of services, listening to customers, managing customer expectations, conceiving and creating service breakthroughs, service quality, positioning of services, managing demand and supply, creating a strategic service vision and designing a customer-focused organization to create and retain customers. 1-6 credits, maximum 6. Prerequisite: 12 credit hours of marketing and consent of instructor. Structured internship or field project with supporting academic study.

5133
Marketing Management. Prerequisite: admission to MBA program. Consideration at an advanced level of the major elements of marketing from the point of view of the marketing executive. Emphasis on problem solving and decision making; using an interdisciplinary approach. Development of an integrated, comprehensive marketing strategy. 3 credits, maximum 3. Prerequisite: 5133. Seminar in Marketing. 3 credits, maximum 3. Prerequisite: 5133. Selected topics in marketing. Industrial marketing, product management, strategic marketing planning, international marketing, and services marketing.

5313
Marketing Research Methodology. Prerequisite: 5133. Research methodology applied to marketing problems. Measurement, survey research, experimentation, and statistical analysis of data. 3 credits, maximum 3. Prerequisite: 5133. Seminar in Marketing Research Methodology. 3 credits, maximum 3. Prerequisite: 5133. Selected topics in marketing research techniques. Data collection and analysis techniques such as conjoint analysis, multidimensional scaling, path analysis, and structural equations modeling (via LISREL).

5413
Advanced Marketing Research. Prerequisite: 5313. Introduction to the latest empirical marketing research techniques. Data collection and analysis techniques such as conjoint analysis, multidimensional scaling, path analysis, and structural equations modeling (via LISREL).

5613
Seminar in Marketing Theory. Prerequisite: 5333 or consent of instructor. Development of an evaluation of marketing theory. 3 credits, maximum 3. Prerequisite: 5133 or consent of instructor. Examination of a broad range of marketing management topics from a strategic perspective. Understanding of content, theory and research methods involved in the development of strategic marketing knowledge.

5693

5673
Responsibility in Mass Communication. Interaction between mass media and society, with emphasis upon the communicator's ethics and responsibilities. 3 credits, maximum 3. Lab 4. Responsible Mass Communication. 3 credits, maximum 3. Lab 4. Responsibility in mass communication practice: public relations, advertising, broadcasting and print journalism. Different emphases offered according to student demand or need.

5913
General Semantics in Mass Communication. Prerequisite: graduate standing or consent of instructor. Language as it affects thought and action, with special emphasis on writings of Johnson, Korzybski, Hayakawa, Chase and Lee in relation to communication media.

Master of Business Administration (MBA)

5010
Independent Study. 3-6 credits, maximum 6. Prerequisite: admission to MBA program or consent of MBA director. Investigation of advanced research topics or directed study under the supervision of a faculty member. Consent of MBA Graduate Studies Committee required. 1-3 credits, maximum 3. Lab 4. Independent Study. 1-6 credits, maximum 6. Prerequisite: admission to MBA program or consent of MBA director. Development or supervised research project in management or related field. 1-3 credits, maximum 3. Lab 4. Independent Study. 1-6 credits, maximum 6. Prerequisite: admission to MBA program or consent of MBA director. Development or supervised research project in management or related field.

5021
Managing Individual and Group Performance. Prerequisite: admission to MBA program. Introduction for managers to the art and science of managing individuals and small groups in an organizational context. Motivation, goal setting and rewards, leadership styles, conflict resolution, and team building.
522* Marketing Decisions for Management. Prerequisite: admission to MBA program or consent of MBA director. Exploration of marketing role in organizations through an examination of the significant marketing decisions required of management. Strategic and tactical decisions, marketing’s relationship to business and society, and environmental influences.

512* Global Competitive Environment. Prerequisite: admission to the MBA program or consent of MBA director. Development of a global business strategy with the organization. Issues of highly diversified markets and business environments, global competition, financial markets, and complex organizational relationships. Same course as IS 5233.

520 Managerial Communication Skills. 1-2 credits, maximum 2. Prerequisite: admission to MBA program or consent of MBA director. Examination of corporate strategy formulation and environmental influences on strategy. Concepts used for analysis and development of corporate strategy. Interplay between strategy and the organization.

5261* Legal Issues in Business. Prerequisite: admission to MBA program or consent of MBA director. Analysis of the basic concepts of public and private law related to business decisions. Overview of the laws affecting private business relationships including employment law, agency laws, and various forms of business organizations.

5303* Corporate and Business Strategy. Prerequisite: admission to MBA program or consent of MBA director. Key issues in formulating and implementing business and corporate strategies. The orientation of top management and diagnosis of what is critical in complex business situations and realistic solutions to strategic and organizational problems.

5310* Integrative Decision Making II: Cross-Functional Organizational Boundaries. 2-6 credits, maximum 6. Prerequisites: consent of MBA director and completion of minimum of 24 MBA credit hours, identification and analysis of environmental forces affecting an organization's ability to compete and survive. Interaction among all corporate functional units. Development of a comprehensive, integrated plan of action for the firm.

5313* Business Systems Integration. Prerequisite: admission to the MBA program or consent of the director. The structure and processes by which businesses apply and integrate functional expertise to meet business opportunities. Utilization of people, operations, management, technology, and information systems to preserve and continue viable organizations.

5400* Business Practicum. 1-3 credits, maximum 3. Prerequisite: consent of MBA director. Application of knowledge and skills developed in MBA functional courses in an organizational environment. Integration of functional concepts, allowing students to experience the adaptation of concepts to fit organizational reality, and assisting students in understanding ways in which their academic training can help organizations.

5500* Interdisciplinary Inquiry in Business Administration. 1-3 credits, maximum 9. Prerequisite: consent of MBA director. Investigation of various business problems using an interdisciplinary approach. Courses team taught to ensure problems viewed from varying functional perspectives.

5990* MBA Applied Business Report. 3-6 credits, maximum 6. Prerequisite: admission to MBA program or consent of MBA director. Independent investigation of a business problem under the direction of a supervising professor.

Mathematics (MATH)

0123 Intermediate Algebra. Prerequisite: one year of high school algebra or equivalent. Review of fundamental operations of algebra, rational expressions, exponents and radicals, linear and quadratic equations, inequalities, introduction to analytic geometry. Does not count for college credit. Graded on a satisfactory-unsatisfactory basis.

1483 (A)Mathematical Functions and Their Uses. Prerequisite: 0123 or placement into 1513. Analysis of functions and their graphs from the viewpoint of rates of change. Linear, exponential, logarithmic and other functions. Applications to the natural sciences, agriculture, business and the social sciences.

1493 (A)Applications of Modern Mathematics. Prerequisites: 0123 or placement into 1513. Introduction to contemporary applications of discrete mathematics. Topics from management science, statistics, coding and information theory, social choice and decision making, geometry and growth.

1513 (A)College Algebra. Prerequisite: two years of high school algebra or 0123. Quadratic equations, functions and graphs, inequalities, systems of equations, exponential and logarithmic functions, theory of equations, sequences, permutations and combinations. No credit for those with prior credit in 1715 or any mathematics course for which 1513 is a prerequisite.

1613 (A)Trigonometry. Prerequisites: 1513 or equivalent, or concurrent enrollment. Trigonometric functions, logarithms, solution of triangles and applications to physical sciences. No credit for those who have prior credit in 1715 or any course for which 1613 is a prerequisite.

1715 (A)College Algebra and Trigonometry. Prerequisites: one year of high school plane geometry, and 0123 or high school equivalent. An integrated course in college algebra and trigonometry. Combined credit for 1513, 1613, and 1715 limited to six hours. No credit for those with prior credit in any course for which 1613 is a prerequisite. Satisfies the six hour general education Analytical and Quantitative Thought area requirement.

2103 (A)Elementary Calculus. Prerequisite: 1513, An introduction to differential and integral calculus. For students of business and social sciences.

2123 (A)Calculus for Technology Programs I. Prerequisites: 1715 or 1513 and 1613. First semester of a terminal sequence in calculus for students in the School of Technology. Functions and graphs, differentiation and integration with applications.

2133 (A)Calculus for Technology Programs II. Prerequisite: 2123. Second semester of a terminal sequence in calculus for students in the School of Technology. Calculus of trigonometric, exponential and logarithmic functions and applications to physical problems.
**Prerequisites:** 1715, or 1513.

**Calculus I.**

Methods of solution of ordinary differential equations with applications. First order equations, linear equations of higher order, series solutions, and Laplace transforms.

**Calculus II.**

Prerequisite: 2145. An introduction to derivatives, integrals and their applications, including introductory analytic geometry. Satisfies the six hour general education Analytical and Quantitative Thought area requirement.

**Discrete Mathematics I.**

Prerequisite: 1513 or 1715. Logic, set theory proof techniques, probability and combinatorics, relations and functions, matrix algebra, graphs, Boolean algebra and lattices. Same course as CS 2653.

**Introduction to Problem Solving.**

Prerequisite: 2145. An introduction to techniques of problem solving with problems drawn from throughout mathematics.

**Linear Algebra.**

Prerequisite: 2145. Algebra and geometry of finite-dimensional linear spaces, linear transformations, algebra of matrices, eigenvalues and eigenvectors.

**Linear Algebra and Differential Equations.**

Prerequisite: 2155. An integrated treatment of linear algebra and differential equations. No credit for those with credit in 2203 or 3013.

**Geometric Structures.**

Prerequisite: 1483, 1493 or 1513. Fundamentals of plane geometry, geometric motion (translation, rotations, reflections), polyhedra, applications to measurements.

**Mathematical Structures.**

Prerequisite: 1483, 1493 or 1513. Foundations of number systems, system theory, algebraic systems, functions and applications, and probability.

**Introduction to Modern Algebra.**

Prerequisite: 3013. Introduction to set theory and logic; elementary properties of rings, integral domains, fields and groups.

**Discrete Mathematics II.**

Prerequisite: 2653 or 3613. A continuation of 2653. Algebraic structures, coding theory, finite state machines, machine decomposition, computability, formal language theory. Same course as CS 3653.

**Mathematical Logic and Computability.**

Prerequisites: 3613 or PHIL 3000 or 3003 or consent of instructor. The basic metatheorems of first order logic: soundness, completeness, compactness, Lowenheim-Skolem theorem, undecidability of first order logic, Godel's incompleteness theorem. Enumerability, diagonalization, number systems, standard and non-standard models, Godel numberings, Turing machines, recursive functions, and evidence for Church's thesis. Same course as CS 4003 and PHIL 4003.

**Calculus of Several Variables.**

Prerequisites: 2155 and 3013. Differential and integral calculus of functions of several variables, vector analysis, Stokes' Theorem, Green's Theorem and applications.

**Introduction to Modern Analysis.**

Prerequisite: 2155. An introduction to the theorems and proofs of one-variable calculus. Properties of the real numbers, sequences and series of constants and functions, limits, continuity, differentiation and integration.

**History of Mathematics.**

Prerequisite: 2145. Early development of mathematics as a science, contributions of Greek mathematics, mathematical advancements of the 17th and 18th centuries, and the mathematics of the 19th and 20th centuries. The emphasis in the course will be on replicating the setting and techniques of the times to understand the nature of a discovery and its relationship to contemporary thought.

**Advanced Calculus I.**

Prerequisites: 3013 and 4023. A rigorous treatment of calculus of one and several variables. Elementary topology of Euclidean spaces, continuity and uniform continuity, differentiation and integration.

**Advanced Calculus II.**

Prerequisite: 4143. Continuation of 4143. A rigorous treatment of sequences and series of functions, uniform convergence, differentiation and integration of vector-valued functions, and differential forms.

**Intermediate Differential Equations.**


**Complex Variables.**

Prerequisite: 4013. Analytic functions, power series, residues and poles, conformal mapping, and applications.

**Geometry.**

Prerequisite: 3013, recommended 3613. An axiomatic development of Euclidean and non-Euclidean geometries.

**Numerical Mathematics: Analysis.**

Prerequisite: 2233, 3013, knowledge of FORTRAN or consent of instructor. Machine computing, algorithms, and analysis of errors applied to interpolation and approximation of functions solving equations and systems of equations, discrete variable methods for integrals and differential equations. Same course as CS 4513.

**Linear and Nonlinear Programming.**

Prerequisites: 2155, 3013. Linear programming, simplex methods, duality, sensitivity analysis, integer programming and nonlinear programming.

**Introduction to Mathematical Modeling.**

Prerequisite: 3013. Techniques of problem solving and mathematical models presented by examples and case studies of applications of mathematics in industrial settings. Oral and written presentation of solutions.

**Modern Algebra I.**

Prerequisite: 3613. An introduction to the theory of groups and vector spaces.


5233* Partial Differential Equations. Prerequisite: 4013 or 4233. Classification of second order equations, characteristics, general theory of first order equations, Dirichlet problem for Laplace’s equation and Green’s functions, eigenvalue problems, and variational methods.

5243* Ordinary Differential Equations I. Prerequisites: 4143; 5013 or 5023. Existence and uniqueness of solutions, linear systems and their asymptotic behavior, oscillation and comparison and variational methods.

5253* Ordinary Differential Equations II. Prerequisite: 5243. Stability and asymptotic behavior of systems of nonlinear differential equations, Liapunov Theory, perturbation and the Poincare-Bendixon theory for planar autonomous systems, bifurcation, basins and attractors, chaotic behavior, and invariant tori.

5283* Complex Analysis I. Prerequisite: 4143. Basic topology of the plane, functions of a complex variable, analytic functions, transformations, infinite series, integration and conformal mapping.

5293* Complex Analysis II. Prerequisite: 5283. Riemann Mapping Theorem, meromorphic functions, analytic continuation, Dirichlet problem, and entire functions.

5303* General Topology. Prerequisite: 4143 or consent of instructor. Basic properties of topological spaces and continuous functions, including connectedness, compactness, and separation and countability axioms. Metric, product, and quotient spaces, Urysohn lemma, and Tietze extension theorem.

5313* Geometric Topology. Prerequisites: 4613, 5013. Manifolds, complexes, the fundamental group, covering spaces, combinatorial group theory, the Seifert-Van Kampen theorem, and related topics.

5413* Differential Geometry. Prerequisite: 4013 or 4143. Differential manifolds, vector fields, differential forms, connections, Riemannian metrics, geodesics, completeness, curvature, and related topics.

5523* The Calculus of Variations and Optimal Control. Prerequisite: 4023 or 4143. Extrema of integrals depending on unknown functions. Euler conditions, Hamilton-Jacobi equations, Weierstrass E-function, Pontryagin maximum principle, bang-bang controls, feedback, stochastic problems and Kalman-Bucy filter.

5543* Numerical Analysis for Differential Equations. Prerequisites: 4513 or 4513, and 4233. Advanced machine computing, algorithms, analysis of truncation and rounding errors, convergence and stability applied to discrete variables, finite elements, and spectral methods in ordinary and partial differential equations. Same course as CS 5543.

5553* Numerical Analysis for Linear Algebra. Prerequisites: 3013, and 4513 or CS 4513. Advanced machine computing, algorithms, analysis of rounding errors, condition, convergence, and stability applied to direct and iterative solution of linear systems of equations, linear least squares problems, and algebraic eigenvalue problems, including LU and QR factorization, conjugate gradients, OR algorithm, and Lanczos method. Same course as CS 5553.


5613* Algebra I. Prerequisite: 4613. A rigorous treatment of classical results in group theory and ring theory.

5623* Algebra II. Prerequisite: 5613. A rigorous treatment of classical results in module theory and field theory.

5653* Automata and Finite State Machines. Prerequisites: 3613 or CS 5313 or CS 5113 and CS 5213. Finite state model, state diagrams and flow tables, equivalent states and equivalent machines. Formal grammars, context-free languages and their relation to automata. Turing machines, and recursive function. Same course as CS 5653.

5663* Computability and Decidability. Effectiveness, primitive recursivity, general recursivity, recursive functions, equivalence of computability definitions, decidability, recursive algorithms. Same course as CS 5663.

5902 Seminar and Practicum in the Teaching of College Mathematics. Prerequisite: graduate standing in mathematics or consent of instructor. Foundations of college mathematics teaching, including lecturing, grading, and exam preparation. Adaptive classroom activities to better serve different types of learners. Current trends in mathematics education such as calculus reform, cooperative learning, and technology in the classroom.


6010 Advanced Seminar in Mathematics. 1-3 credits, maximum 12. Prerequisites: consent of instructor and student’s advisory committee. Directed reading on advanced topics in mathematics.


6143* Functional Analysis I. Prerequisites: 4613 or 5023, 5153, 5303. Theory of topological vector spaces including metrizability, consequences of completeness, Banach spaces, weak topologies, and convexity.

6153* Functional Analysis II. Prerequisite: 6143 or consent of instructor. Introduction to and basic results in several subfields of analysis which employ functional analytic methods. Topics from bounded and unbounded operator theory, Banach algebras, distributions, Fourier analysis, and representation theory.

6213* Harmonic Analysis. Prerequisites: 5153, 5283. Classical results giving connections among the size of a harmonic or analytic function on a complex domain, the existence and smoothness of its boundary values, and behavior of the Fourier series; selected extensions, related topics and applications.


6283* Several Complex Variables. Prerequisite: 5253. Elements of function theory of several complex variables, including extension phenomena, domains of holomorphy, notions of convexity, holomorphic maps, and complex analytic varieties.

6290* Topics in Analysis. 1-3 credits, maximum 9. Prerequisite: consent of instructor. Advanced topics in analysis.

6323* Algebraic Topology I. Prerequisite: 5313. Homotopy groups, homology, and covering spaces, the Eilenberg-Steinreid axioms, Mayer-Vietoris sequences, universal coefficient theorems, the Eilenberg-Zilber theorem and Kuneth formulas, cup and cap products, and duality in manifolds.

6333* Algebraic Topology II. Prerequisite: 6323. Homotopy groups, the Hurewicz and Whitehead theorems, Eilenberg-MacLane spaces, obstruction theory, fibrations, spectral sequences, and related topics.

6390* Topics in Topology. 1-3 credits, maximum 9. Prerequisite: consent of instructor. Advanced topics in topology.

6433* Algebraic Geometry. Prerequisite: 5263, Advanced projective varieties, dimension, algebraic curves, divisors, and Rieman-Roch theorem for curves.

6453* Complex Geometry. Prerequisite: 5283. Complex manifolds, analytic sheaves, differential forms, Dolbeault cohomology, Hodge theory, line bundles, divisors, Kodaira embedding, and vanishing.
4690* Topics in Geometry. 1-3 credits, maximum 9. Prerequisite: consent of instructor. Advanced topics in geometry.

6513* Theoretical Numerical Analysis. Prerequisites: 5513, 5543 or CS 5543, and 5553 or CS 5553. An advanced theoretical treatment based on function spaces and operator theory of algorithms for machine computing and analysis on function spaces and operator theory.

6590* Topics in Applied Mathematics. 1-3 credits, maximum 9. Prerequisite: consent of instructor. Advanced topics in applied mathematics.

6613* Commutative Algebra. Prerequisite: 5623. Commutative rings, exactness properties of modules, tensor products, integral dependence, chain conditions, completions, filtrations, local rings, dimension theory, and flatness.

6623* Homological Algebra. Prerequisite: 5623. Closed and projective classes, resolution and derived functors, adjoint theorem, construction of projective classes in the categories of groups, rings and modules; categories, Abelian categories.

6690* Topics in Algebra. 1-3 credits, maximum 9. Prerequisite: consent of instructor. Advanced topics in algebra.

6713* Analytic Number Theory. Prerequisite: 4283 or 5253. Arithmetic functions, Zeta and L functions, distribution of primes and introduction to modular forms.

6723* Algebraic Number Theory. Prerequisite: 5013 or 5523. Number fields, ideal theory, units, decomposition of primes, quadratic and cyclotomic fields, introduction to local fields.

6790* Topics in Number Theory. 1-3 credits, maximum 9. Prerequisite: consent of instructor. Advanced topics in number theory.

6813* Lie Groups and Representations. Prerequisites: 4153, 4613, 5903. Differentiable manifolds, vector fields, Lie groups, exponential map, homogeneous spaces, representations of compact Lie groups, and maximal tori.


6890* Topics in Representation Theory. 1-3 credits, maximum 9. Prerequisite: consent of instructor. Advanced topics in representation theory.

3043 Mechanics of Machinery. Prerequisites: ENSC 2122, MATH 2233. The kinematics and kinetics of rigid bodies sub-jected to planar and spatial motion: vector and matrix methods. Euler’s equations to examine gyroscopic motion. The design of gears and gear trains; Analytical design of cam profiles. Multi-degree of freedom machines including the application of the Lagrangean equation.

3113 Measurements and Instrumentation. Lab 3. Corequisites: 3403, 3723. Application of basic electronic laboratory measurement equipment. Selection and testing of transducers for measurement of displacement, time frequency, velocity, pressure, force, temperature, flow-rate, and vibration, for machine design applications. Considerations of accuracy, uncertainty and repeatability. Design projects involving the use of analog and digital integrated circuits and construction of prototype sensors. Practice in the use of signal processing including digital filtering and applications of Fast Fourier Transform theory. Practice in the use of computer-based data acquisition systems. Preparation of formal reports, including the presentation of plots, figures and tables.

3123 Manufacturing Processes. Prerequisites: ENSC 2142 and ENSC 3313 or equivalent. An introduction to manufacturing processes including the fundamental processes of casting, forging, rolling, extrusion, drawing and metal cutting. Quantitative relationships to identify important parameters which influence a given process.

3223 Thermodynamics II. Prerequisite: ENSC 2213. A continuation of ENSC 2213. Irreversibility and availability, power cycles, refrigeration cycles, mixtures and solutions, chemical reactions, phase and chemical equilibrium, and introduction to compressible flow.


3293 Compressible Fluid Flow. Prerequisites: ENSC 2213, 3233, MATH 2233. Gas flows in one and two dimensions. Basic thermodynamic and dynamic equations. Nozzle and duct flows, choking, plane and oblique shock waves, Prandtl-Meyer expansions, rocket propulsion, frictional high-velocity flows and heat addition effects. Two-dimensional ideal fluid flow, stream function, velocity potential, linearized flows and method of characteristics.

3323 Mechanical Design I. Prerequisites: ENSC 2112, ENSC 2142. Introduction to the design process. Consideration of reliability, factors of safety, product liability, and economics. Use of codes, standards, and other design resources. Design stress analysis of mechanical components such as beams, rings, cylinders, and shafts. Analysis of stiffness and deflection of straight and curved beams, columns, and links. Consideration of failure theories for various types of engineering materials. Application of fatigue analyses in the design process.


3723 Systems I. Prerequisites: ENSC 2122, 2613 and MATH 2233. Physical and mathematical modeling of electrical and mechanical dynamic systems. Transient response of first- and second-order systems. Laplace transform technique for solving differential equations; transfer functions, frequency response and resonance. Same course as ECEG 3723.


4053* Automatic Control Systems. Prerequisite: 3113. Properties of feedback control systems, mathematical models of basic components state-variable models of feedback systems design specifications of control systems; time-domain analysis, stability, stability robustness, transform analysis, frequency domain techniques, root-locus, design of single-input-single-output systems and compensation techniques for engineering systems. Same course as ECEG 4413.

4063* Mechanical Vibrations. Prerequisite: 3723 Lumped parameter analysis of multi-mode vibrating systems. Analysis techniques including classical analytical methods, matrix methods and numerical methods. Selection and design of vibration isolation systems. Selection of vibration instrumentation. Machine dynamics, including rotor dynamics, nonlinear effects, and self-excited vibrations.

4223* Aerospace Engineering Laboratory. Lab 3. Prerequisites: 3113, 3523, 4283. Experiments in aerospace principles including top ics in aeronautics and astronautics. State-of-the-art instrumentation, diagnostics, and computerized data acquisition equipment and techniques applied to experiments including application of low speed wind tunnel testing techniques, rocket propulsion and control-jet experiments, fundamentals of supersonic nozzles, and flight test evaluation of performance, stability, control, and handling qualities of a propeller-driven airplane.

4243* Gas Power Systems. Prerequisites: 3222 and ENSC 3233. Power and propulsion engines utilizing a gas as the working fluid. The modynamic and dynamic equations of one-dimensional compressible flow, including shock waves. Design and analysis of overall aircrew reactor engine systems and individual components of the aircraft engine, as well as engine component matching, using design software packages. Centrifugal and axial flow turbine and compressors.
Vapor Power Systems. Prerequisites: 3223, 3233. Vapor power cycles, combustion processes associated with power plants, and auxiliary systems associated with power plants. Overall design of power plants as well as component design. Power system economics and loan analysis. Extensive use of spreadsheet design and analysis packages.

Experimental Fluid Dynamics. Lab 3. Prerequisites: 3113 and ENSC 3233. Experimental study of basic and applied fluid dynamics systems with comparisons to analytical predictions. Fluid dynamics instrumentation, digital data acquisition and processing, design of facilities and experiments, technical report writing and design project with experimental verification.


Design for Manufacturing. Lab 3. Prerequisite: 3123. Integration of concepts of product design with manufacturing principles, including behavior and properties of material, stress analysis, heat transfer and lubrication. Processing techniques and economics. Emphasis on analysis requirements and applications of processes parameters and design variables, in CAD/CAM.

Mechanical Metallurgy. Lab 2. Prerequisite: ENSC 3313. Mechanical deformation processes and strengthening mechanisms in engineering materials. Material failure modes including creep, fatigue, stress corrosion, ductile and brittle fractures.

Design Projects. Lab 4. Prerequisites: 3033, 3113, 3233. Students work in small teams on a semester-long design project sponsored by a company, agency, or individual. Team members work with mentors from sponsors and with faculty members in fields related to their topics. Presentations on safety, patent law, product liability, report writing, oral presentations, scheduling and idea. Oral presentations, progress reports, and a professional log book documenting personal activity and contributions.

Mechanical Design II. Prerequisites: 3033, 3123 or 4333, 3323. Design of power transmission systems, including belts, chains and gears. Selection and application of hydraulic and pneumatic components in machine design applications. Selection of electronic sensors, actuators, encoders, and related electromechanical components. Design practice in the form of short projects integrating segments of the course.

Experimental Methods in Design. Lab 6. Prerequisites: 3113 and 3323. Laboratory techniques for the experimental analysis of vibration, stress, force and motion. Projects involve the use of strain gages, brittle lacquer techniques, reflection and transmission polariscopes, load cells and accelerometers.

Aerospace Systems Design. Lab 4. Prerequisites: senior standing and consent of instructor. Multidisciplinary design of aerospace vehicles. Multidisciplinary teams that work on a semester-long project that includes the design, construction, and flight test of an aerospace vehicle optimized for a given set of requirements. TEAMWORK and presentation skills emphasized. Students from all appropriate fields are encouraged to enroll.

Seminar. Prerequisite: senior standing. Group discussions on professional aspects of engineering, teamwork, leadership and presentation skills. Preparation of written and oral reports on selected and assigned topics.


Design of Indoor Environmental Systems. Prerequisites: 3323, 3323. Design of heating, ventilating and air conditioning systems. Calculation of heating and cooling loads.

Dynamic Systems Design. Prerequisites: 3033, 3113. Design of control systems, formulation of design specifications, characterization and selection of components for dynamic engineering systems including sensors and actuator elements, considerations of passive, active, open-loop and closed-loop solutions, use of microprocessors and microcontrollers as part of dynamic engineering systems, design practice with open-ended design projects integrating the various components of the course.

Thesis. 1-6 credits. maximum 6. A student studying for a master's degree who elects to write a thesis must enroll in this course.

Mechanical Engineering Projects. 1-2 credits. maximum 12. Project in research or design selected by the student, or assigned by the instructor. A student who wishes to complete a master's degree under Plan III must enroll in this course.

Engineering Practice. 1-12 credits, maximum 12. Prerequisites: senior or graduate standing and consent of instructor. Solution of real-life engineering design and development problems in an actual or simulated industrial environment. Activities include application of design and testing procedures, economic evaluation and periodic oral and written reporting on one or more assigned problems. Activities must be approved in advance by the adviser.

Advanced Dynamics. Prerequisites: 3043, MATH 3013. Advanced treatment of analytical methods for rigid body motion with emphasis on multi-dimensional motion. Newtonian formulations, Lagrange's equations, Euler's equations, the Poinscot construction, Hamilton's equations, Canonical transformations, spin stabilization, the rotation matrix, and Kane's formulations. Applications to engineering problems.

Advanced Mechanical Vibrations. Prerequisite: 4063 or consent of instructor. Analysis of nonlinear vibrations, classical analysis of continuous systems and numerical methods.

Engineering Acoustics. Acoustical analysis and measurement techniques, with emphasis on design applications for noise and vibration control in machinery and buildings.

Numerical Engineering Analysis. Prerequisite: basic FORTRAN programming. Practical digital methods for obtaining steady-state and transient solutions to lumped and distributed mechanical, fluid and thermal problems.

Metal Cutting. Prerequisite: ENSC 3313. Understanding the fundamental principles and practice (mechanics and material aspects) of machining and grinding of materials. Historical aspects; physics of cutting; mechanics of machining (orthogonal and oblique); shear stress and shear strain in machining, dynamometry; tool materials, tool wear, tool life, and machinability; vibrations in machining; thermal aspects of machining, cutting fluids; economics; surface finish accuracy and surface integrity, and grinding.

Mechanical Behavior of Materials. Prerequisite: ENSC 3313 or equivalent. A unified approach to the behavior and response of engineering materials to applied loads. Mechanical and metallurgical fundamentals of deformation processes. Spatial scales of atomic physics, micromechanics and continuum mechanics.
5373* Instrumentation. Lab 2. Analysis and design of instrumentation systems. Laboratory experiences with electronic instrumentation and transducers, application of digital and analog integrated circuit components to measurement problems.

5403* Computer-aided Analysis and Design. Prerequisite: basic FORTRAN programming. Theory, application and implementation of digital-computer-oriented algorithms for the synthesis, simulation, analysis and design of engineering systems. Advanced FORTRAN methods for optimization, simulation and data analysis. Implementation of these methods uses program libraries, batch processing, remote terminals and graphic display units.


5463* Nonlinear System Analysis and Control. Prerequisite: 4053 or ECEN 4413. Failure of superposition of effects; phase-plane analysis; limit-cycles; Lyapunov stability; hyperstability and input-output stability; controllability and observability of nonlinear systems; feedback linearization; robust nonlinear control system design. Same course as ECEN 5463.


5483* Digital Data Acquisition and Control. Prerequisite: undergraduate course in programing. Use of microcomputers operating in real-time applied to engineering systems for data acquisition and control, use of analog to digital, digital to analog, and digital input/output, synchronous and asynchronous programming. Compensation in the engineering use of microcomputers through lectures and laboratory applications. Same course as ECEN 5483.

5493* Software Design for Real-Time Distributed Systems. Prerequisite: 5483 or ECEN 5483 or consent of instructor. Fundamental concepts associated with the design of software for implementation on distributed computer, time-division or time-sharing operating systems and computers. Parallel computing in a real-time environment and control algorithm design. State-of-the-art boards including analog-to-digital and digital-t-ad analog equipment and newest computer-aided software engineering tools. Same course as ECEN 5493.

5513* Stochastic Systems. Prerequisite: ECEN 3513 and 4503 or STAT 4033 or MAE 4053 or MAE 4063 or consent of instructor. Theory and applications involving probability, random variables, functions of random variables, and stochastic processes, including Gaussian and Markov processes. Correlation, power spectral density, and nonstationary random processes. Response of linear systems to stochastic processes. State-space formulation and covariance analysis. Same course as ECEN 5513.

5523* Estimation Theory. Prerequisite: 5513 or ECEN 5513. Stochastic model development, parameter estimation and state estimation. The linear model, model order determination, least squares, estimation, maximum likelihood estimation, Bayesian estimation, Gaussian random vectors, estimation in linear and Gaussian models, state estimation, the Kalman filter, prediction and smoothing. Same course as ECEN 5523.

5533* Analysis of Structural Systems. Prerequisite: 3523. Computer-oriented matrix methods in the analysis of linear structural systems; energy principles; matrix equations for static and dynamic analyses of elastic systems; stability.


5553* Fatigue and Fracture Mechanics. Prerequisite: 4333 or consent of instructor. Fracture processes in engineering materials including design considerations, failure avoidance and predictability. Fatigue processes and high-strength, toughness-limited materials. Same course as CIVE 5553.


5583* Corrosion Engineering. Lab 2. Prerequisite: ENSC 3313. Modern theory of corrosion and its applications in preventing or controlling corrosion damage economically and safely in service.


5633* Applied Thermodynamics. First and Second Law analysis. Prediction of properties of non-ideal fluids, including mixtures. Engineering applications to power system design, solar systems, HVAC systems, waste heat recovery and underground petroleum reservoirs.

5703* Optimization Applications. Prerequisite: graduate standing. A survey of various methods of unconstrained and constrained linear and non-linear optimization. Applications of these methodologies using hand-worked examples and available software packages. Intended for engineering and science students. Same course as CHE 5703, ECEN 5703 and IEM 5023.

5713* Linear Systems. Prerequisite: graduate standing. Introduction to mathematical analysis of networks and learning rules, and on the application of neural networks to certain engineering problems image and signal processing and control systems. Same course as CHE 5713 and ECEN 5733.

5733* Neural Networks. Prerequisite: graduate standing. Introduction to mathematical analysis of networks and learning rules, and on the application of neural networks to certain engineering problems image and signal processing and control systems. Same course as CHE 5713 and ECEN 5733.


5773* Intelligent Systems. Prerequisite: 5733 or ECEN 5733. Introduction to the state-of-the art intelligent control and system successfully deployed to industrial and defense applications. Emerging intelligent algorithms (e.g., bottom-up, top-down, semiotics); reinforcement learning and hybrid systems; and case studies and design projects. Same course as ECEN 5773.

5803* Advanced Thermodynamics I. Prerequisite: 3223. A rigorous examination of the fundamental principles of engineering thermodynamics; the First Law, the pure substance, flow processes, Second Law, availability, properties of substances, thermochemistry, mixtures and equilibrium.
6123* Radiation Heat Transfer. The mechanism of the transfer of energy by thermal radiation; radiant properties of materials, energy transfer prediction methods and solar energy topics.

5843* Conduction Heat Transfer. Prerequisite: ENSC 3233. Advanced heat transfer analysis and design, with primary emphasis on conduction.

5853* Computational Heat Transfer. Prerequisites: ENSC 3233, graduate standing, knowledge of FORTRAN. Computational techniques for the solution of two-dimensional heat transfer, fluid flow and related processes in problems of practical interest. A general-purpose computer program used to demonstrate the capabilities of the numerical method through a wide variety of engineering problems.

5873* Advanced Indoor Environmental System. Prerequisite: 4703. Heating, cooling, and ventilating systems. System and component design, building thermal simulation and energy calculation procedures.

5913* Ideal-fluid Aerodynamics. Prerequisite: ENSC 3233 or equivalent. Principles of inviscid, incompressible flow about airfoils and wings. Two and three dimensional panel methods. Introduction to unsteady and compressibility effects.

5923* Guidance and Control of Aerospace Vehicles. Prerequisite: 4053 or ECEN 4413 or equivalent. Navigation, guidance and attitude control of aircraft, launch vehicles and spacecraft. Inertial navigation mechanizations and error analysis. Stability augmentation systems.

5933* Aeroelasticity. Prerequisite: graduate standing or consent of instructor. Interactions between fluid dynamic, inertial and elastic forces. Development of analytical and computational Methods for analysis. Application to a broad range of problems in engineering.

5000 Research and Thesis. 1-15 credits, maximum 30. Prerequisites: consent of the head or the graduate committee of the School and approval of the assistant dean. Independent research under the direct supervision of a member of the graduate faculty. For students pursuing study beyond the level of the M.S. degree.

6010* Advanced Study. 1-12 credits. Prerequisite: approval of the student's advisory committee. Study and investigation under the supervision of a member of the faculty along lines of interest well advanced of and supported by the 6000-series courses.

6123* Non-traditional Machining. Prerequisite: consent of instructor. Rationale for non-traditional machining; various non-traditional machining processes including electro-discharge machining, electro-chemical machining, plasma arc, microwave-, and laser assisted processing, waterjet (abrasive) cutting, ultrasonic machining, chemical machining, thermal assisted processing, and electron beam machining.

6133* Surface Mechanics. Prerequisite: consent of instructor. Models and solutions basic to surface studies. Equations of continuum mechanics, thermal field solutions at sliding interfaces, elasticity, plasticity. Applications of solution techniques to surface, surface layer and interface phenomena.

6143* Thermal Analysis of Manufacturing Processes. Prerequisites: graduate standing and consent of instructor. Thermal analysis of various moving heat source problems encountered in a variety of manufacturing processes, including machining, grinding, polishing, casting, welding, energy beam cutting and other tribological applications such as meshing of gears, cams, bearings. Analysis of both transient and steady state conditions.

6233* Turbulent Fluid Dynamics. Prerequisite: 5233. Isotropic turbulence, turbulent wakes and jets, bound turbulent shear flows, transition, hydrodynamic stability and integral calculation methods for turbulent boundary layers.

6263* Computational Fluid Dynamics. Prerequisite: 5233. Steam function-vorticity and pressure-velocity simulations of incompressible and compressible flows. Temperature and concentration solutions. Applications to various external and internal flow problems.

6423* System Identification. Prerequisite: 5473 or 5713 or ECEN 5473 or ECEN 5713. Linear and nonlinear systems modeling of random systems. Models of linear time-invariant systems, non-parametric methods and preliminary model development, parameter estimation methods, convergence and consistency, distributions of parameter estimates, nonlinear modeling. Same course as ELEC 6423.

6453* Adaptive Control. Prerequisite: 5473 or ECEN 5473 or ECEN 5713 or M&E 5713. Analysis and design of control techniques which modify their performance to adapt to changes in system operation. Review of systems analysis techniques, including state variable representations, linearization, discretization, covariance analysis, stability, and linear quadratic gaussian design. On-line parameter estimation, model reference adaptive systems, stable-tuning regulators, stable adaptive systems. Same course as ECEN 6453.

6463* Advances in Nonlinear Control. Prerequisites: 5463 or ECEN 5463. Introduction to vector fields and Lie algebra; controllability and observability of nonlinear systems; local de-coupling techniques; input-output and state-space representation of nonlinear systems; feedback linearization; control invariant and distribution; control of Hamiltonian systems. Same course as ECEN 6463.

6483* Robust Multivariable Control Systems. Prerequisite: 5713 or ECEN 5713 or ELEC 5713. Introduction to multivariable systems: SISO robustness vs. MIMO robustness; multivariable system poles and zeros; MIMO transfer functions; multivariable frequency response analysis; multi-input multi-output Nyquist theorem; performance specifications; stability of feedback systems; linear fractional transformations (LFT’s); characterization of all stabilizing controllers; structured singular value; algebraic ricatti equations; H2 optimal control; H-infinity controller design. Same course as ECEN 6483.

6553* Advanced Solid Mechanics. General nonlinear problems of elasticity including thermal, dynamic and anisotropy effects; stress wave propagation; consideration of plasticity.

6823* Advanced Radiative Transfer. Prerequisite: 5823. Radiative energy transfer within participating media and among real surfaces. Anisotropic scattering, angular distribution index effects, and wavelength-dependent analysis. Current solution techniques-approximate and exact. Relationship of electric fields to radiative transfer. Combined radiation with conduction and/or convection. A project concerned with a unique radiative transfer problem.

6843* Convection Heat Transfer. Prerequisite: 5233 or equivalent. Advanced convective heat transfer in laminar and turbulent flows over external and internal surfaces and inside channels. Heat transfer at high velocities, free convection boundary layers, and mass transfer.

Mechanical Engineering Technology (MET)

1103 Introduction to Mechanical Engineering Technology. Lab 2. Introduction to mechanical engineering technology, analytical techniques, and data presentation. Orientation to the mechanical engineering technologist's profession.


2103 Industrial Materials. Lab 3. Prerequisite: CHEM 1314. A survey of the properties, characteristics and applications of metals, polymers, ceramics and other industrial materials. Terminology, engineering properties and round properties involved in material selection, specification and processing. Laboratory activities include data collection and report generation, determination of material characteristics, and evaluation of material characteristics.

2213 Machine Drafting. Lab 6. Prerequisites: 1223, GEN 1153. Detail and assembly drawings of machines and products using drafting machines and computer-aided drafting techniques.


3003 Dynamics. Prerequisites: GEN 2323 and MATH 2123. Plane motion of particles and rigid bodies. Force-acceleration, work-energy, and impulse-momentum principles. Graphical analysis, mechanisms and vibrations.

3113 Basic Instrumentation. Lab 2. Prerequisites: GEN 2323, MATH 2123. Data analysis. Theory, operational characteristics and application of transducers for measurement of strain, force, velocity, acceleration, displacement, time, frequency, temperature, pressure, fluid flow.

3313 Applied Fluid Mechanics. Prerequisites: 2313, MATH 2123, and PHYS 1214. Fluid mechanics principles applied to fluid power systems and general fluid systems. Fluid system analysis using Bernoulli and general energy equations, laminar and turbulent flows, flow and pressure measurement, flow forces, lift and drag.
3333 Thermodynamics and Heat Transfer for Electronics. Lab 3. Prerequisites: MATH 2133 and junior standing. Principles of thermodynamics and design of heat transfer techniques. Application of computer numerical control (CNC) and robotics. Machine capabilities and tooling requirements with programs being prepared manually and with COMPACT II computer assistance.

3431 Electrohydraulics and Motion Control. Lab 2. Prerequisites: 3313, EE 3103. Principles of electronics as applied to fluid power controls. Trends in modern fluid power systems. Solenoid systems, proportional control, servosystems, programmable controllers, and robotics. Lab includes design, fabrication and operation of practical systems.


Mechanized Agriculture (MCAG)

1413 Introduction to Engineering in Agriculture. Prerequisite: MATH 1513 or concurrent enrollment. Application of the physical and engineering sciences to agricultural problems. Energy; energy conversion; thermal, electrical, mechanical and fluid systems; equipment calibration; environmental control of agriculture buildings and irrigation system requirements.

2313 Surveying. Lab 3. Prerequisite: MATH 1613. An introduction to the basic concepts of surveying for small areas. Common practices of plane surveying: differential, profile, and topographic leveling; field notes, accuracy and precision, error, error control, and land measurement.


3211 Engines and Power. Lab 4. Prerequisites: 14-3, MATH 1513. Theory, operation, performance and diagnostics of internal combustion engines for mobile applications.

3223 Metals and Welding. Lab 3. Prerequisite: 1413. Essential knowledge and theory necessary for understanding the principles of hot and cold metals and welding. Laboratory provides opportunity to apply and develop associated skills.

3311 Surveying. Lab 4. Prerequisites: 1413, MATH 1513. Use of surveying equipment and common applications in agriculture.

3321 Erosion Control Practices. Lab 4. Prerequisites: MATH 1513 and concurrent enrollment in MCAG 3311. Analysis, planning and management of soil and water resources.

4101 Agricultural Electrification. Lab 4. Prerequisite: 1413, MATH 1513. A study of electrical theory and electrical applications in agricultural environments.

4123 Principles of Food Engineering. Prerequisite: MATH 1513. For non-engineers. Application of the engineering approach to solving heat and mass transfer problems in food processing. An introduction to the basic concepts of food processing laws, fluid flow, heat transfer, refrigeration, freezing, psychrometry, and energy conservation.

4200 Topics in Mechanized Agriculture. 1-4 credits, maximum 4. Investigations in specialized areas of mechanized agriculture.

4201 Irrigation Principles. Prerequisite: MATH 1513. Sources, measurement and efficient use of irrigation water. Selection of pumping plants and power units. Layout and management of surface and sprinkler systems.

4212 Safety and Health in Agribusiness. Lab 2. Prerequisite: junior standing or above. Study of the causes and prevention of accidents in agribusinesses. Investigations including the acute and chronic risks of machinery, animals, gases, confined spaces, outdoor and hazardous materials.

4220* Advanced Methods in Agricultural Mechanization. 1-6 credits, maximum 6. Prerequisite: 4222. Developing agricultural mechanics programs for vocational agriculture and technical schools. Application of agricultural mechanical methods, practices and skills to advance project.

4223 Methods and Management of Agricultural Mechanization. Lab 3. Prerequisite MATH 1513. The role of agricultural mechanic in educational systems. A study of the principles of agricultural mechanics, methods of teaching, instructor responsibility and liability, laboratory safety, project construction, selection of resources, project evaluation, and the selection, use and care of tools.

4311 Technology and Environment. Lab 4. Prerequisites: 1413, MATH 1513. A study of the impact of technology on the environment.

Medical Technology (MTCL)

4117 Clinical Microbiology. Lab 12. Prerequisite concurrent internship in affiliated hospital, an all degree requirements for B.S. in medical technology except 30 hours MTCL. The theory and laboratory study of pathogenic bacteria, viruses, rickettsiae, fungi, and parasites. Includes isolation, identification, antimicrobial susceptibility testing, and medical significance
Clinical Chemistry I. Lab 9. Prerequisites: concurrent internship in affiliated hospital, and all degree requirements for B.S. in medical technology except 30 hours MTCL. The theory and laboratory methodology of analytical biochemistry, clinical microscopy, routine and special procedures, and medical significance.

Clinical Hematology. Lab 12. Prerequisites: concurrent internship in affiliated hospital, and all degree requirements for B.S. in medical technology except 30 hours MTCL. Systematized study of diseases, cell maturation and function, principles of hemostasis; methodology used in routine and special hematology studies; and correlation of hematologic findings with physiological conditions.

Clinical Immunology. Lab 12. Prerequisites: Concurrent internship in affiliated hospital, and all degree requirements for B.S. in medical technology except 30 hours MTCL. Immunology fields. Evaluating and understanding scientific and professional literature, and making presentations in selected areas.

Topics in Medical Technology. Prerequisites: concurrent internship in affiliated hospital, and all degree requirements for B.S. in medical technology except 30 hours MTCL. Principles and practices of the medical laboratory including basic management, quality assurance, education methodology, computer applications, laboratory safety, and special projects in selected areas.

Microbiology (MICR)

1513 (L) Inquiry-based Biology. Lab 3. Prerequisites: CHEM 1413, GEOL 1613, PHYS 1313 recommended. Directed inquiry and hands on study of biological principles. Recommended for elementary education majors as model course to learn and teach science.

2124 Introduction to Microbiology. Lab 4. Prerequisites: one year of chemistry; and BIOL 1604, and 1403 or 1604. General principles of microbiology.

3013 Introduction to Biomedical Science I. Prerequisites: CHEM 1515 and PHYS 1214 or equivalent. Health science applications of biology, chemistry and physics. Inferential reasoning and application of mathematics. Interpretation of research and graphical data.

3023 Introduction to Biomedical Science II. prerequisites: CHEM 1515 and PHYS 1214 or equivalent. Health science applications of biology, chemistry and physics. Inferential reasoning and application of mathematics. Interpretation of research and graphical data. Continuation of 3013.

3143 Medical Mycology. Lab 4. Prerequisite: 2124. Examination of fungi as animal pathogens; laboratory techniques used in the identification of human and animal pathogens, and differentiation from common contaminants.

3153 Medical Parasitology. Lab 2. Prerequisite: introductory biology. Human and parasitological problems including endemic, exotic and zoonotic organisms. Life cycles, diagnosis and control procedures. Principles applicable to all areas of zoology, medicine, veterinary medicine and medical technology.

3154 Food Microbiology. Lab 4. Prerequisites: 2124 and organic chemistry. Relationship of microorganisms to food manufacture and preservation, to food spoilage and microbial food poisoning and to various aspects of primary food production. Same course as ANS 3154.


3254 Immunology. Lab 3. Prerequisite: 2124. Verbal abilities to defend itself against foreign invasion. Chemistry and biology of the acquired immune response. Same course as CLML 3254.

4000 Honors in Microbiology. 1-4 credits, maximum 4. Prerequisite: consent of departmental honors committee. Supervised study and research in microbiology.

4001 Professional Transitions in Microbiology and Cell and Molecular Biology. Prerequisites: declared microbiology or cell and molecular biology major with minimum 70 hours earned and consent of instructor. Understanding major areas and employment activities in microbiology, cell biology and molecular biology fields. Evaluating and understanding scientific and professional literature, and making the transition from undergraduate education to postgraduate education or employment. Same course as CLML 4001.

4113 Microbiology of Soil. Lab 6. Prerequisite: 2124. Microorganisms of the soil and their relationship to soil fertility.

4123 Virology. Prerequisites: BIOL 3014 or one course in biochemistry. Corequisite: 3224. Virus-host interactions including structure-function of animal, plant and bacterial viruses. Discussion of the molecular biology of virus infection and development. Same course as CLML 4123.

4124 Microbial Ecology. Lab 4. Prerequisites: 2124 and one semester of organic chemistry. Corequisite: 3224. Roles of microbes in biogeochemical cycles and energy transfers.


4134 Pathogenic Microbiology. Lab 3. Prerequisites: 2124. Corequisite: 3224. Investigation of pathogenic bacteria as they relate to humans, other animals, plants and insects.

4323 Bioenergetics. Prerequisites: BIOL 3653 or BIOL 3014. Bioenergetics reactions and mechanisms involved in energy production in plants, animals and microbial systems. Same course as CLML 4323.

4990 Special Problems. 2-4 credits, maximum 4. Prerequisite: consent of instructor. Minor investigations in the field of microbiology.

4993 Senior Honors Project. Prerequisites: departmental invitation, senior standing, Honors Program participation. A research project under the direction of a faculty member resulting in a written report to be judged by a second faculty member as well. Required for graduation with departmental honors in microbiology.

5000 Thesis. 2-6 credits, maximum 6. Prerequisite: consent of major professor. A student studying for the M.S. degree enrolls in this course for six hours credit.

5113 Advanced Immunology. Prerequisite: 3254. Advanced studies with emphasis on the regulation of vertebrate immune responses.

5130 Current Topics in Immunology. 1 credit, maximum 6. Prerequisites: 3255 and consent of instructor. Discussion or current immunologic literature, with emphasis on critical analysis of research papers.


5153 Emerging Infectious Agents. Prerequisites: 3134, 4123. An in-depth discussion of the importance of emerging infectious agents, the molecular basis for their emergence, and the broad spectrum of host-microbe interactions favoring the evolution of new infectious agents.

5160 Seminar. 1 credit, maximum 2. Required of all graduate students majoring in microbiology.

5203 Bio-informatics. Lab 1. Prerequisite: graduate standing or consent of instructor. BASIC programs and public domain software to model and analyze simple biological processes. Models to evaluate more complex biological processes. No prior experience with computers necessary, but recommended.

5223 Membrane Physiology. Prerequisites: PHYS 1214 and BIOL 3014 or BIOL 4113 or CHEM 3354 or PHYS 3313. Application of biophysical, biochemical and biological techniques to the study of the structure and function of membranes and membrane components; kinetic measurements, spectroscopic techniques and directed techniques. Application of these illustrated with current research problems. Same course as PHYS 5353.

Microbiology 289
5254*  Biotechnology.  Lab 2.  Prerequisites:  4133 and 5142 or consent of instructor.  An indepth exposure to the practical application of biological principles.  Classical and modern (genetic engineering) biotechnology, within a framework involving the identification of a problem or need, determination of a solution or product, strain development, scale-up technology, and product recovery or process enhancement.

5713*  Three Dimension Computer Visualization and Modeling of Biological Macromolecules.  Prerequisite: graduate standing or consent of instructor.  Visualization and modeling of 3-D structure of biologically important macromolecules, such as DNA, RNA, and proteins; important components of modern biological research.  Computer programs used in the modern research environment.  The operation, applications, and limitations of computer programs employed for analysis of genetic information and the correlation between genetic information and macromolecular structure.

5980*  Special Problems.  1-4 credits, maximum 10.  Prerequisite: permission of instructor.  Investigations in the field of microbiology.

6000*  Dissertation.  1-15 credits, maximum 45.  Prerequisite: consent of major adviser.  Research in microbiology for the Ph.D. degree.

6112*  Molecular Biology of Bacterial Viruses.  Prerequisites: 4123 and 4133.  Advanced study of bacteriophages.

6120*  Recent Advances in Microbiology.  1-3 credits, maximum 6.  Prerequisite: one graduate course in biochemistry.  Discussion and evaluation of recent scientific contributions in terms of the living organism.

6143*  Advanced Microbial Physiology.  Lab 3.  Prerequisite: 3224 or consent of instructor.  Discussion of selected topics in microbial physiology.  Critical analysis of research papers.


6253*  Microbial Evolution.  Prerequisites: 2124, BIOL 3653, BIOL 3024.  The mechanisms and results of microbial evolution in nature and in the laboratory, with emphasis on microbes as model evolutionary systems, molecular evolution, classification and phylogeny, and discussion of protobiology and the probable fate of engineered microbes.

6304*  Genetics of Simple Eukaryotes.  Prerequisites: solid understanding of basic cellular maintenance and propagation processes and consent of instructor.  Indepth discussion of lessons learned from simple eukaryotes such as S. cerevisiae (yeast), A. nidulans (fungus), D. melanogaster (fly) and C. elegans (worm).

6323*  Current Topics in Eukaryotic Signal Transduction and Gene Regulation.  Prerequisites:  BIOL 3653, BIOL 3014, 3024.  Discussion of current literature on the mechanisms of eukaryotic signal transduction and gene regulation.

Military Science (MLSC)

1000  Leadership Laboratory.  1 credit, maximum 2.  Lab 2.  Prerequisites: concurrent enrollment in 1112 and 1212.  Learning and practicing basic skills such as rappelling, drill and ceremony, land navigation, individual first aid, individual training in small unit tactics.

1112  Introduction to Reserve Officers’ Training Corps (ROTC).  Team study and activities in basic drill, physical fitness, rappelling, leadership reaction course, first aid, presentations and basic marksmanship.  Fundamentals of leadership.  Optional weekend exercise.  Concurrent enrollment in MLSC 1000 recommended.

1212  Introduction to Leadership.  Principles of effective leading, communication skills, and organizational ethical values.  Concurrent enrollment in MLSC 1000 recommended.  Optional weekend exercise.

2122  Camp Challenge.  Lab 4.  Prerequisites: open only to students who have not completed all of basic ROTC and who pass physical examination.  A five-week summer camp similar to Army Basic Training.  No military obligation incurred.  Completion of 2122 qualifies a student for entry into the advanced course.

2130  Military Physical Conditioning.  1 credit, maximum 2.  Lab 3.  Prerequisite: must be enrolled in MLSC theory classes.  Participation in and learning to plan and lead a physical fitness program.  Development of an individual fitness program and the role of exercise and fitness in person’s life.

2223  Self and Team Development.  Lab 2.  Ethics-based leadership skills that develop individual abilities and contribute to the building of effective teams.  Skills in oral presentation, writing, planning, coordinating groups, land navigation and basic military tactics.


3113  Leading Small Organizations I.  Lab 2.  Prerequisite: completion of lower-division MLSC or equivalent, and approval of professor of military science.  Practical opportunities to lead small groups in situations of increasing complexity receiving personal assessments and encouragement.  Use of small unit defensive tactics and opportunities to plan and conduct training for lower-division students both to develop such skills and as vehicles for practicing leading.

3223  Leading Small Organizations II.  Lab 2.  Prerequisite: 3113.  Analysis of tasks; preparation of written or oral guidance for team members to accomplish tasks.  Delegating tasks and supervising.  Planning and adapting to the unexpected in organizations under stress.  Examination and application of lessons from leadership case studies.  Examination of importance of ethical decision making in setting a positive climate that enhances team performance.

4014  Reserve Officers’ Training Corps (ROTC) Advanced Camp.  Lab 8.  Prerequisites: 3113 and 3223.  A five-week camp conducted at an Army post.  Individual leadership and basic skills performance.

4123  Leadership Challenge and Goal-Setting.  Lab 2.  Prerequisites: 3113 and 3223.  Planning conducting and evaluating activities of the ROTC cadet organization.  Articulating goals, putting plans into action to attain them.  Assesing organizational cohesion and developing strategies to improve it.  Developing confidence in skills to lead people and manage resources.

4223  Military Ethics, Justice and Professionalism.  Lab 2.  Prerequisites: 3113 and 3223.  Continuation of the methodology from MLSC 4123.  Identification and resolution of ethical dilemmas.  Refining counseling and motivating techniques.  Examination of aspects of tradition and law as related to leading as an officer in the Army.

4422  The Tactical Planning Process.  Prerequisite: ROTC advanced course status or consent of department head.  The tactical planning process and its components.  Computer tactical simulations used to organize and synchronize the process.

Music (MUSI)

0501  Concert and Recital Attendance.  Graduation requirement for music degree or certificate candidates.


1011  Piano Class Lessons.  For students with no previous experience.

1021  Piano Class Lessons.

1031  Voice Class Lessons.

1041  Voice Class Lessons.

1051  Organ Class Lessons.

1071  Single Reed Techniques.  Lab 2.  Methods for playing and teaching the clarinet and saxophone.

1081  Double Reed Techniques.  Lab 2.  Methods for playing and teaching the oboe and bassoon.

1090  Secondary Harpsichord.  1-2 credits, maximum 5.


1100  Elective Harpsichord.  1-2 credits, maximum 8.

1110  Elective Organ.  1-4 credits, maximum 8.

1120  Elective Piano.  1-4 credits, maximum 8.

1130  Elective Voice.  1-4 credits, maximum 8.

290  Microbiology
Fundamentals of Music. Accepted for certificate/licensure in elementary education. Fundamentals of music, sight-singing, and piano keyboard. No credit for students with prior credit in 1592.

Music Education. Prerequisite: 2672. For certificate/licensure in elementary education. Methods of teaching music in grades K-6.

Piano Skills for Vocal Music Education Majors. Prerequisite: 211 or consent of instructor. Development of skills in sight-reading, score reading, and general ensemble accomplishment for vocal music education majors.

Elective Harpsichord. 1-2 credits, maximum 8.

Elective Organ. 1-4 credits, maximum 8. Prerequisite: 1110.

Elective Piano. 1-4 credits, maximum 8. Prerequisite: 1120.

Elective Voice. 1-4 credits, maximum 8. Prerequisite: 1130.

Elective Brass. 1-4 credits, maximum 8. Prerequisite: 1140.

Elective String. 1-4 credits, maximum 8. Prerequisite: 1150.

Elective Woodwind. 1-4 credits, maximum 8. Prerequisite: 1160.

Elective Percussion. 1-4 credits, maximum 8. Prerequisite: 1170.

Secondary Organ. 1-2 credits, maximum 8. Prerequisite: 1180.

Secondary Piano. 1-2 credits, maximum 8. Prerequisite: 1190.

Secondary Voice. 1-2 credits, maximum 8. Prerequisite: 1200.

Secondary Brass. 1-2 credits, maximum 8. Prerequisite: 1210.

Secondary String. 1-2 credits, maximum 8. Prerequisite: 1220.

Secondary Woodwind. 1-2 credits, maximum 8. Prerequisite: 1230.

Secondary Percussion. 1-2 credits, maximum 8. Prerequisite: 1240.

Major Organ. 1-4 credits, maximum 8. Prerequisites: upper-division examination, 2250.

Major Piano. 1-4 credits, maximum 8. Prerequisites: upper-division examination, 2260.

Major Voice. 1-4 credits, maximum 8. Prerequisites: upper-division examination, 2270.

Major Violin. 1-4 credits, maximum 8. Prerequisites: upper-division examination, 2280.

Major Viola. 1-4 credits, maximum 8. Prerequisites: upper-division examination, 2290.

Major Cello. 1-4 credits, maximum 8. Prerequisites: upper-division examination, 2300.

Major Double Bass. 1-4 credits, maximum 8. Prerequisites: upper-division examination, 2310.

Major Guitar. 1-4 credits, maximum 8. Prerequisites: upper-division examination, 2320.

Major Harp. 1-4 credits, maximum 8. Prerequisites: upper-division examination, 2330.

Major Flute. 1-4 credits, maximum 8. Prerequisites: upper-division examination, 2340.

Major Oboe. 1-4 credits, maximum 8. Prerequisites: upper-division examination, 2350.

Major Clarinet. 1-4 credits, maximum 8. Prerequisites: upper-division examination, 2360.

Major Saxophone. 1-4 credits, maximum 8. Prerequisites: upper-division examination, 2370.

Major Bassoon. 1-4 credits, maximum 8. Prerequisites: upper-division examination, 2380.

Major Trumpet. 1-4 credits, maximum 8. Prerequisites: upper-division examination, 2390.

Major French Horn. 1-4 credits, maximum 8. Prerequisites: upper-division examination, 2400.

Major Trombone. 1-4 credits, maximum 8. Prerequisites: upper-division examination, 2410.

Major Euphonium. 1-4 credits, maximum 8. Prerequisites: upper-division examination, 2420.

Major Tuba. 1-4 credits, maximum 8. Prerequisites: upper-division examination, 2430.

Major Percussion. 1-4 credits, maximum 8. Prerequisites: upper-division examination, 2440.

Major Harpsichord. 1-4 credits, maximum 8. Prerequisites: upper-division examination, 2450.

Pre-clinical and Laboratory Experiences in Music. Prerequisite: declared intent to pursue Teacher Education program. Observation and micro-teaching in music. Graded on a pass/fail basis.

World Music. Survey of the richly diverse music of non-Western cultures emphasizing traditional musical practices prior to contact with Western media. Exploration of the wide parameters of musical possibilities and the distinct priorities of various musical cultures, in order to gain insight and appreciation of distinctly non-Western music. Historical recordings supplemented by video tapes. Knowledge of Western classical music notation helpful.

Survey of Rock and Roll Styles. Elements and musical styles of rock and roll, its evolution and its social, economic and cultural effects.

Survey of Jazz Styles. Elements and stylistic features of jazz, its evolution and its impact on society.

Form and Analysis. Prerequisites: 2563 and satisfactory upper-division examination. Analysis of standard repertoire with emphasis on form and structural harmonic analysis.

Elementary Music Methods K-6. Prerequisite: 3731. Current elementary music trends, techniques, and materials. For those who will be involved with teaching elementary music grades K-6.
4001 Junior Recital. Prerequisites: junior standing and consent of major applied music teacher.

4021 Piano Class Lessons. Prerequisite: senior music major status.

4031 Solo Literature for the Adolescent Singer. Examination of solo literature and pedagogical approaches suitable for use at the high school level.

4100 Music Industry Internship. 1-6 credits, maximum 8. Lab 8. Prerequisites: 90 credit hours and minimum 2.50 GPA in all music and business courses. Directed practical experiences in an approved retail store or in a work situation related to the music industry.

4250 Major Organ. 1-6 credits, maximum 12. Prerequisites: 3250 and successful completion of recital attendance requirements.

4260 Major Piano. 1-6 credits, maximum 12. Prerequisites: 3260 and successful completion of recital attendance requirements.

4270 Major Voice. 1-6 credits, maximum 12. Prerequisites: 3270 and successful completion of recital attendance requirements.

4280 Major Violin. 1-6 credits, maximum 12. Prerequisites: 3280 and successful completion of recital attendance requirements.

4290 Major Viola. 1-6 credits, maximum 12. Prerequisites: 3290 and successful completion of recital attendance requirements.

4300 Major Cello. 1-6 credits, maximum 12. Prerequisites: 3300 and successful completion of recital attendance requirements.

4310 Major Double Bass. 1-6 credits, maximum 12. Prerequisites: 3310 and successful completion of recital attendance requirements.

4320 Major Guitar. 1-6 credits, maximum 12. Prerequisites: 3320 and successful completion of recital attendance requirements.

4330 Major Harp. 1-6 credits, maximum 12. Prerequisites: 3330 and successful completion of recital attendance requirements.

4340 Major Flute. 1-6 credits, maximum 12. Prerequisites: 3340 and successful completion of recital attendance requirements.

4350 Major Oboe. 1-6 credits, maximum 12. Prerequisites: 3350 and successful completion of recital attendance requirements.

4360 Major Clarinet. 1-6 credits, maximum 12. Prerequisites: 3360 and successful completion of recital attendance requirements.

4370 Major Saxophone. 1-6 credits, maximum 12. Prerequisites: 3370 and successful completion of recital attendance requirements.

4380 Major Bassoon. 1-6 credits, maximum 12. Prerequisites: 3380 and successful completion of recital attendance requirements.

4390 Major Trumpet. 1-6 credits, maximum 12. Prerequisites: 3390 and successful completion of recital attendance requirements.

4400 Major French Horn. 1-6 credits, maximum 12. Prerequisites: 3400 and successful completion of recital attendance requirements.

4410 Major Trombone. 1-6 credits, maximum 12. Prerequisites: 3410 and successful completion of recital attendance requirements.

4420 Major Euphonium. 1-4 credits, maximum 8. Prerequisites: 3420 and successful completion of recital attendance requirements.

4430 Major Tuba. 1-6 credits, maximum 12. Prerequisites: 3430 and successful completion of recital attendance requirements.

4440 Major Percussion. 1-6 credits, maximum 12. Prerequisites: 3440 and successful completion of recital attendance requirements.

4450 Major Harpsichord. 1-4 credits, maximum 8.

4490* Lessons in Applied Music (Major Field). 1-4 credits, maximum 4. Prerequisite: bachelor’s degree or equivalent performing level in applied major field. Major applied music field.

4600* Chamber Ensembles. 1 credit, maximum 8. Lab 2. Prerequisite: 2600 (4 hrs.) or equivalent. Combinations of voices, keyboard, and orchestral instruments for performing chamber music, music theater and duo piano repertoire.

4753* Advanced Music History and Literature. Prerequisite: two semesters of music history. Advanced music history and literature. Historical and stylistic analyses of musical forms and composers’ techniques. Open to graduate students and advanced undergraduate students.

4810* Problems in Musical Composition. 1-2 credits. Prerequisites: 1543 and consent of instructor. Survey of music composition.

4840* Special Studies in Music Literature. 1-2 credits, maximum 4. Prerequisite: junior standing or consent of instructor. Survey of music literature suitable for teaching various levels in applied music.

4890* Special Studies in Music Pedagogy. 1-2 credits, maximum 4. Prerequisite: junior standing or consent of instructor. Survey of music pedagogical methods suitable for various levels and types of applied music.

4901 Senior Recital. Prerequisites: senior standing and permission of major applied music teacher.

4912 Orchestration and Arranging. Prerequisite: upper-division standing as a music major or consent of instructor. Orchestrating for instrumental ensembles and arranging for choral ensembles.

4940 Student Teaching in Public School Music. 1-12 credits, maximum 12. Prerequisites: 3951 and full admission to Teacher Education. Directed observation, seminars, and supervised student teaching in selected elementary and secondary music programs. Graded on a pass-fail basis.

4952* Music in the School Curriculum. Aims, content and motivation of the music education program in elementary and secondary schools from the standpoint of the classroom teacher, music specialist and administrator.

4962* Music Education Seminar. Research into latest developments of public school choral and instrumental music.

4972 Twentieth Century Music Theory and Literature. Prerequisites: 2563, 3763. Melodic, harmonic and rhythmic techniques in 20th century music.

4990* Selected Studies in Music and Music Education. 1-3 credits, maximum 8. Short-term area studies in music and music education.

4993 Senior Honors Project. Prerequisites: departmental invitation, senior standing. Honors Program participation. A guided program in musical research, music composition, or music performance, ending with an honors project under the direction of a faculty member with a second faculty member to complete an examining committee. Required for graduation with departmental honors in music.

5004* Final Degree Project. Preparation of a recital of significant repertoire to be conducted or played in public performance, depending upon the student's degree track. Submission of a formal paper that is a formal interpretive analysis of each work.

5113* Introduction to Graduate Studies in Music. Prerequisite: admission to Master of Music program. Understanding of the resources available for research in the field of music. Examination of the types of research materials needed for classes in the Master of Music degree program, as well as providing the groundwork for success in the professional world as a music educator and performer.

5480* Lessons in Applied Music (Minor Field). 1-2 credits, maximum 4. Prerequisite: bachelor's degree or equivalent performance level, in applied major field.

5490* Lessons in Applied Music (Major Field). 1-2 credits, maximum 8. Prerequisite: bachelor’s degree or equivalent performance level, in applied major field. Private Lessons.

5512* Advanced Studies in Music Literature and Pedagogy I. Prerequisite: 3753, 3763 or equivalent. Techniques of successful programming, teaching and performance of ensemble literature through a survey of repertoire appropriate to the student’s chosen medium.

5522* Advanced Studies in Music Literature and Pedagogy II. Prerequisite: 3753, 3763 or equivalent. A continuation of 5512, with emphasis upon music of the 20th century and its attendant specialized performance techniques.

5583* World Music. Survey of the richly diverse music of non-Western cultures emphasizing traditional musical practices prior to contact with Western media. Historical recordings supplemented by video tapes. Knowledge of Western classical music notation helpful. Taught in conjunction with 3583.
Natural Science (NATS)

5050  Report. 1-2 credits. maximum 2. Prerequisite: enrollment in program leading to M.S. in natural science. Guidance in reading and research required for M.S. in natural science degree.

5990  Topics in Natural and Applied Sciences. 1-3 credits, maximum 9. Prerequisite: graduate standing. Special topics in the natural and applied sciences for students interested in topics not normally covered in existing course work.

Nutritional Sciences (NSCI)

2111  Professional Careers in Nutritional Sciences. Career opportunities in dietetics and foods and nutrition. Roles and responsibilities of professional sciences professionals. Routes to professional memberships and current issues in professionalism.

2114  (N)Principles of Human Nutrition. Functions of the nutrients in human life processes. Nutrient relationship to health as a basis for food choices. Open to all University students.

2850  Special Topics in Nutritional Sciences. 1-3 credits, maximum 4. Study of specific consumer education issues or topics in nutritional sciences.

3133  Science of Food Preparation. Lab 3. Prerequisites: HRAD 1114, organic chemistry. Application of scientific principles to food preparation.

3213  Management in Hospitality and Food Service Systems. Prerequisite: a course in economics. Function and methods of management as related to the hospitality and food service industries.

3223  Nutrition Across the Life Span. Prerequisite: 2114 or equivalent. Nutritional needs and dietary concerns of individuals from conception through old age.

3440  Nutritional Sciences Preprofessional Experience. 1-3 hours, maximum 3. Supervised work experience in one or more of the following: college and university food service, health care facilities, and food processing plants.

3543  I, (S)Food and the Human Environment. Impact of the various factors which affect food availability, production, processing, distribution and consumption of food in the world. Challenges and solutions to the world food crisis.

3553  Purchasing in Hospitality and Food Service Systems. Prerequisite: 3133 or concurrent enrollment. Procurement of food and non-food materials in hospitality and related industries.


4013  Experimental Foods. Lab 6. Prerequisite: 3133 or consent of instructor. Investigations in physical, chemical and sensory qualities of foods under experimental conditions. Development of an individual research project.

4023  Nutrition and Health Issues. Prerequisites: 2114, 3223. Analysis of the role of specific nutrients in health maintenance and in prevention of chronic disease. Communication of nutrition information to the public.

4323  Human Nutrition and Metabolism. Prerequisites: 2114 or equivalent, organic chemistry, physiology. Digestion, absorption and metabolism of nutrients; functions and health implications in the human organism.

4333  Food, Beverage and Labor Cost Controls. Prerequisites: ACCT 2203, junior standing. Menu analysis and food/beverage/labor cost controls associated with hospitality industry operations.

4365  Quantity Food Production Management. Lab 5. Prerequisites: HRAD 2125, HRAD or NSCI 3553 and a course in accounting or mathematics or consent of instructor. Organizing, purchasing, costing, preparation and service of food in a quantifiable food production setting.

4373  Creative Teaching of Nutrition. Prerequisites: 2114, 3223 or concurrent enrollment. Analyses of various methods, techniques, resources and evaluation for nutrition education. Experimental component required.

4573  Food Systems Administration. Lab 3. Prerequisites: HRAD 3553, 4365. Management and integration of financial, human, physical, food and other material resources in various settings.

4643  Critical Issues in Nutrition and Healthcare. Prerequisite: senior standing. Integration of the body of knowledge of nutrition and healthcare through examination of critical issues.

4733  Community Nutrition. Prerequisites: 2114, 3223 and an educational methods course. Application of nutrition, education and communication principles to community nutrition programs and services. Field work required.

4850  Special Unit Studies in Nutritional Sciences. 1-3 credits, maximum 6. Special units of study in nutritional sciences.

4853  Medical Nutrition Therapy I. Lab 2. Prerequisites: 3812, 4323 or concurrent enrollment in one course in biochemistry or consent of instructor. Physiological and metabolic bases for dietary modifications in disease states. Interpretation of laboratory data as it applies to nutritional care.

4863  Medical Nutrition Therapy II. Lab 2. Prerequisite: 4853. A continuation of 4853.

4900  Honors Creative Component. 1-3 credits maximum 3. Prerequisites: College of Human Environmental Sciences Honors Program participation, senior standing. Guided creative component for students completing requirement for College Honors in College of Human Environmental Sciences. Thesis, creative project of report under the direction of a faculty member in the major area, with second faculty reader and oral examination.

5000  Research in Nutritional Sciences. 1-6 credits, maximum 6. Prerequisite: consent of adviser. Individual research and thesis that will fulfill the requirements for the master's degree.

5012  Public Policy Development in Food, Nutrition and Related Programs. Rationale underlying selected governmental programs in food and nutrition and other home economic areas and assessment of the effectiveness the programs.

5123  Research Developments in Nutritional Sciences. Basic components of the research process and application of research method to nutritional sciences.
Contemporary Issues in Dietetics. 1-2 credits, maximum 4. Prerequisite: consent of instructor. Advanced study of the magnitude, causes, and nature of hunger and undernutrition in low income countries; emphasis on programs, policies and planning directed toward alleviating hunger.

Nutritional Assessment. Prerequisites: 3223, 4323, or equivalent. Dietary, physical, and biochemical assessment techniques and their application to the human being of metabolic processes which involve essential dietary components.

International Nutrition and World Hunger. Prerequisite: consent of instructor. Advanced study of the magnitude, causes, and nature of hunger and undernutrition in low income countries; emphasis on programs, policies and planning directed toward alleviating hunger.

Quality of Work Life in Food Service Organizations. Prerequisite: one course in personnel management. Analysis of administrative problems in food service organizations. Focus on quality of work life assessment.

Theory, Research and Practice of Nutrition Education. Prerequisites: 4373 or equivalent. Contemporary approaches to methods in nutrition education. Focus on various learning and behavior change theories and application in nutrition education.

Advanced Medical Nutrition Therapy. Prerequisites: admission to dietetic internship or consent of instructor. Focus on interrelationships of quality gical and metabolic bases for nutritional support in disease.

Advanced Food Conservation and Processing. 2 credits, maximum 2. Lab 3. Prerequisite: 4013. Recent advances in food processing in relation to quality of product and conservation of food nutrients.

Manpower Management in Health Care and Related Industries. Lab 3. Prerequisite: 3223, 4573, or consent of instructor. Management of human resources in health care and related industries.

Community Diets. Prerequisites: 4373 or equivalent. Analysis of the impact of political, legislative, economic and cultural diversity factors on dietetic practice in public health and other community nutrition programs.

Experimental Methods in Nutritional Sciences. Prerequisites: a course in biochemistry, one course in statistics, a graduate course in food or nutrition. Experimental design for research in food and nutrition based on analytical laboratory techniques and other research methodology.

Management in Health Care Systems. Prerequisite: 4365, 4573 or consent of instructor. Total quality management for nutrition and food services in health care and related industries. Basics, systems and tools for monitoring and evaluating quality in nutrition and food service departments.

Special Topics in Nutritional Sciences. 1-3 credits, maximum 4. Prerequisite: graduate standing. Specialized workshops in nutrition, food science or food service administration.


Seminar in Nutritional Sciences. 1 credit, maximum 2. Prerequisite: for M.S. students. Individual and group seminars on current issues and research in nutritional sciences.

Doctoral Thesis. 1-12 credits, maximum 30. Prerequisite: consent of major professor.

Critical Analysis of Current Issues in Nutrition. Prerequisite: 5463 or consent of instructor. Current issues in human nutrition with emphasis on interrelationships of nutrients in metabolism and their impact on health.

Micronutrients in Human Nutrition. Prerequisite: 5463 or consent of instructor. In depth study of vitamins and minerals and their interrelationships in metabolism.

Critical Analysis of Current Issues in Food Service Administration. Prerequisites: 5530, 5673. Current issues in food service administration with emphasis on total quality management, robotics, solid waste management and research needs.

Independent Study in Nutritional Sciences. 1-3 credits, maximum 6. In-depth analysis of research issues in nutritional sciences.

Advanced Studies in Nutritional Sciences. 1 credit, advanced level. Critical evaluation of research in nutritional sciences. Individual and group seminars on selected topics.

Analysis and Assessment of Training Needs. Techniques and procedures used in determining needs for, and content of instructional programs. Emphasizes needs-assessment techniques and methods for identifying and analyzing the knowledge, skills and competencies required for satisfactory job performance. Procedures for translating such information into instructional programs. No credit for students with credit in TIED 4344.

Introduction to Career Education. Current and prospective teachers introduced to the fundamental concepts and operational practices of career education. Historical development, needs assessment, goals, implementation strategies, evaluation, developmental concepts, curriculum planning and articulation.

Seminar in Teacher Education. Procedures for gaining admission to Teacher Education and student teaching. Requirements for certification and graduation, and course planning to meet those requirements. Documentation and completion of 45 clock hours of observations in various school settings. Graded on a pass-fail basis.

Occupational Education Workshop. 1-3 credits, maximum 6. Professional workshops of various topics and lengths. Focus on a particular topic from such areas as the development, use and evaluation of instructional methods and materials.

Methods of Teaching Occupational Education. Lab 2. Applications of teaching and learning principles. Instructional planning and delivery strategies available to the instructor, including shop and laboratory instruction, indi- vidualized and competency-based instruction and the use of instructional technology. Laboratory component involves course participants in micro-teaching and other actual situations. No credit for students with credit in TIED 4103.

Thesis or Report. Lab 2. Overview of MS-DOS microcomputer applications in workplace education, including selection of hardware and software, spreadsheets, authoring systems, Internet and other on-line databases, and multimedia applications. Same course as BS PR 4213.

4223* Program Planning and Development in Occupational Education. Planning and designing programs for the development of human resources. Program goals and objectives, curriculum, facilities, teaching-learning theories, materials development, program resources and program and instructional evaluation.

4333* (I)International Occupational Education. Comparison and analysis of international occupations, materials development, program resources and curriculum, facilities, teaching-learning theories, signed programs for the development of human resources. Program goals and objectives, curriculum, facilities, teaching-learning theories, materials development, program resources and program and instructional evaluation.

4470 Teaching Practicum in Occupational Education. 1-12 credits, maximum 12. Prerequisite: full admission to Teacher Education. Organized teaching experiences under the guidance and direction of a local school cooperating teacher and university teacher educator. Participant assigned to a cooperating teacher with responsibility for planning, implementing and evaluating the classroom, laboratory or shop. Graded on a pass-fail basis.

5000* Thesis or Report. 2-10 credits, maximum 10. Students studying for a master's degree may enroll for a total of two credit hours if they write a report or six hours if they write a thesis. Students working on a specialist's degree may earn a maximum of 10 hours credit.

5010* Seminar. 1-3 credits, maximum 6. Graduate student seminars focusing on current and critical issues and common problems relevant to occupational education.

5113* Principles of Occupational Education. Underlying principles and evolving concepts in occupational and adult education. Critical analysis of educational programs and service areas and the resulting implications for leadership personnel at all levels of program responsibility.

5133* International Workplace Education. Prerequisite: graduate standing. Ideas, practices and systems of occupational education in other countries compared with contemporary practices in the United States to provide a basis for an enlarged, critical view of technical education.

5153* Curriculum Planning in Occupational Education. Principles and procedures for curriculum planning, development and management in occupational and adult education with analyses of current trends and practices and their implications for program quality.

5313* History and Organization of Vocational and Technical Education. Prerequisite: graduate standing. Social, political, and economic forces acting upon vocational and technical education studied in depth for leadership development.

5333* Administration and Supervision of Local Occupational Education Programs. The duties of administrative and supervisory personnel responsible for the development, coordination and promotion of occupational education programs.

5340* Special Problems in Occupational Education. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Directed independent study of special topics involving assigned reading, research, field work or a combination of these.

5443* Interpreting Research in Occupational Education. Seminar on the methods of research, review, synthesis and interpretation with application to particular fields of occupational and adult education.

5460* Modern Technology in Occupational Education. 1-6 credits, maximum 6. Technological developments in specialized occupational areas examined and analyzed for educational curriculum and program implications.

5553* Occupational Education for Students with Special Needs. Techniques and procedures by which occupational education may serve individuals with special needs. Field experiences an integral part of the course.

5720* Workshop. 1-3 credits, maximum 10. Professional workshops of various topics and lengths. Each workshop designed to meet unique or special needs of individuals concerned with adult education and human resource development.

5880* Internship in Occupational Education. 3-6 credits, maximum 6. Prerequisite: consent of instructor. Supervised experience working in business, industry, human service, or education settings.

6000* Doctoral Dissertation. 2-10 credits, maximum 15. Required of all candidates for the Doctor of Education degree in adult education and human resource development.

6103* Philosophy of Occupational Education. Alternative perspectives for developing a philosophical position in occupational and adult education.

6110* Graduate Reading in Occupational Education. 1-6 credits, maximum 6. Prerequisites: graduate standing and consent of supervising professor. Supervised readings of significant literature not included in regularly scheduled courses.

6113* Teacher Education and Personnel Development for Occupational Education. Prerequisite: 6103. Required of all candidates for the Doctor of Education degree in adult education and human resource development.

6333* Strategic Planning and Policy Development. Theoretical and practical aspects of the conceptual and implementation processes. Articulation among various public and private sector organizations.

6343* Financing Vocational-Technical Education. Prerequisite: graduate standing. Development of conceptual and legal bases for funding public vocational-technical education programs. Sources of funds, distribution strategies, local, state and federal accountability requirements, and fraud and abuse of funds.

6353* Educational Futures. Prerequisite: admission to OSU doctoral program. An examination and discussion of demographic, social, economic, educational and technological trends and conditions having an impact on the nature and role of education and educational institutions.

6871* Doctoral Seminar: Level 1. Orientation to doctoral program in OCED. May be taken prior to program application; required of all applicants.

6880* Doctoral Internship in Occupational Education. 1-8 credits, maximum 8. Prerequisite: consent of instructor. Directed field experiences related to the participant's area of concentration. Practice and testing ideas, theories and concepts learned in graduate study.


Petroleum Technology (PET)

1234 Petroleum Fluid Properties. Lab 2. Prerequisites: MATH 1513 or 1715; CHEM 1215 or 1314. Chemical and physical properties of petroleum, petroleum products, natural gas, coal and drilling fluids. Introduction to reservoir engineering.

Philosophy (PHIL)

1013 (H)Philosophical Classics. Basic works by great thinkers, including Plato, Descartes and Hume.

1213 (H)Philosophies of Life. Introductory ethics and social philosophy. Moral decision-making, the good life, social values, freedom and responsibility.

1313 (A)Logic and Critical Thinking. Formal and informal reasoning, common fallacies, definitions and language functions, patterns of explanation. Practical criticism and development of everyday arguments.

2113 (H)Introduction to Philosophy. Selected philosophical problems: the nature of reality, knowledge, value, social ideals and religion.


3113* (H)Ancient and Medieval Philosophy. Major systems of Western thought from the Greeks to 15th century Europe. Emphasis on Plato, Aristotle, Augustine and Aquinas.

3213* (H)Modern Philosophy. Major philosophers and problems in Western thought from the 16th through the 19th century. Emphasis on Descartes, Hume and Kant.

3313 (H)19th and 20th Century Philosophy. Major philosophers and problems in Western thought from Hegel to the present.
3413 Philosophy. Contemporary and classical views on the nature of moral judgements, moral value, relativity and objectivity, freedom and responsibility.


3713* (H)Philosophy of Education. Classical and contemporary philosophers who have systematically developed their ideas about education, including Plato, Aristotle, Rousseau, Locke and Dewey.

3803 (H)Business Ethics. Ethical issues in business, such as employer-employee duties and loyalties, advertising uses, preferential treatment practices. Analytic grounding in basic theories of ethics.

3813* (H)Recent American Philosophy. Dominant trends in American philosophy during the last 100 years, with emphasis on pragmatism.

3823 (H)Engineering Ethics. Philosophical analysis of moral issues in engineering practice, such as whistleblowing, conflicts of interest and product liability. Professional codes of ethics.

3833* (H)Biomedical Ethics. Moral problems brought about by recent developments in scientific research and medical technology. Abortion, euthanasia, genetic engineering, and human experimentation.

3843 (H)Philosophy of Law. Prerequisite: upper-division standing. Philosophical issues related to U.S. law. The relationship between law and morality, the nature and functions of law, and grounds of liability.

3913* (H)Existentialism. Selected writings and themes in the development of existentialism and related intellectual movements. Subjectivity, phenomenological description, hermeneutics, freedom and value; and such writers as Kierkegaard, Nietzsche, Heidegger, Sartre, Marcel and Buber.

3923 (H)Contemporary Issues in Philosophy. Selected current controversies and recent trends in philosophy.

3943* (H)Asian Philosophy. Three main streams of Asian thought: Indian, Chinese and Buddhist. How various thinkers in the three traditions have dealt with questions of being and becoming, knowledge, ethics and society.

4003* Mathematical Logic and Computability. Prerequisites: 3000 or 3003 or MATH 3613 or consent of instructor. The basic metatheorems of first order logic: soundness, completeness, compactness, Lowenheim-Skolem theorem, undecidability of first order logic, Gödel's incompleteness theorem. Enumerability, diagonalization, formal systems, standard and non-standard models, G"odel numbering, Turing machines, recursive functions, and evidence for Church's thesis. Same course as CS 4003 and MATH 4003.

4013* (H)Perspectives on Death and Dying. Issues that arise as individuals confront the fact of mortality. Dying patients, the ethical issues of euthanasia and suicide, the process of grief, death in literature and the arts, and philosophical and religious views on immortality.

4113* (H)Philosophy of Art and Literature. Nature of aesthetic objects and experiences; form, meaning and value in the arts; the function of art in society; criteria of criticism of the arts.


4453* (H)Philosophy in Literature. Selected literary works examined for philosophical ideas and themes. Attention to the interrelation of form and content. Thematic approach.

4713* (H)Philosophy of Science. Philosophical issues related to science and its role in society. Topics include science and common sense, laws and theories, causality, nature of scientific progress.

4733* (H)Philosophy of Biology. Selected philosophical topics, such as Darwinism and other theories of evolution, physical reductionism, and issues of genetic engineering.

4983* Metaphysics and Epistemology. Prerequisite: 12 credit hours of philosophy. The study of the fundamental nature of reality and human knowledge of it.

4990* Special Studies in Philosophy. 1-3 credits, maximum 10. Selected philosophical topics or works.

4991* Contemporary Philosophy Research. Prerequisites: upper-division standing, at least 12 hours in philosophy completed. Study of leading edge research in philosophy through presentation and discussion of current philosophy journal articles with faculty.

4993 Senior Honors Thesis. Prerequisites: departmental invitation, senior standing, Honors Program participation. A guided reading and research program ending with an honors thesis under the direction of a faculty member, with second faculty reader and oral examination. Required for graduation with departmental honors in philosophy.

5000* Thesis in Philosophy. 1-6 credits, maximum 6. Supervised individual work on a thesis for a master's degree.

5210* Seminar on a Major Philosopher. 3 credits, maximum 9. Prerequisite: three courses in philosophy. The writings of a major philosopher and related material.

5310* Seminar on a Field of Philosophy. 3 credits, maximum 9. Prerequisite: three courses in philosophy. Selected topics in one field of philosophy.


5610* Philosophical Issues in Education. 2-3 credits, maximum 3. Contemporary issues in educational theory and practice. The relation of education to political thought, religion, public law and culture.

5713* Contemporary Philosophies of Education. Analysis of contemporary educational philosophies, with attention to recommended aims, curricula and methods.

5910* Research Problems in Philosophy. 1-3 credits, maximum 10. Prerequisite: consent of instructor and department head. Individual or group research on specific philosophical problems.

**Physics (PHYS)**

1014 (N)Descriptive Physics. A survey course presenting the basic concepts and principles of physics with a minimum of mathematics. Motion, waves, temperature, electricity, magnetism, optics, atomic structure, and nuclear energy. No credit for students with credit in 1114.

1114 (L,N)General Physics. Lab 2. Prerequisite: high school algebra and trigonometry, or MATH 1483 or MATH 1715. Algebra-based introductory course covering the basic concepts of physics. Practical examples of the role of physics in other disciplines. Newtonian mechanics, fluids, heat, thermodynamics, waves, sound.

1214 (L,N)General Physics. Lab 2. Prerequisite: 991144. Continuation of 1114; electricity, magnetism, optics, quantum physics, atomic and nuclear structure.

1313 (L,N)Inquiry-based Physics. Lab 3. Properties of matter, motion, light and color, electrical circuits and energy conservation. Recommended for elementary education majors as model course to learn and teach science.


2414 General Physics for Science Majors II. Lab 2. Prerequisite: 2014 or 2314. Continuation of 2314. Electrostatics, electric fields and circuits, circuits, waves, physical optics, modern physics, nuclear physics, and thermodynamics.

3013* Mechanics I. Prerequisites: 2114 or equivalent, and MATH 2233 or concurrent enrollment. Mechanics of particles, systems of particles and rigid bodies.
3113* Heat. Prerequisites: 1214 or equivalent and MATH 2155 or concurrent enrollment. Thermodynamics; heat transfer, elementary theory of specific heat and the three laws of thermodynamics.

3213* Optics. Prerequisites: 2114 or 2414 and 3513, of consent of the instructor. Geometrical optics; interference, diffraction, dispersion, absorption and polarization of light.

3313* Modern Physics for Engineers. Prerequisite: 2114 or equivalent. Emphasis on nuclear, molecular and solid state physics with engineering applications.

3222* Modern Laboratory Methods I. Lab 6. Prerequisites: 2014, 2114. Introduction to electric and electronic measurements and computer applications in experimental control, data collection and laboratory computation. Experiments on test instruments, integrated electronics, signal processing, computer interfacing and data acquisition.

3513* Mathematical Physics. Prerequisites: 1214, 2114 or 2414 and MATH 2155. Physical applications of vectors, vector calculus and differential equations. Fourier analysis. Orbit geometry, coordinate systems and transformation of coordinates. Matrices and determinants.

3622* Modern Laboratory Methods II. Lab 6. Prerequisites: 2014, 2114. Introduction to the operating principles and applications of modern physical methods used in research. Laboratory experiments with lasers, wave propagation, thermometry, radiation detection, optical interferometry and spectroscopy.

3713 Modern Physics I. Prerequisite: 2114. Atomic physics, special theory of relativity, and introduction to solid state and nuclear physics.

4003* Computer Simulation Methods in Physics. Prerequisites: 3013, 3113, 3313 or consent of instructor. Introduction to computer simulation methods used in the physical sciences. Linear systems, nonlinear systems, molecular dynamics, Monte Carlo methods, cellular automata, simple quantum systems. Some knowledge of either C, FORTRAN, Pascal, or BASIC required.

4019* Special Problems. 1-3 credits, maximum 9. Prerequisite: consent of instructor. Individual laboratory work of an advanced nature.

4113* Electricity and Magnetism. Prerequisites: 2114 and MATH 2233, or their equivalents. Electromagnetic fields; magnetic fields of steady currents, induced EMFs, Maxwell's equations and introduction to electromagnetic wave theory. Vector analysis used.

4213 Introduction to Nuclear and Particle Physics. Prerequisites: 8 hours of physics and 8 hours of chemistry. For nonphysics majors. Fundamentals of nuclear physics with applications to chemistry, engineering and biology.

4263* Introduction to Solid State Physics. Structure, specific heat, dielectric properties, lattice vibrations, free electron theory, band structure and superconductivity of solids.

4413* Modern Physics II. Prerequisites: 3013 and 3713. Atomic and X-ray spectra; one-dimensional Schrödinger equation; nuclear structure; introduction to statistical mechanics and elementary quantum statistics.

4423* Mechanics II. Prerequisite: 3013. Coupled oscillators, propagation of waves in discrete and continuous media, mechanics of discrete and continuous media and acoustics.

4513* Introductory Quantum Mechanics. Prerequisite: 3713. Uncertainty principle, setting up Schrödinger equation (time dependent as well as time independent) and solution for linear oscillator, hydrogen atom, periodic and other potentials.

4663* Radioactivity and Nuclear Physics. Prerequisite: 3313. Natural and artificial radioactivity, decay laws; absorption, detection and measurement of radiations; nuclear transformations.

4712* Senior Project. Lab 6. Advanced individual experimental projects. Project proposal, formal laboratory report, and oral presentation are required.

4813* Electromagnetic Radiation. Prerequisites: 3213, 3513, 4113. Electromagnetic wave theory; reflection and refraction of electromagnetic waves; resonant cavities, wave guides, fiber propagation of electromagnetic waves; radiation sources; relativistic description of electromagnetic fields.

4993 Senior Honors Thesis. Prerequisites: departmental invitation, senior standing, Honors Program participation. A guided reading and research program ending with an honors thesis under the direction of a faculty member, with second faculty reader and oral examination. Required for graduation with departmental honors in physics.

5000* Master's Thesis Research or Report. 1-9 credits, maximum 9. Prerequisite: consent of major professor. Thesis research or report for master's degree.

5110 Seminar. 1-5 credits, maximum 20. Prerequisite: graduate standing in physics. Special topics in physics.


5133* Theory of Spectra. Line spectra, hyperfine structure, Lamb shift, band spectra, NMR spectra and ESR spectra.


5213* Statistical Mechanics. Prerequisites: 5113 and 5613 or consent of instructor. Classical and quantum mechanical distribution functions for independent particles; interacting classical and quantum systems, superfluidity, phase transitions and critical phenomena, approximation methods.

5263* Particle Physics. Prerequisites: 5613. Nuclear forces, structure of nuclei and nuclear models.


5350* Special Problems. 1-3 credits, maximum 3. Prerequisite: graduate standing in physics. Special problems of experimental or theoretical nature. Largely individual work with written report required.

5353* Membrane Physiology. Prerequisites: 1214 and BIOL 3014 or BIOL 4113 or CHEM 3354 or PHYS 3313. Application of biophysical, biochemical and mathematical methods to the study of the structure and function of membranes and membrane components, kinetic measurements, spectroscopic techniques and diffraction techniques. Application of these illustrated with current research problems. Same course as MICRO 5223.

5413* Classical Mechanics. Prerequisite: 4423 or consent of instructor. Generalized coordinates and advanced dynamics; coupled systems, wave motion; theory of elasticity.

5453* Methods of Theoretical Physics. Prerequisite: 3513. Introduction to the various methods and techniques used in theoretical physics.

5532* Quantum Mechanics I. Prerequisite: 5453. Postulates of quantum mechanics. Operators, commutation relations, eigenfunctions. Schroedinger, Heisenberg and interaction formalisms, angular momentum and central field problems; nondegenerate perturbation theory.

5663* Solid State Physics I. Prerequisite: 4513. Crystal structure, cohesive energy of ionic crystals and metals, specific heats, free electron theory of metals, band theory. Brillouin zones, insulators and alloys; magnetic properties, optical properties and thermal and electrical conductivity of solids.

5713* Solid State Physics II. Prerequisite: 5663 or equivalent. Symmetry, dielectric properties, ferroelectrics, magnetic properties, mechanical properties and defects of solids.

5913* Selected Topics in Astrophysics. Recommended: ASTR 3023. Derivation of fundamental relations and application to problems in astronomical spectroscopy, stellar atmospheres, stellar interiors, interstellar matter and radio astronomy.

5960* Problems in Chemical Physics. 3-6 credits, maximum 6. Prerequisite: consent of instructor. Intermolecular forces, interaction of radiation with matter in bulk form, dielectric properties of matter, polymer physics and quantum theory of biopolymers.
6820* Advanced Graduate Seminar. 1-3 credits, maximum 9. Prerequisite: consent of instructor. Special topics of an advanced nature in physics.

6821* Advanced Theory of Solids. Prerequisite: 5613. Many-body techniques, transport processes, band theoretical techniques, superconductivity, dynamics of electrons in a magnetic field, and alloys.

6822* Group Theory for Physics. Prerequisite: 5453. Group theory and imperfections in crystalline materials, coordination and d
color centers.

6823* Semiconductors I. Prerequisites: 5113, 5613 5663. The first part of a survey of the physics of semiconductors. Bonding and structure, crystal growth, epitaxial growth, band theory, phonons, photons, defects, intrinsic and extrinsic statistics, trapping and recombination.

6831* Quantum Mechanics II. Prerequisite: 5613. Scattering theory, many-particle quantum mechanics and application to atomic and molecular systems; degenerate and time-dependent perturbation theory.

6832* Semiconductors II. Prerequisite: 6243. The second part of the semiconductors sequence. Transport phenomena, junctions, devices, heterostructures and optical properties.

6833* Modern Optics. Prerequisites: 5313, 5163, 5613. Non-linear optics, higher-order susceptibilities; four-wave mixing; quantum optics and photon statistics, Maxwell-Bloch equations.

6834* Advanced Topics in Solid State Physics. Prerequisite: 5663 or equivalent. Interaction of radiation and matter, neutron scattering, phase transitions, magnetic resonance and cooperative phenomena.

6835* Advanced Nuclear and Particle Physics. Prerequisite: 5663. Nuclear and elementary particle interactions, resonances, and models; relativistic quantum mechanics and quantum field theory.

671* Classical Theory of Fields. Prerequisite: 5113 Radiation theory, waveguides, scattering and dispersion relations, relativity.

6803* Photonics I: Advanced Optics. Lab 9. Prerequisite: ECEN 3213 or 3813. Advanced optics including spectral and time characteristics of detectors, characteristics of lasers, time, frequency and spatial parameters of laser emission, interferometric techniques, and nonlinear effects such as two-photon absorption and second and third harmonic generations. Ultrafast laser pulses. Same course as CHEM 6803 and ECEN 6803.

6811* Photonics II: THz Photonics and THz-TDS. Lab 3. Prerequisite: 6803. THz Photonics and THz time-domain spectroscopy (THz-TDS). Concepts and techniques of driving electronic devices with ultrashort laser pulses to generate and detect freely propagating pulses of THz electromagnetic radiation using several operational research systems. Same course as CHEM 6811 and ECEN 6811.


6831* Photonics II: Spectroscopy II. Lab 3. Prerequisite: 6803. Advanced spectroscopic instruments and methods used for investigations of semi-conductors and solid state materials. Stimulated emission characterized both in wavelength and in time. Time-resolved fluorescence measurements. Multiphotonic excitations. Fast measurement techniques including subnanosecond detectors, picosecond streak cameras, and ultrafast four-wave mixing and correlation techniques. Time-dependent photocurrent measurements. Same course as CHEM 6831 and ECEN 6831.

6841* Photonics III: Microscopy I. Lab 3. Prerequisite: CHEM 3553 or consent of instructor. The theory and imaging of solid surfaces. Basics of scanning probe microscopy (SPM). Contact and non-contact atomic force microscopy (AFM). Scanning tunneling microscopy (STM) in air. Same course as CHEM 6841 and ECEN 6841.

6851* Photonics III: Microscopy II. Lab 3. Prerequisite: 3553 or consent of instructor. Advanced techniques of SPM. Magnetic force microscopy, Kelvin force microscopy, STM in vacuum. Characterization of materials with SPM. Nanolithography with SPM. Device manufacturing and analysis. Same course as CHEM 6851 and ECEN 6851.

6861* Photonics III: Microscopy III and Image Processing. Lab 3. Prerequisite: ECEN 5793. Digital image processing, including projects. Image acquisition and display, image enhancement, geometric operations, linear and nonlinear filtering, image restoration, edge detection, image analysis, morphology, segmentation, recognition, and coding/compression. Same course as CHEM 6861 and ECEN 6861.


6891* Photonics IV: Semiconductor Synthesis and Devices I1. Lab 3. Prerequisite: 6803. Processing, fabrication and characterization of semiconductor optoelectronic devices in class 100/10000 cleanrooms. Cleanroom operation including general procedure for material processing and device fabrication. Device processing using a variety of processing such as mask aligner, vacuum evaporators and rapid thermal annealer. Testing using optical and electrical testing apparatus such as I-V, C-V, Hall, and optical spectral measurement systems. Same course as CHEM 6891 and ECEN 6891.

Plant Pathology (PLP)

3344 Plant Pathology, Lab 4. Prerequisite: BIOL 1403. Concepts of disease development, spread and control of fungal, bacterial, nema
tode and environmental diseases.

3553 Fungi: Myths and More. Lab 2. Prerequi
tive: Biology. Colorful folklore and myths of fungi and the role of fungi in the ecosystem and human affairs as diseases of plants, animals and humans. Laboratory instruction on mushroom structures, mechanisms of dispersal and genetic recombinations. Undergraduate research component on isolation and growth of mushrooms and other fungi.

4400 Undergraduate Research. 1-3 credits, maxi
mum 3. Prerequisite: consent of instructor. Undergraduate research projects in plant pathology.

4922* Applications of Biotechnology in Arthropod and Pathogen Control. Prerequisites: introductory biology and chemistry or equiva
tent. Applications of biotechnology in control
ing arthropod pests of plants and animals and plant pathogens. Introduction to underlying technology, products being deployed, their ef
cfectiveness and associated problems or concerns resulting from their use. Same course as ENTO 4922.

5000* Research. 1-6 credits, maximum 6. Research for the M.S. degree.

5004* Plant Hematology. Lab 3. Prerequisite: 3344 or concurrent enrollment. General morphology, taxonomy and biometrics of parasitic and plant parasitic nematodes. Plant parasitic nema
tode assay techniques, subfamily identification, symptomology, pathogenicity and control.

5012* Plant Virology Laboratory. Lab 4. Prerequi
tive: previous or concurrent enrollment in 5013. Methods of investigating plant viruses.

5013 Plant Virology. Prerequisites: 3344 or equiva
tent; one course in biochemistry or physiology. Transmission, characterization, differentiation, replication and control of plant viruses; discussion of current literature.

5043* Plant Pathology. Lab 4. Prerequisite: BIOL 1403. Principles of plant pathology; disease development, spread and control of fungal, bacterial, viral, nematode and environmental diseases. For advanced, special, and non-plant pathology graduate students.

5104* Mycology. Lab 4. Prerequisite: graduate stand
ing. A systematic study of the Fungi, with emphasis on taxonomy, comparative morphology and fungal biology. Taught in the Department of Plant Pathology. Same course as BOT 5104.

5304* Photobacteriology. Lab 3. Prerequisite: 3344. Bacteria as plant pathogens, with examination of the taxonomy, genetics, ecology, physiology, host-parasite interaction and control of phylobacteria.

5413 Plant Disease Epidemiology. Lab 3. Prerequi
tive: 3344 or 5043. Introduction to meth
dology and technical equipment used in epi
demiological research and application of epidemiological principles in plant disease con

5523 Integrated Management of Insect Pests and Pathogens. Prerequisites: 3344 and ENTO 2023 or equivalent or consent of instructor. Modern theory and practices for management of insect pests and pathogens in plant production systems, emphasizing an ecologically-based, integrated approach. Basic concepts of pest management, decision-making, cost/benefit analysis, and risk/benefit analysis. Same course as ENTO 5523.

5560* Problems in Plant Pathology. 1-5 credits, maximum 10. Prerequisite: consent of instructor.

5613* Host Plant Resistance. Lab 2. Prerequisites: 3344 and ENTO 2023 or equivalent and a general genetics course; or consent of instructor. Interactions of plants and the herbivorous insects and pathogenic micro-organisms that attack them. Development and deployment of multiple pest resistant cultivars in crop management systems. Same course as ENTO 5613.

5724* Physiology of Host-Pathogen Interactions. Lab 4. Prerequisites: 3344 and BIOL 3653. Physiology of the interactions between plants and pathogens. Mechanisms by which pathogens infect and by which plants resist infection.

5850* Plant Pathology Seminar. 1 credit maximum per semester. 2 credits for M.S. and 4 credits for Ph.D. required.

5860* Colloquium. 2 credits, maximum 2. Prerequisite: 3344. Concepts and principles of plant pathology through discussions of pertinent literature.

5870* Scientific Presentations. 1 credit, maximum 1. Prerequisite: consent of instructor. Preparation and delivery of scientific presentations including 50-minute seminars, 10-minute talks, and posters. Same course as ENTO 5870.

5992* Career Skills and Professionalism for Scientists. Prerequisite: graduate standing. For graduate students majoring in science-based fields, especially those nearing graduation. Skills needed for effective job application and interviewing, career development and advancement, communication with professional colleagues and the public, and personal professional development. Same course as ENTO 5992.

6000* Research. 1-12 credits, maximum 36. Research for the Ph.D. degree.

6102* Genetics of Plant Disease. Lab 4. Prerequisites: 3344 or equivalent and a course in general genetics. Genetics of host plants, plant pathogens and the interaction between the two. Flor's gene-for-gene hypothesis and its implications in breeding for disease resistance.

6303* Soilborne Diseases of Plants. Lab 3. Prerequisite: 3344. Soilborne diseases, their refection and importance, the pathogens involved, rhizoplane and rhizosphere influences, inoculum potential, specialization of pathogens, suppressive soil effects and disease management. Lecture and discussion sessions will emphasize in-depth understanding of problems and complexities associated with studies of soilborne pathogens.

Plant Science (PLNT)

1213 Principles of Crop Science. Production, management and improvement of modern agricultural crops. Structure and growth of crop plants relating to management strategies and adaption to varying abiotic and biotic factors. Importance of crop production to the producer and the consumer.

2013 Crop Production Laboratory. Lab 2. Prerequisite: 1213. Hands-on experiences with crop plants. Identification of crops in seed, seeding, mature stages; crop morphology, seed quality, grain grading, growth stages of crops.

2041 Career Orientation. Prerequisite: sophomore standing in the Department of Plant and Soil Sciences. Development and improvement of written and oral communicative skills; orientation to research and extension activities related to plant and soil sciences, and academic requirements and procedures. Graded on pass-fail basis.

3111 Weed Control Laboratory. Lab 2. Prerequisites: 1213 and 3112 (or concurrent enrollment). Identification of common weeds, principles and practices of herbicide application, and application equipment, handling and proper use of herbicides.

3112 Principles of Weed Control. Prerequisite: 1213. Weed control principles and practices included in cultural and chemical weed control. Current weed control practices in crops, rangeland and crop situations.

3213* Pasture Management and Forage Production. Prerequisites: 1213, SOIL 2124, and MATH 1513. Pasture systems, livestock management and forage crop production for maximum economical production of introduced forage species.

3554* (N)Plant Genetics and Biotechnology. Lab 2. Prerequisite: BIOL 1114. Basic principles dealing with the improvement of the major cereal crops. Principles and practices of herbicide application, and application equipment, handling and proper use of herbicides.

3781 Market Grain Technology. Lab 2. Prerequisite: 1213. Quality characteristics of grain for commercial use; identification of different market classes of grain, quality factors, and admixtures affecting the commercial grade; practice in grading grain using the federal grain standards.

3790 Seed and Plant Identification. 1 credit maximum. Lab 3. Prerequisite: 1213. Identification and classification of agronomically important crop and weed species from seed and from seedling, vegetative, flowering or mature plants.

4080 Professional Internship. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Internship must be at an approved agribusiness site: consent of a faculty member supervising the research. Supervised independent research results in appropriate topics.

4113* Advanced Weed Science. Prerequisites: 3111 and 3112. Integrated approach for weed management. Weed life cycles and biology, weed crop interferences, herbicide families and their characteristics, and finally a systematic and integrated weed management system. Methods of conducting and interpreting research results in appropriate topics.

4123* Crop Physiology. Prerequisites: 1213 and BOT 3463. Application of basic physiological concepts of growth and cultural management and underlying crop production: environmental and genetic effects on growth of crop plants. Plant ecosystems at the community level relative to optimum yields and quality.

4353* Plant Breeding. Prerequisite: 3554 or equivalent. Basic principles dealing with the improvement of plants through application of genetic principles.

4470* Problems and Special Study. 1-3 credits, maximum 12. Lab 1-3. Prerequisite: consent of the instructor. Problems in plant science selected from topics in range and turf, plant breeding and genetics, crop management and physiology, and weed control.

4571 Senior Seminar. Prerequisite: senior standing in plant and soil sciences. Career opportunities (talks and field trips): preparation of resumes and interviews. Graded on a pass-fail basis. Same course as RLEM 4571 and SOIL 4571.

4673* Grain Crops. Lab 2. Prerequisite: 1213. Production, distribution, classification, utilization and improvement of the major cereal crops.

4772* Oilseed, Pulse and Mucilage Crops. Prerequisite: 1213. Production, utilization and improvement of oilseed, pulse and mucilage crops with special emphasis on peanuts and soybeans.

4783* Cotton Production. Prerequisite: 1213. Production, utilization and improvement of cotton. Several other agronomic fiber crops briefly discussed.

5000* Master's Thesis. 1-6 credits. 6 maximum total credits under Plan II. 2 maximum total credits under Plan II. Prerequisite: consent of adviser. Research planned, conducted and reported in consultation with a major professor.

5020* Graduate Seminar. 1 credit maximum per semester 1 credit on M.S. program and 2 credits on a Ph.D. program required. Prerequisite: graduate standing. Philosophy of research, methods of research, interpretation of research.

5110* Problems and Special Study. 1-4 credits, maximum 6. Prerequisite: consent of instructor. Supervised study of special problems and topics not covered in other graduate courses.

5112* Herbicide Fate in the Environment. Prerequisite: 4112. Processes involved in the behavior and fate of herbicides in air, soil, and water. Reaction, movement and dissipation of herbicides in soil.

5230* Research. 1-4 credits, maximum 4. Prerequisite: consent of a faculty member supervising the research. Supervised independent research on selected topics.

5403* Physiological Action of Herbicides. Prerequisites: BOT 3463. The mode of action, uptake and translocation, and metabolism of herbicides in crops and weeds.

5414* Plant Breeding Theory, Methods and Strategies. Prerequisites: 3554, 4353 and STAT 5013, or consent of instructor. Development and application of statistical and genetic principles to breeding methodology of self- and cross-pollinated crops; emphasis on selection methods pertinent to plant improvement; examination of philosophies and strategies employed in private and public plant breeding programs.

5433* Biotechnology in Plant Improvement. Prerequisites: 3554, 4353, and BIOL 3014 or consent of instructor. Use of emerging technologies in cell biology and molecular genetics to study and manipulate plants. Emphasis on genetic systems which influence productivity and end-product utilization. The integration of biotechnology into plant breeding programs and issues concerning the release of genetically engineered organisms into the environment.

5443* Advanced Genetics. Prerequisites: 3554; BIOL 3653. Concepts of eukaryotic genetics with emphasis on classical, molecular and quantitative genetics.

5452* Cytogenetics. Prerequisite: 5443 or concurrent enrollment in BOT 5232. Behavior of chromosomes, cellular organelles and cytoplasm in relation to genetic behavior.

5803* International Agricultural Research Systems. Organization, management and budgeting of agricultural research systems with emphasis on developing countries. Analysis of research and training priorities, budgeting, staffing and management of projects.

6000* Doctoral Thesis. 1-6 credits, maximum 20. Requisite: consent of advisor. Independent research to be conducted and reported with the supervision of a major professor as partial requirement for the Ph.D. degree.

6010* Advanced Topics and Conference. 1-6 credits, maximum 12. Prerequisite: M.S. degree. Supervised study of advanced topics. A reading and conference course designed to acquaint the advanced student with fields not covered in other courses.

6410* Topics in Plant Breeding and Genetics. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Selected topics in the statistical experimental analysis of quantitative traits, evolutionary development of domesticated plants and animals, and techniques used in breeding crop plants.

---

Political Science (POLS)

1010 Studies in American Government. 1-2 credits. Maximum 2. Special study in American government to allow transfer students to fulfill general education requirements as established by Regents' policy.

1113 American Government. Organization, processes and functions of the national government of the United States. Satisfies, with HIST 1103 or 1483 or 1493, the State Regents requirement of six credit hours of American history and American government before graduation.


2033 Introduction to Public Administration. Public administration, including administration, administrative organization, decision-making, governmental public relations, and administrative responsibilities.

2113 (S) Comparative Politics. A comparative study of the political processes and institutions of contemporary societies. Introduction to the concepts and methods of comparative politics.

2993 Honors Tutorial in Political Science. Prerequisites: 1013, honors standing, and invitation by head of department. For the special needs of the sophomore-level honors student majoring in political science who wishes to study individualized topics at an accelerated pace in a tutorial format. After mastering basic principles in an area of interest the student will conduct independent research under close-faculty supervision and prepare a report or reports.

3003 (I,S) The Soviet Union: History, Society and Culture. A comprehensive view of the political, economic, technological, geographical and cultural spheres which are most relevant to the current situation. Accessible to beginning undergraduates. Same course as HIST 3003 and RUSS 3003.

3013* (S) International Relations. Analysis of the major concepts in international relations - power, sovereignty, self-help, cooperation, dependency, and introduction to the dominant theoretical approaches to its study realism, pluralism, Marxism and feminism.

3033* International Law. The nature and scope of public international law, with emphasis on problems related to the recognition of states and governments, jurisdiction over nationals and aliens, and state responsibility in cases of expropriation and revolutionary damage.

3043 Politics of International Trade and Development. Theory and practice of international trade and economics. The patterns of association between political and market-based processes among nation states. Emphasis on interactions among advanced industrial states, transnational phenomena, and opportunities and pitfalls in north-south relations.

3053 (I,S) Introduction to Central Asian Studies. A comprehensive view of newly-emerged Central Asian states examining the history, politics, economics, geography, and culture of Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan as reflected in their thoughts, religion, literature, and architecture, in the past, and the strategic importance of their natural wealth for the present and future. Same course as HIST 3053 and RUSS 3053.

3100 Political Science Internship. 1-6 credits, maximum 6. Prerequisite: consent of department. Internship education experience in a specific subfield in the discipline of political science.

3123* (I) Governments and Politics of the Former Soviet Bloc. Political processes, governmental institutions and public policies of the successor states of the former USSR and selected Eastern European countries in the post-communism era.

3133* (I) Politics of Anglo-American Democracies. Analysis of political processes in governmental institutions of the United Kingdom, Ireland, Canada, Australia, and New Zealand with comparisons to the United States.

3143* (I) Politics of Western Europe. Political processes and governmental institutions of continental Western European states, with emphasis on France, Germany and Italy.

3193 (I,S) Government and Politics in Latin America. Analysis of processes, institutions and contemporary trends in the politics of selected Latin American countries; political development, democratization, political role of the military, political economy and social movements.

3223* (I) Politics and Administration in East Asia. Political processes, governmental institutions and administration in China, Japan and Korea.


3243 Foreign Policies in the Former Soviet Bloc. The comparative foreign policies of the territories of the former “Eastern bloc” in the period following the revolutions of 1989-91. The resurgence of nationalism and the effects of defining and pursuing national self-interest on the foreign policies of Eastern European and former Soviet territories.

3313* (I) Governments and Politics in the Middle East. Analysis of political institutions and processes with emphasis on selected countries of the Middle East; the social and economic basis of politics; nationalism, political development and factors of instability and change.

3353* (S) Parties and Interest Groups. Political parties and interest groups as institutions; their roles and elections and government.

3414* Political Campaigns. Lab 2. Planning, fundraising, targeting, public opinion, support operations, voter contact, the mass media and candidate activities. Lab work in campaigns or government offices.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>3423</td>
<td>Voting and Elections. Electoral systems and their relationship to political development, political socialization, issue emergence, voting behavior, and electoral cycles.</td>
<td></td>
</tr>
<tr>
<td>3453*</td>
<td>The Legislative Process. The power and organization of legislatures, as well as the selection and behavior of legislators. Special attention given to the U.S. Congress.</td>
<td></td>
</tr>
<tr>
<td>3483*</td>
<td>The American Presidency. The politics of presidential selection, removal and succession; formal and informal powers of the president; relations with Congress, the national judiciary and national executive branch; proposed reforms and the vice-presidency.</td>
<td></td>
</tr>
<tr>
<td>3493*</td>
<td>Public Policy. Prerequisite: any one of 1013, 2023, 2113, ECON 1113, 2123, SOC 1113, PHIL 2113. Identification of policy options open to policy makers and examination of measurements and rationales underlying governmental programs.</td>
<td></td>
</tr>
<tr>
<td>3513</td>
<td>Public Opinion and Polling. The nature of public opinion. Public opinion polling, the factors influencing opinion formation, and the effects of public opinion on policy and policy makers.</td>
<td></td>
</tr>
<tr>
<td>3523</td>
<td>Campaign Fundraising and the Media. Prerequisite: 1113. Techniques used by successful candidates for elective office to present their positions to the voting public. Beginning with the basic elements of fundraising exploration of current campaign finance laws, funding techniques and campaign budgeting. Message development, media production and ad placement. Preparation of a fundraising strategy.</td>
<td></td>
</tr>
<tr>
<td>3533</td>
<td>Political Lobby and Grassroots Organization. Prerequisite: 1113. Traditional special interest lobbying and the rapidly emerging local grassroots constituent movement. New federal laws pertaining to lobbying and rules that govern the conduct of state lobbying. The implications of technology and the potential advent of a plebiscite form of government. Development of complete grassroots strategy on an issue either at the federal or state level.</td>
<td></td>
</tr>
<tr>
<td>3613*</td>
<td>State and Local Government. Political processes, government and administration of American states, cities and counties; special emphasis on Oklahoma.</td>
<td></td>
</tr>
<tr>
<td>3663*</td>
<td>Political Thought. The teachings of the three lasting traditions of Western political thought: classical, Christian and modern.</td>
<td></td>
</tr>
<tr>
<td>3823</td>
<td>Political and Legal Issues in Fire and Emergency Management. Effect of legal and political issues on the management and particular approach of professional emergency management organizations. Applicable law and regulations related to organizational administration and emergency operations. The politics of disaster, in particular within the framework of applicable federal, state, and local law and guidelines, through case studies and guest lecturers.</td>
<td></td>
</tr>
<tr>
<td>3893*</td>
<td>Terrorism and Emergency Management. A general introduction to the basic concepts for preparedness, response and command functions at the scene of a potential terrorist incident.</td>
<td></td>
</tr>
<tr>
<td>3953*</td>
<td>Minorities in the American Political System. Prerequisite: 1113. Examination of mass and elite level behavior of minorities in the contemporary U.S. political system.</td>
<td></td>
</tr>
<tr>
<td>3983*</td>
<td>The Judicial Process: Courts, Judges and Politics. The American judiciary and legal process from a political perspective with particular emphasis on judicial organization and emergency management. Recruitment, fact-finding, decision-making, impact of decisions, the legal profession and relations among courts.</td>
<td></td>
</tr>
<tr>
<td>4003*</td>
<td>Political Analysis. Prerequisites: 60 credit hours.</td>
<td></td>
</tr>
<tr>
<td>4013*</td>
<td>American Foreign Policy. Major problems and policies of American foreign relations since World War II and description of foreign formula and aid administration.</td>
<td></td>
</tr>
<tr>
<td>4023</td>
<td>World Politics. Foreign policies of major powers, areas of tension and sources of international conflict.</td>
<td></td>
</tr>
<tr>
<td>4053*</td>
<td>Problems of Government, Politics and Public Policy. 1-6 credits, maximum 6. Prerequisites: 60 credit hours, or 45 hours with GPA of 3.25, including 2113. Logic and techniques of modern political analysis, including the logic of political analysis, the collection and analysis of political information, and data processing and computer applications to the study of politics.</td>
<td></td>
</tr>
<tr>
<td>4100*</td>
<td>International Institutions. The organization of international politics and the role of international institutions, with emphasis on the United Nations and related agencies.</td>
<td></td>
</tr>
<tr>
<td>4113*</td>
<td>Legal Problems of the International Environment. A case survey of diverse areas in which international law finds applicability: problems of territorial jurisdiction, continental shelves, straits, canals and international river systems, maritime law, national and outer space law and the international law of pollution.</td>
<td></td>
</tr>
<tr>
<td>4343*</td>
<td>The United States Constitution. An examination of the theoretical, philosophical, and legal underpinnings of the U.S. Constitution, relying heavily on a study of The Federalist Papers.</td>
<td></td>
</tr>
<tr>
<td>4353*</td>
<td>Administrative Law. Legal powers, limits, and procedures of administrative agencies with emphasis on federal and state administrative procedure acts.</td>
<td></td>
</tr>
<tr>
<td>4363*</td>
<td>Environmental Law and Administration. Statutory law, case law, and administrative practices relating to regulation of the environment, in a topical analysis of major environmental law and policies.</td>
<td></td>
</tr>
<tr>
<td>4403*</td>
<td>Urban Politics. Problems of governing American metropolitan areas.</td>
<td></td>
</tr>
<tr>
<td>4413*</td>
<td>Government Budgeting. The politics, planning and administration of government budgets.</td>
<td></td>
</tr>
<tr>
<td>4453*</td>
<td>Personnel Administration. Problems, processes and procedures of public personnel administration.</td>
<td></td>
</tr>
<tr>
<td>4513*</td>
<td>American Politics. Significant developments and issues in American politics, including American political behavior and political leadership.</td>
<td></td>
</tr>
<tr>
<td>4553*</td>
<td>American Political Thought. A survey of the major developments in American political thought from the Colonial period to the present, followed by a topical analysis of major developments in contemporary political science.</td>
<td></td>
</tr>
<tr>
<td>4593*</td>
<td>Natural Resources and Environmental Policy. Current issues in the law, politics and administration of energy, land, water, mineral and other natural resource policy with particular emphasis on relations to environmental policies and law.</td>
<td></td>
</tr>
<tr>
<td>4653*</td>
<td>Contemporary Political Thought. An analysis of 19th and 20th century political ideas, with emphasis on the rise and fall of ideologies along side controversies over relativism, positivism, pragmatism, and resurgent religious faiths.</td>
<td></td>
</tr>
<tr>
<td>4663</td>
<td>Politics and Human Reason. An overview of past and present accounts of politics as rational activity, with attention given to Aristotle, the Federalist, and modern social choice theory.</td>
<td></td>
</tr>
</tbody>
</table>
1-6 credits, maximum 6. Required for graduation with membership, with second faculty reader and oral examination. Required for natural and man-made disasters, disaster recovery, and the recovery process. Related issues such as governmental assistance, computer mapping, hazard analysis, planning, structural protection, and new technologies. The relationship and effectiveness of preparedness to action and recovery through case study analysis.

4963* American Constitutional Law: Equal Protection of the Laws. Prerequisite: 2023 or 3983 recommended. Development of principles of constitutional law by the Supreme Court concerning equal protection of the laws concepts in matters of race, gender, wealth, citizenship, legislative reapportionment and voting rights, government employment and affirmative action programs. Legal research techniques.

4973* American Constitutional Law: The Division of Governmental Powers. Prerequisite: 2023 or 3983 recommended. Development of principles of constitutional law by the Supreme Court concerning federalism and separation of powers with particular emphasis on political and doctrinal developments surrounding judicial review, regulation of commerce, taxing and spending and presidential power. Introduction to legal research methods.

4983* American Constitutional Law: Due Process of Law. Prerequisite: 2023 or 3983 recommended. Development of principles of constitutional law by the Supreme Court concerning federalism and separation of powers with particular emphasis on political and doctrinal developments surrounding judicial review, regulation of commerce, taxing and spending and presidential power. Introduction to legal research methods.

5013* Quantitative Methods of Political Analysis. Required of all graduate students. Fundamental methodological issues in the scientific study of politics. Logic of science, principles of research design and computer data manipulation and analysis.

5030* Research in Public Administration, Public Policy and Politics. 1-6 credits, maximum 6. Individually supervised research.

5030* Internship in Public Administration and Government. 1-6 credits, maximum 6. Individually supervised internship in administrative and governmental career areas. Paper required.

5040* Readings in Politics, Public Policy or Public Administration. 1-6 credits, maximum 6. Prerequisite: consent of supervising professor. Readings in the student's major area of study.

5100* Advanced Problems in Government, Politics, and Public Policy. 3 credits, maximum 6. Seminar topic varies from semester to semester.

5113* Seminar in Public Program Evaluation. Methodology of evaluation research in public programs. Emphasis will be placed on designing and interpreting evaluative studies rather than the mastery of particular mathematical, statistical or computer skills.

5210* Seminar in International Relations. 3 credits, maximum 6. Research on the dynamics and institutions of international politics.

5213* Seminar in the International Political Economy. Prerequisite: graduate standing. Research on the mechanics and theories of interaction between economic and political phenomena. Same course as IS 5213.

5313* Public Management. Introduction to the general principles of management as they are applied in the public sector. Systems theory, organization design, and techniques of supervision.

5320* Seminar in Public Budgeting and Finance. 3 credit hours, maximum 6. Major processes and practices involved in governmental budgeting in the United States at national, state, and local level.

5323* Urban Politics and Management. Introduction to the concepts, processes and techniques of managing urban political systems to include problems of leadership, decision making, general management, and group behavior.

5333* Seminar in Public Personnel Administration. Current practices, problems and issues in public sector personnel administration, including merit system, civil service reform collective bargaining, and equal opportunity and affirmative action.

5343* Seminar in Fire and Emergency Services Administration. Introduction to policies, procedures and administrative processes required to deliver fire and emergency services. Fire department and fire department management. Concepts of risk assessment, its use in emergency management planning, and its limitations. Applications to emergency management. Specifically designed for FEMP students. Not of interest to students in environmental management.

5353* Seminar in Design, Structure and Processes of Public Organizations. Administration in the public sector, stressing traditional and emerging organization structures. Awareness of administrative processes and environment that include program design and implementation and administrative accountability.

5410* Seminar in Comparative Politics and Government. 3 credits, maximum 6. Research in the public policies and governmental institutions of foreign countries.

5510* Seminar in Political Behavior. 1-3 credits, maximum 6. Examination of contemporary theories of political behavior with emphasis on empirical studies.

5613* Seminar in Public Policy. Public policy process including policy design, implementation and change. Approaches to public policy including design science, rational choice, policy sciences, normative models, and institutionalism.

5620* Seminar in Natural Resource Policy, Law, and Administration. 3 credits, maximum 9. Analysis of the legal and public policy aspects of environmental regulation, including special emphasis on one of three components: environmental law, administrative law, and national resource law and policy.

5633* Practical Environmental Compliance. Environmental decision making, reading and understanding environmental statutes and regulations, and effectively dealing with the EPA. Environmental permitting and enforcement, policies and procedures. Review of hazardous waste regulations with emphasis on ground water problems.

5643* Regulatory Risk Analysis. Risk-based decision making, government's risk analysis paradigm, risk analysis policy, and social aspects of risk assessment. Review of the RCRA corrective action, CERCLA (Superfund) remedial action, and NEPA environmental impact study programs.


5663* Community Relations in Environmental and Emergency Management. Preparation for the environmental manager, emergency manager, and fire department manager to communicate and negotiate with the public and media concerning environmental threats to human health routine and non-routine releases of toxic substances and radioactive materials. Strategies for community-based planning, emergency preparedness, environmental response, site damage, and conflict management.

5710* Seminar in American Political Institutions. 1-3 credits, maximum 6. American institutions, including Congress, the presidency, courts, political parties and interest groups.
Seminar in Women and Politics. 3 credits. Prerequisite: graduate standing. Research on a variety of topics concerning women and politics, including women's movements, women and elections, and public opinion.

Psychology (PSYC)

1113 (S)Introductory Psychology. Principles, theories, vocabulary, and applications of the science of psychology.

2313 Psychology and Human Problems. Prerequisite: 1113. Personality dynamics and their application to personal, cultural and vocational experience.

2583 (S)Developmental Psychology. Prerequisite: 1113. The nature of pertinent studies, causes, and theories of human developmental phenomena across the life span.

2593 Psychology of Human Sexuality. Prerequisite: 1113. Survey of behavioral, personality and psychophysiological components of human sexuality, with special emphasis on the delineation of facts from sexual myths.

2743 (S)Social Psychology. Theories and applications of social cognition, the self, pro-social and aggressive behavior, groups, attitudes and the environment.

3013 Psychology of Motivation. Prerequisite: 1113. Review of research and theory in such areas of motivation as hunger, sex, frustration, aggression, achievement, affiliation, and altruism.

3073 (N)Neurobiological Psychology. Prerequisite: 1113. Neural bases of human experience and behavior. Topics include sensation and perception, motivation and emotion, learning and thinking.

3113 (N)Comparative Psychology. Prerequisite: 3113. Comparative study of behavior characteristics of selected samples of the animal kingdom from protozoa to humans.

3173 Cognitive Neuroscience. Prerequisite: 1113, 3073. Multidisciplinary approach to understanding how mental activities of the mind are the result of the processing by the brain.

3214 Quantitative Methods in Psychology. Lab 2. Prerequisites: 1113, MATH 1513, or consent of instructor. Design and evaluation of research in psychology including scales of measurement, basic research designs, and quantitative procedures for data analysis, with emphasis on problems encountered in psychological research.

3223 (S)The Psychology of Work and Industrial Behavior. Prerequisite: 1113. Experimental literature in area of employee motivation. Techniques useful in measurement of employee attitudes and opinions.

3333 (S)Industrial and Organizational Psychology. Prerequisite: 1113. Behavior in task group and organizational context with emphasis on management, leadership and human relations.

3413 (S)Psychology of Social Behaviors. Lab 1. Prerequisites: 1113, 3212. Contemporary theoretical and methodological issues in social psychology with special emphasis on the social psychology of the experiment and experimentation with the social aspects of human behavior.

3443 S)Abnormal Psychology. Prerequisites: 1113, and 60 credit hours or 45 hours with GPA of 3.25. Review of major approaches to conceptualizing abnormal behavior including dynamic, social and learning-based theories. Discussion and illustration of the major forms of mental illness such as neuroses, psychoses and character disorders.

3513 Psychology of Learning. Prerequisites: 1113, 3213. Behavior change as a function of experience from relatively simple learning processes such as classical and instrumental conditioning to relatively complex processes such as verbal learning and concept identification.

3643 (S)Applied Community Psychology. Prerequisite: 1113. Psychological principles for prevention, intervention and rehabilitation in the community model.

3713 Psychology of Memory. Prerequisites: 1113 and three additional hours of psychology. Body of contemporary research on human memory and the process of knowledge acquisition with a focus on processes and strategies inside the human mind.


3771 Careers and Professionalism in Psychology. Lab 1. Prerequisite: psychology major or minor. Current career options in psychology are reviewed and career skills developed. Skills and information that a professional psychologist needs in a work setting are stressed.

3823 Cognitive Psychology. Prerequisites: 1113, 32-3 or equivalent. Cognitive processes. Thinking, problem solving, visual imagery, attention and memory search. Both theory and application emphasized.

3914 Experimental Psychology. Lab 4. Prerequisites: 1113, 3213 or equivalent and five additional hours in psychology. Problems, methods and applications of experimental psychology.

3990 Undergraduate Seminar. 1-6 credits, maximum 6. Prerequisites: 1113, 3213 or equivalent and five additional hours in psychology. Problems, methods and applications of experimental psychology.

4023* Human Evolutionary Psychology. Prerequisite: 1113. The practical and theoretical application of natural selection to human behaviors including sexuality, gender roles, emotion, personality, politics and religion.

4123* (S)Psychology of Women. Lab 1. Prerequisite: 1113. Sex differences and the development of sex role behavior. Encompasses the psychological dynamics of developmental and social issues for women.

4133* (S)Psychology of Minorities. Prerequisite: 1113. Review of psychological theories and research pertinent to minority group status.

4143* (S)Psychology and Law. Lab 1. The new psycho-legal literature reviewed with emphasis on the psychological basis of voir dire, eyewitness behavior, courtroom persuasion, jury deliberation, and mental health issues.

4183* Current Issues in Clinical Psychology. Prerequisites: 1113, 3443 and three additional credit hours in psychology. Problems of the individual in contemporary society and various clinical approaches that have been proposed as possible solutions to these problems.

4213* (S)Conflict Resolution. Prerequisite: 1113. Interpersonal conflict studied from psychological perspectives. Types and uses of conflict, and conditions for constructive dispute settlement.

4223* Decision Making and Problem Solving. Prerequisite: 3823 or consent of instructor, or graduate standing. An examination of the research literature on individual decision making and problem solving with dual emphases on theory and application. Thorough knowledge of human cognitive functioning needed.

4333* Personality. Prerequisites: 1113, 3443, or consent of instructor. Basic assumptions, research, and clinical issues relating to the major personality theories.

4483* (S)Psychology of Parent Behavior. Prerequisite: 1113. Historical and contemporary conceptions of parent-child relationship and approaches to communication and discipline; special problems in parenting.

4493* History of Psychology. Prerequisite: 1113. History of psychology as an aspect of European intellectual history. Psychological thought from early philosophical roots to modern conceptions of psychology as a science.

4813* Psychological Testing. Prerequisites: 1113 and 3213. Quantitative aspects of measurement and testing, with emphasis on scaling, standardization, reliability and validity. Basic principles of construction and the ethics of use.

4823* Computer Applications in Psychology. Prerequisites: 3213 and 3914 and consent of instructor. Organizing experimental data for computerized analysis. Emphasis on preparing programs peculiar to within-subject experiments used in psychology. Selection, modification and creation of data analysis programs. A thorough knowledge of statistical techniques is assumed.

4880 Senior Honors Thesis. 1-6 credits, maximum 6. Prerequisites: 3213, departmental invitation, senior standing, Honors Program participation. A guided reading and research program ending with an honors thesis under the direction of a senior faculty member. Required for graduation with departmental honors in psychology.

4883 Current Issues in Psychology. Prerequisites: 3213, 3914. A capstone course examining current issues in psychology, their relationships to current issues in other academic disciplines, and their relevance in an educated society.

4990* Special Problems. 1-6 credits, maximum 6. Prerequisites: 1113, 3213 and consent of instructor. For honors students and other outstanding students. Experimental or library research.
5003* Thesis. 1-6 credits, maximum 6. Required of all graduate students majoring in psychology and writing a thesis.

501* Proseminar in Biopsychology. Prerequisite: graduate standing in the Department of Psychology. Major theories, methodologies and substantive issues in biopsychology.

502* Proseminar in Cognitive Psychology. Prerequisite: graduate standing in the Department of Psychology. Major theories, methodologies and substantive issues in cognitive psychology.

503* Proseminar in Developmental Psychology. Prerequisite: graduate standing in the Department of Psychology. Major theories, methodologies and substantive issues in development psychology.

504* Proseminar in History and Systems of Psychology. Prerequisite: graduate standing in the Department of Psychology. Major theories, methodologies and substantive issues in history and systems of psychology.

505* Proseminar in Psychology of Learning. Prerequisite: graduate standing in the Department of Psychology. Major theories, methodologies and substantive issues in learning psychology.

506* Proseminar in Psychology of Personality. Prerequisite: graduate standing in the Department of Psychology. Major theories, methodologies and substantive issues in personality psychology.

507* Proseminar in Social Psychology. Prerequisite: graduate standing in the Department of Psychology. Major theories, methodologies and substantive issues in social psychology.

508* Proseminar in Tests and Measurements. Prerequisite: graduate standing in the Department of Psychology. Major theories, methodologies and substantive issues in tests and measurements.

509* Proseminar in Psychology. Prerequisite: graduate standing in the Department of Psychology. Major theories, methodologies and substantive issues of current relevance in the discipline.

5113* Psychopathology. Prerequisite: graduate standing in psychology or consent of instructor. Principles of diagnosis and treatment of major disorders.

5120* Psychology Workshop. 2-6 credits, max. 6 maximum. Provides an opportunity to study specific psychological problems, both applied and theoretical.

5153* Cognitive Assessment. Lab 1. Prerequisites: 3443, 4813; graduate standing in the clinical program of the Department of Psychology, the doctoral school or counseling psychology program or the psychometry program, or consent of instructor. Cognitive and intellectual assessment of children, adolescents and adults. Fundamental skills in administration, scoring, and interpretation of cognitive tests and report writing. Application of cognitive tests to specific clinical problems.

5183* Seminar In Neuropsychology. Prerequisites: one introductory course in physiological psychology and cognitive psychology; graduate-level neurobiology recommended. Introduction to the experimental and clinical nature of congenital and acquired neuropsychological disorders and their treatments.

5193* Ethics and Professional Development in Psychology. Prerequisite: graduate standing in the Department of Psychology. Principles of ethics with a focus on the guidelines and standards for psychology. Legal and ethical issues for the practice of clinical psychology.

5303* Quantitative Methods in Psychology I. Prerequisite: 3213. Statistical methods of evaluating research hypotheses in psychology. Descriptive measures, Student's t, one-way analysis of variance, comparisons among groups and statistical robustness are stressed.

5314* Quantitative Methods in Psychology II. Lab 2. Prerequisite: 5303. A continuation of 5303. Higher-order analysis of variance designs, correlation and regression techniques, and analysis of covariance, with emphasis on applications to psychological experimentation. Computer applications of all procedures using SPSS and/or SAS during the lab.

5333* Systems of Psychotherapy. Prerequisites: 5113; graduate standing in the clinical program of the Department of Psychology or consent of instructor. The major approaches to psychotherapy. Methods for creating multiple impact for behavioral change, including interpersonal, personal, social, community and preventative interventions.

5360* Research. 1-12 credits, maximum 12. Prerequisite: consent of instructor. Research project on some psychological problem.

5620* Seminar in Psychology. 1-2 credits, maximum 12. Prerequisite: consent of instructor. Consideration of special topics that are particularly timely or technical in nature.

5660* Teaching Practicum. 1-2 credits, maximum 2. Prerequisite: consent of instructor. Primarily for graduate students with well-defined new teaching responsibilities.

5823* Cognitive Processes. Theory and experimental research findings dealing with human thought processes from a developmental and functional standpoint.

6000* Dissertation. 1-16 credits, maximum 60. Research and report thereon by graduate students in partial fulfillment of requirements for the Doctor of Philosophy degree.

6083* Principles of Behavior Therapy. Prerequisite: graduate standing in the clinical program of the Department of Psychology or consent of instructor. Principles and procedures of behavior therapy and modification.

6133* Ethnic and Cultural Diversity in Psychotherapy. Prerequisites: six credit hours in psychology and consent of instructor. Increasing understanding and appreciation of ethnic and cultural diversity in the psychotherapy context. Critical examination of theory and research related to psychotherapy with multicultural populations.

6143* The Psychology of Substance Abuse. Prerequisite: consent of instructor. Introduction to psychological classification of psychoactive substance (alcohol and drug) use disorders. Theory and research on psychological, biological, and environmental factors that are concomitants of substance abuse. Overview of major research techniques and treatment modalities in this area.

6173* Child Psychopathology and Treatment. Prerequisites: 3443, 3583 or equivalent; graduate standing in the clinical program of the Department of Psychology, the doctorate school psychology with the consent of a supervisor, or consent of instructor. Theoretical positions and issues in child psychopathology. Procedures used in the treatment of psychological disorders of children.

6223* Research Design. Prerequisites: 3914 and doctoral level standing. Experimental techniques in psychophysics, sensory processes, attention and perception, motivation and emotion, and learning and memory.

6233* Clinical Research Design. Prerequisites: 5303, 5313, and 6223 or consent of instructor. Methodology and research practices in clinical psychology. Including experimental design, research practice, data analysis and interpretation, ethics, and dissemination of research findings.

6253* Seminar in Human Development. Prerequisite: consent of instructor. Behavioral aspects of development from the prenatal period to senescence. Normal development contrasted to exceptional development.

6263* Personality Theories. Prerequisites: nine credit hours of psychology and consent of instructor. Various theories of personality.

6283* Factor Analysis. Factor analysis and implications for measurement of mental abilities, personality traits and learning.

6353* Psychology of Motivation. Prerequisite: 3914. Outline of theory and research in human and animal motivation.

6383* Community Psychology. Prerequisite: consent of instructor. Positive rehabilitative and preventive objectives; application of psychological knowledge and skills to problems of social change and general improvement of the quality of life. Physical, psychological and social factors viewed through system analysis.

6393* Psychology of Language. Review of data and theories of speech and language behaviors. Laboratory techniques and experimental designs will also be reviewed to emphasize understanding of psycholinguistic research.

6413* Systems of Psychology. Two different meanings of "system" considered: the traditional meaning dealing with the various schools of psychology, and the modern meaning in which contemporary social problems are viewed as sets of interrelated variables that produce unforeseen and remote effects.

6433* Psychology of Information Processing: Development and Aging Aspects. Attention, list processing, pattern recognition and related areas in terms of contemporary facts, theory and application. Special attention paid to development and aging aspects of information processing.
### Religious Studies (REL)

**1103** (H) The Religions of Mankind. Major world religions such as Hinduism, Buddhism, Judaism, Christianity and Islam with a view to understanding the general nature of religion and its various dimensions.

**3013** (H) The Old Testament and Its Study. A study of the Hebrew Scriptures with emphasis upon content, historical background, the history of its study and the critical analysis and theological interpretation of selected passages.


**3123** (H) The Old Testament Prophets. Recommended: 3013. An interpretive study of the Hebrew prophets in historical perspective. Intensive study given to the more significant prophets.


**3243** (H) Paul and the Early Church. Recommended: 3023. The letters of Paul in their historical context with special emphasis on his theology and ethics.

**3573** (H) The Religions of Native Americans. Recommended: 1103. Selected tribal worldviews and religious systems. Field trips and reports in laboratory. No credit for students with credit in 4954.

**3613** (H,I) African Cultures and Religion. Key ideas, values and achievements in African culture and tradition as found in literature, art and music viewed in historical and religious perspective.

**3713** (H) Religion, Culture and Society. Recommended: 3103. ANTH 2353, SOC 1113. An introduction to the scientific study of religion. Religious activity in both tribal and technological societies studied in the light of contemporary interpretations of culture and of social behavior. Same course as SOC 3713.

**4050** Studies in Religion. 2-6 credits, maximum 6. Independent studies, seminars and courses on selected topics in religion.

**4113** (H,I) The World of Islam: Cultural Perspectives. The cultural heritage of the world of Islam explored through its expression in the art, architecture and literature of the Muslim peoples.

**4330** Seminar in Biblical Studies. 3 credits, maximum 9. Prerequisite: two courses in Biblical studies. Selected topics in the academic study of the Bible.

### Research, Evaluation, Measurement and Statistics (REMS)

**4052** Measurement and Evaluation in the School. Prerequisite: full admission to Professional Education. Construction and selection of classroom tests. Concepts of test design, administration and analysis. Testing of classroom tests. Contrasts between criterion-referenced and norm-referenced measurement strategies. Grading techniques, rudiments of standard test selection and score interpretation and the basic statistics used to summarize and analyze test results.

**5000** Master's Thesis. 1-6 credits, maximum 6. Prerequisite: consent of instructor.

**5013** Research Design and Methodology. Required of all graduate students in education. An introduction to the concepts of research design, methodology, sampling techniques, internal and external validity and the scientific method in educational problem solving. Critical analysis of educational research studies and the writing of proposals. No credit for student with credit in 5015.

**5320** Seminar in Research, Evaluation, Measurement and Statistics. 3-6 credits, maximum 6. Prerequisite: consent of instructor. In-depth exploration of contemporary problems of research, evaluation, measurement and statistics.

**5373** Educational Measurements. Appropriate applications of tests in the schools. Development of teacher-made tests, selection of standardized tests, interpretation of test results, understanding of the statistics reported in testing literature, uses of test results and recent developments in educational measurement.

**5953** Elementary Statistical Methods in Education. Elementary statistical methods needed by consumers of educational research. Descriptive and inferential statistics. No credit for students with credit in 5015.

**6000** Doctoral Dissertation. 1-25 credits, maximum 25. Prerequisite: consent of instructor. Required of all candidates for doctorate in applied behavioral studies. Credit given upon completion and acceptance of dissertation.

**6003** Analyses of Variance. Prerequisite: admission to a doctoral level program. A thorough examination of analysis of variance procedures as they relate to principles of experimental design in education and behavioral sciences.

**6013** Multiple Regression Analysis in Behavioral Studies. Prerequisite: 6003 or consent of instructor. Applications of multiple regression as a general data analysis strategy for experimental and non-experimental research in behavioral sciences.

**6023** Psychometric Theory. Prerequisite: 6013 or consent of instructor. Theoretical basis for applying psychometric concepts to educational and psychological measurement. The Classical Test Score model and applications to instrument development and design of studies for evaluating instrument quality.

**6373** Program Evaluation. Prerequisites: 5013 and admission to a doctoral level program or consent of instructor. Contexts, purposes and techniques of evaluating educational programs. Evaluation design, information collection, analysis, reporting and uses of results for programs ranging from individual lessons to nation-wide multi-year projects. Special emphasis on evaluation requirements of federally funded programs.

**6663** Applied Multivariate Research In Behavioral Studies. Prerequisite: 6013 or consent of instructor. An overview and analysis of multivariate procedures commonly applied to educational and behavioral research. Emphasis on conceptual design and application of these procedures.

**6850** Directed Reading. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Directed reading for students with advanced graduate standing.

### Russian (RUSS)

**1115** Elementary Russian I. Lab 1 1/2. Understanding, speaking, reading and writing. Method of instruction is audio-lingual.

**1225** Elementary Russian II. Lab 1 1/2. Prerequisite: 1115 or equivalent. Continuation of 1115.

**2115** (I) Intermediate Russian I. Prerequisite: 1225 or equivalent. Continuation of 1225. Russian grammar, composition and conversation.

**2225** (I) Intermediate Russian II. Prerequisite: 2115 or equivalent. Continuation of 2115.

**3003** (I,S) The Soviet Union: History, Society and Culture. A comprehensive view of the Soviet Union, stressing those issues in the political, economic, technological, geographical and cultural situation. Accessible to beginning undergraduates. Same course as HIST 3003 and POLS 3003.
5000 Master’s Report or Thesis. 1-6 credits, maximum 6. Students studying for a master’s degree enroll in this course for a total of 2 credit hours if they write a report, or 6 hours if they write a thesis.

5023 Comparative Education. A systematic investigation of educational institutions in various nations for the purpose of an enlarged, critical view of American education.

5720 Education Workshop. 1-8 credits, maximum 8. For teachers, principals, superintendents, and supervisors who have definite problems in instruction or administration. Students must register for the full number of credit hours for which the workshop is scheduled for a particular term.

5850 Institutional History of Education. History of elementary, secondary, and higher education in Western Civilization with emphasis upon the development of the American educational institution.

5850* Directed Study. 1-3 credits, maximum 3. Directed study for master’s level students.

5883* Educational Sociology. The manner in which social forces and institutions influence education and the educational system in the United States.

5893* Practicum. 1-6 credits, maximum 6. Directed off campus experiences designed to relate ideas and concepts to problems encountered in the management of the school program.

6910* Practicum. 1-6 credits, maximum 6. The student carries out an acceptable research problem (practicum) in a local school situation. Credit given upon completion of the written report.

6983* Master’s Report or Thesis. 1-6 credits, maximum 6. Students studying for a master’s degree enroll in this course for a total of 2 credit hours if they write a report, or 6 hours if they write a thesis.

6993* Doctoral Dissertation. 1-6 credits, maximum 15. Required of all candidates for the Doctor of Education degree. Credit is given upon completion of the dissertation.

6113* Theoretical Foundations of Qualitative Inquiry. Prerequisite: a 5000-level research course. An exploration of the history and philosophies of qualitative inquiry. In-depth overview through readings and discussion on the post-positivistic paradigm.

6123* Qualitative Research: Fieldwork. Investigation of the traditions, philosophies, and techniques of fieldwork research. Participant observation and writing detailed field notes. Designing and conducting a limited fieldwork study in order to get a “hands-on” feel for how to observe, write field notes, and undertake initial analyses.

6133* Qualitative Research: Interviewing. Prerequisite: a 5000-level research course. Investigation of the traditions, philosophies, and techniques of qualitative interview research. Talking with people about the world they inhabit—how they think about and understand aspects of it, including their interactions with others, and how they come to make sense of it. Designing and conducting a limited interview study in order to get a “hands-on” feel for how to question, listen, transcribe, and undertake initial analyses of textual and narrative data.

6190* Qualitative Research: Selected Methods. Designing and conducting a limited study in order to get a “hands-on” feel for the local method. Methods such as case study, grounded theory, ethnography, biography, historical social science, life history, phenomenology, and discourse analysis.

Sociology (SOC)

1113* Introductory Sociology. Coming to terms with the requirements for living in a complex social world. Sociological concepts used to assist students in understanding the social influences in day-to-day life.

2113 Principles of Sociology. Prerequisites: 15 semester credit hours. The science of human society. Emphasis on basic concepts and research studies. Required of all sociology majors and minors.

2123 Social Problems. Exploration in selected social issues in contemporary American society, such as deviance, poverty, sexism, racism and ageism.

2133* American Racial and Ethnic Relations. The historical and sociological dimensions of race and ethnicity in American life, and understanding of the controversies and conflicts that race and ethnicity have generated in the American experience.

3113 Theoretical Thinking in Sociology. Prerequisites: 6 credit hours of sociology, including 1113. Sociological theory in three broad areas: the emergence of social theory, the major schools of social theory and the relativity of theory to sociological research.

3223* Social Psychology. Social basis of personality development and behavior, including symbolic environment, self and group, motivation, attitudes and opinions, and social roles.
3323* (S)Collective Behavior and Social Movements. Analyzes panics, crazes, riots and social movements, emphasizing institutional and social psychological origins and consequences.

3413 Rural Sociology. Life in rural America and nonwestern societies examined with special emphasis on social relations, population movement, social change and problems of rural societies.


3623 Clinical Sociology. Prerequisite: nine hours of sociology including introductory sociology and two or more courses in social psychology. Planned positive change through interventions of services, programs and policies. An examination of the field, practice concerns, clinical sociology in specific settings and with special populations.

3713 (H)Religion, Culture and Society. Recommended: 1113, ANTH 2353, REL 1103. An introduction to the scientific study of religion. Religious activity in both tribal and technologically advanced societies studied in the light of contemporary interpretations of culture and social behavior. Same course as REL 3713.

3823* (S)Sociology of Death and Dying. Death and dying as social phenomena including cross-cultural perspective. An understanding of occupations and professions dealing with terminal patients in hospitals and with funerals. Students required to engage in original research from community sources.

3952 Applied Sociology. Prerequisite: sociology majors or consent of instructor or adviser. Application of sociological theory and methods to various job situations.

3993 (S)Sociology of Aging. Sociological problems of aging, including the analysis of the behavior of the aged within the framework of social institutions.

4003 Senior Thesis in Sociology. Prerequisites: 3113, 4013, 4133, STAT 4013, and consent of instructor. Conduct a research project (review literature, prepare proposal, gather and analyze data and report results) on a sociologically significant topic or issue.

4013* Qualitative and Applied Social Research Methods. Prerequisites: 3113 and STAT 4013. Conducting, analyzing and reporting qualitative social research. Research design, data collection, analysis and write-up of evaluation research and social impact assessments. Individual research project included.

4023* (S)Juvenile Corrections and Treatment Strategies. Prerequisite: 3523 or 4333. The juvenile justice system, emphasizing the juvenile court, diversion and youth service bureaus as well as the more traditional training schools and foster homes. Experimental treatment strategies with institutionalized delinquents.

4043 (S)Gender and Work. Prerequisite: one upper-division course. Consideration of unpaid, paid and volunteer work and gender difference in social agency, family variation and employment with males from United States and less developed countries.

4133* Social Research Methods. Prerequisites: 3113 and STAT 4013. Applying sociological theory and designing quantitative and qualitative research; methods of data collection, processing and analysis; basic skills in computer analysis of social data. Research project included.

4213* (S)Sexuality in American Society. Prerequisite: junior standing or consent of instructor. Sociological aspects of sexual behavior, attitudes and belief systems in society. Similarities and differences in males and females in all types of sexuality.


4323* Sociology of Agriculture. Overview of U.S. agriculture focusing on changing markets and technologies and their impact on farm families and other social institutions and relationships. Emphasis on agricultural problems, policies and alternatives to traditional farming practices.


4343* (S)Medical Sociology. Health and illness as social and societal phenomena including the doctor-patient relationship, distribution and epidemiology of disease, the social meaning of health and illness, basic epidemiology, and the social processes involved in medical practice. Cross-cultural comparisons and the sociology of the health professions.

4383* (S)Social Stratification. Systems of class and caste, with special attention to the United States. Status, occupation, income and other elements in stratification.

4423* (S)Community Organization and Development. Structure, change and development of the local community in rapidly changing society. Emphasis on community organization and planned change.

4433* (S)Environmental Sociology. Critical assessment of the social causes and consequences of problems with resource scarcity and environmental degradation. Environmental problems viewed as social problems viewed as social problems, requiring an understanding of the structural conditions producing environmental problems and inhibiting resolutions.

4443* (S)Sociology of Law and Legal Institutions. Prerequisite: 3523 or 4333. Criminal and civil law as mechanisms of social control; conflict and consensus models of legislation; legal ideology and its application by police, prosecution and defense; courts and administrative agencies of control. Decision processes in the criminal justice system, personnel and case loads and related areas. Native American law; federal policy and trust status, criminal and civil law, tribal jurisdiction, tribal courts.

4513* (S)Demography of Ethnic and Immigrant Population in Global Perspective. The population characteristics of immigrant, ethnic and racial groups along major demographic dimensions. Cross-national comparisons between minority groups on demographic and cultural factors.

4533* (S)World Population Problems. Fertility, mortality and migration, and other factors related to population size, density, and composition; the population explosion, worldwide famine, birth control, and other serious social issues.

4623* (I)International Industry and Work. Prerequisite: six hours of social sciences. A focus on work, industry and globalization within a sociocultural context. The impact of country cultures upon industry and work and adjustment to cross-cultural problem solving and development of global work teams.

4643* (S)Women in Society. A sociological exploration of the image and status of women in society, including family, work and politics. Socialization, education and the women's movement. Introduction to feminist theory.

4723* (S)American Marriage, Family, and Male-Female Relationships. The sociological relationship between marriage and family and other institutional structures and systems, especially work and the economy. Male and female roles and relationships in male selection, sexuality, marriage, divorce, and other intimate situations.

4850 Internship in Sociology. 1-4 credits, maximum 4. Prerequisites: 3952, completion of 12 hours of sociology, or consent of internship coordinator. Field experience in a variety of work settings.

4923* The Field of Corrections. An overview of correctional work focusing on probation, parole and institutions. A survey of contemporary alternatives to conventional imprisonment.

4990* Exploration of Sociological Issues. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Examines sociologically significant topics and issues.

4993 Senior Honors Thesis. Prerequisites: departmental invitation, senior standing, Honors Program participation. A guided reading and research program ending with an honors thesis under the direction of a senior faculty member, with second faculty reader and oral examination. Required for graduation with departmental honors in sociology.

5000* Thesis in Sociology. 1-6 credits, maximum 6.

5043 Advanced Topics in Gender and Work. Prerequisite: graduate standing. In-depth examination of sociological theories of paid, unpaid and volunteer work with special emphasis on gender differences. Case studies including empirical research from the United States and less developed countries.

5113* Classical Sociological Theory. Prerequisite: 3113 or equivalent. Major trends in sociological thought. The emergence of sociological theory in Europe and America.
4571. Soil Chemistry and Environmental Quality. Prerequisite: 2124. Soil chemical processes that affect plant nutrition, nutrient cycling, and fate of environmental pollutants. Chemistry of soil surfaces and soil solution, of important soil processes, and of agronomic and environmental topics such as water quality, soil acidity, pesticide residues, radionuclides, and heavy metals. Soil chemistry and risk assessment, soil remediation and contaminant bioavailability, land application of municipal and industrial wastes, long-term reactions and environmental fate.

4213. Describing and Interpreting Soils. 1 credit, maximum 3. Lab 3. Prerequisite: 2124. Describe and classify soil properties in the field and interpret for suitable agriculture, urban, and other land uses.

4213. Precision Agriculture. Lab 2. Prerequisite: MATH 1513, senior standing. Introduction to the concepts of precision agriculture including analysis of spatial variability, relationships of fertility and crop response, geographical information systems, variable rate technology, optical sensing, global positioning systems, and yield monitoring. Case studies included for detailed analyses. Same course as BAE 4213.

4234. Soil Nutrient Management. Lab 2. Prerequisite: 2124. Soil fertility and use of fertilizer materials for conservation, maintenance, and improvement of soil productivity and to minimize environmental concerns.

4363. Environmental Soil Science. Prerequisites: BIOL 1114 and CHEM 1215. Presentations of soil processes and interpretation for natural resource management; land reclamation; identification of wetlands; oil and soil damages; impact of fertilizer, pesticide and other agricultural chemicals on soil and water quality; water resources; long-term soil erosion and landscape formation; transformations of manure, sewage sludge and other organic by-products.


4470. Problems and Special Study. 1-3 credits, maximum 12. Lab 1-3. Prerequisite: consent of the instructor. Problems in soil science selected from topics in soil chemistry and fertility, soil physics, soil biology, soil conservation and soil morphology.

4483. Soil Microbiology. Prerequisite: 2124 and BIOL 1114 or consent of instructor. A comprehensive overview of microorganisms living in soil and activities that are of agricultural and environmental significance.

4563. Dynamics of Wetland, Forest and Rangeland Soils. Prerequisite: 2124. Dynamics of soils that receive minimal or no production input. Identification of wetland soils and the biogeochemical reactions occurring in wetland soil environments. Nutrient cycling, physical, chemical and biological properties of forest and rangeland soil systems.

4571. Senior Seminar. Prerequisite: senior standing in plant and soil sciences. Career opportunities (talks and field trips); preparation of resumes and interviews. Graded on a pass-fail basis. Same course as PLNT 4571 and RLEM 4571.

4683. Physical Properties of Soils. Prerequisites: 2124 and PHYS 1114. Soil physical properties and processes, and their influence on plant growth.

4863. Animal Waste Management. Prerequisite: 2124. Aspects of animal waste management related to animal nutrition, system design, land application and economic acceptance.

5000. Master's Thesis. 1-6 credits. Maximum total credits under Plan I and 2 maximum total credits under Plan II. Prerequisite: consent of adviser. Research planned, conducted and reported in consultation with a major professor.

5020. Graduate Seminar. 1 credit. Maximum per semester 1 credit on M.S. program and 2 credits on a Ph.D. program required. Prerequisite: graduate standing. Philosophy of research, methods of research, or interpretation of research.

5110. Problems and Special Study. 1-4 credits, maximum 6. Prerequisite: consent of instructor. Supervised study of special problems and topics covered in other graduate courses.

5193. Spatial and Non-spatial Data Base Management of Natural Resources. Prerequisites: one course in statistics and programming experience. Methods of acquiring, managing and analyzing spatial data using geographic information systems. Management of non-spatial data using relational database managers. Development of applications using these tools for mapping and managing natural resources.

5224. Soil Chemical Processes and Impact on Environmental Quality. Lab 3. Prerequisites: 3893 and CHEM 2113 or CHEM 3242 or equivalent. A comprehensive study of chemical processes in soils that impact biogeochemical cycles and environmental quality. Modern theory of soil solution thermodynamics, kinetics of soil chemical processes, soil colloid chemistry, and soil geochemistry. Environmental soil science applications including environmental fate of toxic substances and remediation of contaminated soil. Laboratory component provides hands-on experience with techniques used for soil chemical investigations and with chemical speciation computer models.

5230. Research. 1-4 credits, maximum 4. Prerequisite: consent of a faculty member supervising the research. Supervised independent research on selected topics.


5483. Soil Biodegradation and Bioremediation. Prerequisite: 4483. A comprehensive overview of microorganisms living in soil and their activities of agricultural and environmental significance, emphasizing their roles in improving soil quality, and biodegradation and bioremediation of soil.

5583. Soil Physics. Prerequisites: MATH 2265 or 2365, PHYS 1214. Fluid flow through saturated and unsaturated soils; temperature change and heat flow in soil; soil strength and deformation as it applies to plant response.

5613. Laboratory Methods of Soil, Plant and Environmental Analysis. Lab 3. Prerequisites: CHEM 2122, 3324 or equivalent. Theory, principles and techniques of laboratory methods used for chemical analysis of soil, plant material and environmental samples. Modern analytical methods used for soil testing of plant available nutrients, determination of environmental contaminants, and chemical characterization of soil. Operational theory of applicable instruments including atomic spectrscopic (ICP, AA, ICP-MS, XRF), chromatographic (GC, GC-MS, HPLC, IC), and potentiometric methods. Laboratory component hands-on experience of chemical methods.

5813. Soil-Plant Nutrient Cycling and Environmental Quality. Prerequisite: 4234 or equivalent. Theory and application of soil plant relationships in production and nonproduction environments. Nutrient cycling, mass balance, soil nutrient supply and plant response. Methods to reduce the impact of nutrients on environmental quality, soil-plant buffering and response models.

5990. Soil Physical Analyses. 1-2 credits, maximum 2. Lab 1 or 2. Prerequisite: 4683. Principles and techniques.

6000. Doctoral Thesis. 1-6 credits, maximum 20. Prerequisite: consent of adviser. Independent research to be conducted and reported with the supervision of a major professor as partial requirement for the Ph.D. degree.

6010. Advanced Topics and Conference. 1-6 credits, maximum 12. Prerequisite: M.S. degree. Supervised study of advanced topics. A reading and conference course designed to acquaint the advanced student with fields not covered in other courses.

Spanish (SPAN)

1115. Elementary Spanish I. Lab 1 1/2. Pronunciation, conversation, grammar and reading.

1225. Elementary Spanish II. Lab 1 1/2. Prerequisite: 1115, or equivalent.

2111. (Intermediate Spanish I. Lab 1. Prerequisite: 1225 or equivalent. A continuation of SPAN 2113. Must be taken concurrently with SPAN 2113.

2113. (Intermediate Spanish II. Lab 1. Prerequisite: 1225 or equivalent. A continuation of SPAN 2125. Must be taken concurrently with SPAN 2112.

2222. (Intermediate Spanish III. Lab 1. Prerequisite: 2112 and 2113 or equivalent. Skill consolidation with emphasis on conversation and reading. May be taken concurrently with 2223.

2223. (Intermediate Spanish IV. Lab 1. Prerequisite: 2112 and 2113 or equivalent. Skill consolidation with emphasis on conversation and composition. May be taken concurrently with 2222.

3003. (H,1)Survey of Spanish Literature. Prerequisites: 2222 and 2223, or equivalent. Development of Spanish and Spanish-American literature to the present. Class conducted in Spanish.
3200
(l) Advanced Conversation and Composition. 1-3 credits, maximum 3. Lab 0-6. Prerequisite: 2222 and 2223, or equivalent. Practice in composition and stylistics, designed to bring students up to a high level of proficiency in speaking and in writing. Spanish majors must take all three credits in one semester.

3210
(l) Advanced Grammar. 1-3 credits, maximum 3. Prerequisites: 2222 and 2223, or equivalent. Spanish majors must take all three credits in one semester.

3333
(H,I) Hispanic Civilization I. Prerequisite: 2222 and 2223, or equivalent. Reading and discussion of selected texts outlining the development of contemporary Spanish civilization. Classes conducted in Spanish.

3463
(l) Advanced Diction and Phonetics. Lab 1. Prerequisite: 2222 and 2223, or equivalent. Required course for teacher certification/licensure. Spanish speech sounds and intonation patterns, with practice to improve the student's pronunciation.

4113
(H,I) Chicano Literature and Civilization. Prerequisite: one 3000-level Spanish course, or equivalent. Reading, analysis, and discussion of the most outstanding works in Chicano literature produced since 1848. Contemporary works are emphasized. Classes conducted in Spanish.

4173
(H,I) Hispanic Drama. Prerequisite: one 3000-level Spanish course, or equivalent. Reading and interpretation of dramatic works selected from the Hispanic literatures.

4220
(l) 20th Century Hispanic Literature. 1-3 credits, maximum 3. Prerequisite: one 3000-level Spanish course, or equivalent. Major 20th century Hispanic writers.

4243
(l) Translation and Writing of Documents. Prerequisite: one 3000-level Spanish course, or equivalent. Translation of documents produced by government agencies, universities, business and industrial organizations. Writing of letters, memos and contracts.

4253
(H,I) Masterpieces of Hispanic Literature I. Prerequisite: one 3000-level Spanish course, or equivalent. Reading and analysis of classics selected from the Hispanic literatures.

4263
(H,I) Masterpieces of Hispanic Literature II. Prerequisite: one 3000-level Spanish course, or equivalent. Reading and analysis of classics selected from the Hispanic literatures. A continuation of 4253.

4333
(H,I) Hispanic Civilization II. Prerequisite: one 3000-level Spanish course, or equivalent. Reading and discussion of selected texts outlining the development of contemporary Hispanic civilization outside the Iberian peninsula. Classes conducted in Spanish.

4550
(l) Seminar in Spanish. 1-3 credits, maximum 9. Prerequisite: one 3000-level Spanish course, or equivalent. Readings and discussion of vital subjects in Spanish.

5110*
Advanced Hispanic Studies. 1-3 credits, maximum 9. Lab 18A. Prerequisite: 22 hours of Spanish or graduate standing in foreign language.

Special Education (SPED)

3202
Education of Exceptional Learners. Learning characteristics, needs and problems of educating the exceptional learner in the public schools. Implications of the learning, environmental and cultural characteristics; planning and program assistance available for accommodating the exceptional learner in regular and special education programs; observation of exceptional learners.

3240
Observation and Participation in Special Education. 1-3 credits, maximum 6. Lab 1-3. Supervised activities with various types of exceptional learners and the educational provisions for them. Graded on a pass-fail basis.

3633
Assessment and Intervention for Exceptional Infants and Children-Birth to Age 6. Assessment techniques and intervention strategies appropriate for exceptional infants and young children. Basic theories of development and research supportive of various intervention strategies and assessment techniques.

4453*
Educational Diagnosis and Remediation. Provides skills in the application of standardized and informal assessment information for educational planning. Includes analysis of commonly used achievement, perceptual, motor and language tests and behavioral analysis techniques.

4513*
Introduction to the Emotionally Disturbed. Characteristics, identification and teaching of the emotionally disturbed or behavior disorder student; a variety of theoretical approaches to the subject.

4613*

4640
Student Teaching in Special Education. 1-12 credits, maximum 12. Supervised teaching experience in the area of special education in which the student is preparing to qualify for a teaching certificate. Graded on a pass-fail basis.

4643
Clinical Teaching Seminar. Lab 2. A supervised clinical experience with special needs individuals. Practical application of skills in instructional techniques and approaches, writing and implementation of IEPs and lesson plans, developing or selecting appropriate activities and materials.

4653*
Education of the Mentally Retarded. Education program needs and social-cultural environment of mentally retarded children, adolescents and adults.

4713*
Individualizing Education Programs for Exceptional Individuals. Techniques for teaching individuals with handicapping conditions.

4723*
Curriculum and Methods for Teaching Mentally Retarded Adolescents and Adults. Techniques for teaching the mentally retarded individual from adolescence through adulthood.

4753*
Techniques of Behavior Management and Counseling with Exceptional Individuals. Techniques to develop and evaluate programs of behavior change for exceptional students including counseling with the exceptional individual and conferencing with professionals and parents.

5000*
Master's Thesis. 1-6 credits, maximum 6.

5320
Seminar in Applied Behavioral Studies. 3-6 credits, maximum 6. In-depth exploration of contemporary problems of applied behavioral studies.

5523*
Characteristics of Students with Severe and Profound Disabilities. Educational, psychological and physiological characteristics of students with severe and profound disabilities.

5573*
Communication Strategies for Individuals with Severe and Profound Disabilities. Methods for communicating with severely or profoundly disabled persons and for facilitating their communication through speech, sign, assistive devices and technology.

5583*
Methods for Teaching Persons with Severe and Profound Disabilities. Instructional procedures and resources available for working with the severely or profoundly disabled learner.

5620*
PRACTICUM WITH EXCEPTIONAL LEARNERS. 1-8 credits, maximum 8. Lab 1-8. Prerequisite: consent of instructor. Supervised individual and group experience with exceptional learners. The particular experience (learning disability, mental retardation, gifted, etc.) determined by the student's field of specialization.

5623*
Characteristics of Students with Disabilities. Educational, psychological and physiological characteristics of students with mild and moderate disabilities.

5633*
Behavior Characteristics of Exceptional Individuals. Individual differences and problems that exceptional individuals experience. Educational programs and resources available to assist administrators, teachers and parents in dealing with unique individual needs.

5643*
Counseling Parents of Exceptional Children. Aiding the classroom teacher and other professional personnel in the understanding of unique activities and interpersonal relations involved in counseling with parents of exceptional children.

5653*
Play Therapy in Special Education. Theories and principles of play therapy. The application of play therapy for special education children. Supervised clinical experience with children with emotional, social and psychological problems.

5673*
Developmental Language for the Exceptional Individual. Normal language development and variations from norms demonstrated by handicapped learners. Theoretical approaches to language training, formal and informal assessment techniques, and instructional methods.
Intensive practice in the educational setting is crucial for students with disabilities. Teaching strategies must be adapted to meet the needs of students with mild and moderate disabilities and the theoretical bases for these techniques and approaches. Professional roles of the teacher of students with mild and moderate disabilities include communication with other teachers.

5733* Teaching Strategies for the Physically Handicapped. Types of physical handicaps, educational implications and various adjustments for optimal functioning.

5743* Curriculum Modifications for Exceptional Individuals. Materials and resources designed for use by teachers and other professionals, paraprofessionals and parents in working with exceptional individuals. Includes commercial and teacher-student-made materials.

5783* Psycho-educational Testing of Exceptional Individuals. Intensive practice in the selection, administration and interpretation of individual tests, appropriate for exceptional individuals.

5923* Characteristics and Identification of the Emotionally Disturbed Learner. Characteristics and identification of the emotionally disturbed/behavior-disordered learner. Trains the teacher to identify the emotionally disturbed/behavior-disordered learner.

5853* Advanced Methods for Teaching the Mentally Retarded. A review of research and methodological developments related to the instruction of mentally retarded children, adolescents and adults.

5873* Instructional Strategies and Resources for the Emotionally Disturbed Learner. Instructional procedures and resources available for working with the emotionally disturbed/behavior-disordered learner. A wide range of theoretical approaches explored.

5883* Behavior Management and Affective Education. The utilization of various approaches to the management of individual and group behavior; affective education in a wide range of instructional settings.

5993* Diversity in Special Education. Examination of the influence of ethnic, socioeconomic class, and gender factors on students with disabilities. ‘Ethnographic inquiry’ through Service-Learning Field Placements for understanding cultural diversity and special education. Applicable educational approaches.


6063* Research Topics in Special Education. Prerequisites: REMS 6003, 6013. Classic and current significant research topics; review and reinforcement of professional inquiry skills in reading, utilizing, planning, conducting and reporting research in special education.

6183* Legal Aspects in Special Education. Familiarization and analysis of legal rights and responsibilities of students and parents, as well as responsibilities of students, educators, and administrators in special education; federal and state mandates, case law and recent legal developments affecting special education.

6563* Program Development in Special Education. Physical, social and psychological factors in communities such as power structure, economics, prejudice, religion, as well as national activities influential in establishing programs for the exceptional student.

6603* Current Trends and Issues in Special Education. Current research and literature regarding the education of exceptional children.

6650* Directed Reading. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Directed reading for students with advanced graduate standing.

6680* Internship in Education. 1-8 credits, maximum 8. Lab 3-24. Directed off-campus experiences designed to relate ideas and concepts to problems encountered in the management of the school program.

Speech Communication (SPCH)

2713* Introduction to Speech Communication. Principles and techniques of preparing for, participating in and evaluating communication behavior in the conversation, the interview, group discussion and the public speech. A competency-based approach.

3010* Speech Activity Participation. 1-3 credits, maximum 6. Preparation for, and participation in, speech communication and speech pathology activities.

3703* Small Group Communication. General systems approach to small group processes. Special consideration given to group roles, norms, leadership and decision making. Participation in various types of discussion groups.

3720* Practicum I. 1-2 credits, maximum 2. Prerequisite: speech communication major. Communication facilitation for the speech communication major, with student’s initial role as interventionist.


3733* (S)Elements of Persuasion. Principles and concepts of interpersonal and public persuasive encounters. The instrumental and interactive nature of persuasion. Designing and participating in actual persuasive campaigns.

3743* Advanced Public Speaking. The preparation and delivery of various types of public speeches.

3793* Communication in Interviews. General principles of interviewing. Specific guidelines for the interviewer in survey, journalistic, counseling, selection, appraisal, legal, medical, and sales interviews.

4010 Independent Study in Speech Communication. 1-3 credits, maximum 3. Prerequisite: consent of instructor. Supervised research projects in speech communication.

4703* Communication Theory. Survey of current theories and models dealing with symbolic and communicative behavior.

4710* Topics in Speech Communication. 1-3 credits, maximum 6. Selected current topics in speech communication.

4720* Practicum II. 1-3 credits, maximum 3. Prerequisite: consent of instructor. Individual research projects providing practical experience for advanced undergraduate students on and off campus.

4723* (H)History of Public Address. Analysis of speeches of selected American orators as artifacts and rhetorical responses. Content, structure and style of the speeches and the historical situations in which they were given.

4733* Legal Communication. Analysis and applications of oral communication and analytical skills required for effective performance in trial courts. Course culminates in a day-long mock trial.

4743* Problems of Interpersonal Speech Communication. Application of communication theory to interactions in person-to-person settings. Identification and management of barriers related to the concept of perception, attraction, self-disclosure, listening and conflict.

4753* Intercultural Communication. Social and cultural differences between individuals from diverse backgrounds as possible barriers to effective communication.

4763* Organizational Communication. The interface between communication theory and organizational structure. Nature of communication problems in organizations, strategies for overcoming such problems and the design of effective communication systems in organizational settings.


4793* (S)Nonverbal Communication. Nonverbal aspects of speech communication.

4993* Senior Honors Thesis. Prerequisites: departmental invitation, senior standing. Honors Program participation. A guided reading and research program ending with an honors thesis under the direction of a faculty member. Required for graduation with departmental honors in speech communication.

5000* Research and Thesis. 1-3 credits, maximum 6. Prerequisite: approval of major professor. Research in speech and audiology.

5013* Introduction to Graduate Study. Research methods with special emphasis on those used most frequently in communication research: professional opportunities in the various speech fields; practical experience in outlining a piece of research.

5023* Introduction to Quantitative Research in Speech. Methods and major findings of empirical research in speech.
Statistics (STAT)

2013 *Elementary Statistics. Prerequisite: MATH 1483 or 1513. An introductory course in the theory and methods of statistics. Descriptive measures, elementary probability, samplings, estimation, hypothesis testing, correlation and regression. No credit for students with credit in 2023.

2023 *Elementary Statistics for Business and Economics. Prerequisite: MATH 1483 or 1513. Basic statistics course for undergraduate business majors. Descriptive statistics, basic probability, discrete and continuous distributions, paired data analysis, estimation, hypothesis testing, correlation and regression. No credit for students with credit in 2013.

3013 Intermediate Statistical Analysis. Prerequisite: 2013 or 2023. Applications of elementary statistics, introductory experimental design, introduction to the analysis of variance, simple and multiple linear regression, nonparametric statistics, survey sampling, time series and Bayesian analysis.

4013 *Statistical Methods I. Lab 2. Prerequisite: 3013 or 4013 or 4033. Basic experimental statistics, basic probability distributions, methods of estimation, tests of significance, linear regression and correlation, analysis of variance for data that are in one way, a two-way crossed, or in a two-fold nested classification.

4023 *Statistical Methods II. Lab 2. Prerequisite: 3013 or 4013 or 4033. Basic concepts of experimental design. Analysis of variance, covariance, split-plot design. Factorial arrangements of treatments, multiple regression in estimation and curvilinear regression, enumeration data.

4033 *Engineering Statistics. Prerequisite: MATH 2155. Introduction to probability, random variables, probability distributions, estimation, confidence intervals, hypothesis testing, linear regression.

4043 *Applied Regression Analysis. Prerequisite: one of 4013, 4033, or 5013 or equivalent. Matrix algebra, simple linear regression, residual analysis techniques, multiple regression, dummy variables.

4091 *Statistical Analysis System. Prerequisite: 4013 or equivalent. SAS dataset construction, elementary statistical analysis, and use of statistics and graphics procedures available in the SAS package.

4113 *Probability Theory. Prerequisites: MATH 2155 and one other course in MATH that has either 2145 or 2155 as a prerequisite. Basic probability theory, random events, dependence and independence, random variables, moments, distributions of functions of random variables, weak laws of large numbers, central limit theorems.

4203 *Mathematical Statistics I. Prerequisite: MATH 2155. Introduction to probability theory for students who are not graduate majors in statistics or mathematics. Probability, dependence and independence, random variables, univariate distributions, multivariate distributions, moments, functions of random variables, moment generating functions.

4213 *Mathematical Statistics II. Prerequisites: 4203 and MATH 3013. Statistical inference for students who are not graduate majors in statistics or mathematics. Sampling distributions, maximum likelihood methods, point and interval estimation, hypothesis testing.

4223 *Statistical Inference. Prerequisites: 4113 and MATH 3013. Sampling distributions, point estimation, maximum likelihood methods, Rao-Cramer inequality, confidence intervals, hypothesis testing, sufficiency, completeness.

4910 *Special Studies. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Special subjects in statistics.

4993 Senior Honors Project. Prerequisites: departmental invitation, senior standing, Honors Program participation. A guided reading and research program ending with an honors project under the direction of a faculty member, with a second faculty reader and an oral examination. Required for graduation with departmental honors in statistics.


5013 *Statistics for Experimenters I. Prerequisites: graduate standing and MATH 1513. Introduction to probability, random variables, probability distributions, fundamentals of statistical inference, hypothesis testing, regression, one-way classification, analysis of variance, comparative experiments, correlation and linear regression, introduction to categorical data analysis.

5023 *Statistics for Experimenters II. Prerequisites: graduate standing and 4023 or 5013. Analysis of variance, covariance, use of variance components and their estimation, completely randomized, randomized block and Latin square designs, multiple comparisons.

5033 *Nonparametric Methods. Prerequisite: one of 4023, 4043, 5023 or consent of instructor. A continuation of 4013 and 4023, concentration on nonparametric methods. Alternatives to non-parametric statistical methods; analysis of categorical and ordinal data, methods based on rank transforms, measures of association, goodness of fit tests, order statistics.

5043 *Sample Survey Designs. Prerequisite: one of 4013, 4033, 5013 or consent of instructor. Constructing and analyzing personal, telephone and mail surveys. Descriptive surveys including simple random, stratified random designs. Questionnaires, logistic models, analyses involving errors, use of random number tables, sample size estimation and other topics related to practical conduct of surveys.


5063 *Multivariate Methods. Prerequisites: 4043 and 5023 or equivalent. Analysis of data involving variables of a categorical nature. Contingency tables, exact tests, binary response models, loglinear models, analyses involving ordinal variables, multinomial response models. Computer usage for analysis is discussed.

5113 Intermediate Probability Theory. Prerequisites: 4113 and MATH 5143. Measure theoretic probability, random variables, dependence and expectation, product spaces and independence, conditioning, different kinds of convergence in probability theory, statistical spaces, characteristic functions and their applications. Same course as MATH 5113.

5133 *Stochastic Processes. Prerequisites: 4113 or MATH 2233, MATH 3013. Definition of a stochastic process, probability structure, mean and covariance function, the set of sample functions, stationary processes and their spectral analyses, renewal processes, counting processes, discrete and continuous Markov chains, birth and death processes, exponential model queueing theory. Same course as IEM 5133 and MATH 5133.

5203 *Large Sample Inference. Prerequisites: 4223* and 5113. Different types of convergence in probability theory, central limit theorem, consistency, large sample estimation and tests of hypotheses, concepts of asymptotic efficiency, nonparametric tests.

5213 *Bayesian Decision Theory. Prerequisite: 4223. Statistical spaces, decision spaces, loss and risk, minimum risk decisions, conjugate families of distributions, Bayesian decisions.
5303* Experimental Design. Prerequisite: 5023 or 4203 with consent of instructor. Review of basic concepts and principles of comparative experiments, the role of randomization in experimentation, interpretation of effects and interactions in multi-factor designs, error term selection principle, multiple comparisons, split-plot experiments, incomplete block designs, confounding of factorial effects in 2n and 3n factorial designs, single and fractional replications, application optimum seeking designs, pooling of experiments over time and space, crossover and switch back designs.

5323* Advanced Design of Experiments. Prerequisites: 5303 and 5323 or consent of instructor. Construction of various experimental designs, such as mutually orthogonal series of Latin Squares, balanced and partially balanced incomplete block designs, confounded and fractionally replicated designs. Response surface methodology. Theory of factorial arrangements of treatments. Confounding of factorial effects. Fractional replication of factorials, confounding in mixed series of factorials, randomization tests, transformations of data, plot techniques and principles of split-plot techniques. Analysis of series of experiments and analysis of covariance.

6910* Special Problems. 1-6 credits, maximum 12. Investigation of special problems in the theory and application of statistics using current techniques. Special studies for Ph.D. level students.
Practices and Problems in Integrating Academic and Vocational Education. Prerequisite: 4103 or consent of instructor. Experience in learning, designing, and practicing strategies that technical and industrial teachers use to integrate academic competencies into their particular curricula. Design and presentation of cognitive psycho-motor and affective occupational lessons that integrate math, social studies, science and/or English-related competencies.

School-to-Work Transition. Strategies and procedures for coordinating school-to-work transition programs (e.g., cooperative education, youth apprenticeship, career exploration). Planning, organizing, implementing, and evaluating school-related, work-based learning.

Supervision of Vocational Education. Prerequisite: consent of instructor. Role and function of administrators responsible for supervising the planning, implementation and management of vocational education programs.

Evaluation of Instruction. Principles of evaluation and methods for applying these principles to improve the effectiveness of vocational education programs.

Teaching Related Information. Selection of job-related topics common to most trades with procedures for incorporating those topics into the regular curriculum.

Advanced Instructional Procedures in Trade and Industrial Education. Advanced methods and procedures for effective teaching and learning in the trade and industrial classroom and laboratory. Teaching basic educational and employment skills and the selection of job-related topics common to most occupations with procedures for incorporating those topics into the regular curriculum.

Guidance, Placement and Follow-up in Occupational Education. Teacher-counselor cooperation in vocational student advise ment, placement and follow-up.

Individualizing Competency-based Instruction Programs. Develops knowledge and skills utilizing the concept of open entry/open exit necessary for planning, developing and implementing a competency-based vocational education program.

Vocational Education, Community and Industry Relations. Exploration of strategies for developing meaningful relationships among vocational educators, industry representatives, and community members to increase the likelihood that the needs of students, workers, employers and community members are met.

Conference Leading. Developing skills in planning, organizing and leading conferences.

Developing and Analyzing Teaching Content. 1-3 credits, maximum 6. Provides opportunity for experienced teachers to incorporate the latest industrial technology into their course of study.

Introduction to Technical Education. The role and function of technical education in the development of human resources. Historic and philosophic bases for technical education with emphasis on programs, purposes, and objectives and the variety of environments in which such programs exist.

Occupational Analysis. Techniques for determining educational requirements of technical occupations. Analysis systems used by educational institutions, the military and the United States Department of Labor.

Instructional Design for Training. Design and development of training to address performance problems in organizations, business and industry. In-depth study of a systematic approach to training for performance. Same course as HRAE 5433.

Introduction to Industrial Technology Education. Industrial technology education in a modern educational system, including the historical and philosophic bases for such programs. Purposes, objectives and functions of contemporary industrial arts and technology education programs in public schools. Participation in on-site observation experience in the public schools.


Materials and Processes. Lab 4. Introduces students to the basic properties of metallic, polymeric, wood, ceramic and composite materials and the proper techniques used to convert the materials into products. Special attention is given to the safety and care of industrial equipment.

Constructing Structures. Lab 3. Prerequisite: 3033 or equivalent or consent of instructor. Comprehensive study of the activities involved in preparing to build, building, and completing residential, commercial, industrial, and civil structures.

Industrial Communication Graphics. Lab 4. Methods and techniques for the visual communication of information and ideas. The elements of drafting, design, screen printing and photography into a total concept of modern graphic communication.

Methods for Teaching Technology Education Systems. Lab 3 Prerequisites: 3033 and 3550 or consent of instructor. Unique methods and activities are specifically adapted for and related to the systems in technology education. Fundamental and specific methods preparation for those students planning to teach technology education in the public schools.

Manufacturing Enterprise. Lab 3. Prerequisite: 3033. The managed activities used to design, engineer, produce, and market manufactured products. Additional emphasis on providing financial and personnel support for these activities.

Fundamentals of Power Technology. Lab 3. The inputs, processes, and outputs associated with energy systems. Emphasis on the sources of energy; methods of controlling, converting, and transmitting energy; and the utilization of energy conversion systems. Practical experience in overhaul and tune-up of small two- and four-cycle engines.

Research and Development in Industrial Technology Education. Lab 3. Prerequisites: 3033 and 3553. The methodology and practices of technical research and development as conducted in an industrial and educational setting. Laboratory activities performing basic tasks associated with product and process research and development.

Seminar in Industrial Technology Education. 1-3 credits, maximum 3. Oral and written discussion of selected current interest topics concerning industrial arts and technology education. Forum for review of research proposals, student programs, other projects and ideas having an impact on the industrial arts and technology education profession.

Special Problems in Technical Content in Industrial Arts and Technology Education. 1-3 credits, maximum 6. Prerequisites: 3033 and 3553 or equivalent or consent of instructor. Problems associated with the technical content areas in industrial arts and technology education. Introduction of new and advanced technical systems into the curriculum of public school technology education programs.


Telecommunications Management (TCOM)

Telecommunications Laboratory. Prerequisite: EGEN 3553, TCOM 5123 or co-requisite. Familiarization with the hardware used to move voice, data and video traffic. Data network experiments include set up and operation of a small LAN, interconnection of these LANs via bridges or routers, and attachment of voice and video modules to the LANs. Telephone network experiments include installation of small PBXs and interconnection of them to the campus phone system, and interconnection of the lab PBXs with crosspoint switches and fiber. Video experiments include interconnection and operation of a small two-camera studio, and digitizing and transferring the video over the lab's small PBX system. Practical operating aspects and standards of distance transmission devices, switching equipment media for transmitting data, voice and video signals. Handling information problems within selected environments.
513* Industry Overview and Telecommunications Applications. Prerequisites: graduate standing and consent of program director. Overview of telecommunications industry, technology, regulatory environment, and current top themes in the networking and transport layers using TCP/IP, IPX/SPX, and Netbeui, as well as security issues and other multi-layer protocol suites. Flow control, RSVP, encryption, compression, and LAN/WAN applications.

512* Telecommunications Systems II. Prerequisites: ECEN 5553 and consent of program director. Applied technical coverage of selected topics from the upper layers of the OSI model. Applications and management of a network. Systems analysis and design of telecommunications networks covering voice, data, and video. Management of a network. Technical as well as managerial aspects of telecommunications technologies. Guest speakers from the telecommunications industry.

514* Telecommunications Analysis, Planning and Design. Prerequisites: ECEN 5553 and consent of program director. Introduction to the basic system analysis tools and the procedures for conducting a system analysis. System requirements, the initial analysis, the general feasibility of study, structured analysis, detailed analysis, logical design, and the general system proposal. Current system documentation through use of classical and structured tools and techniques for describing flows, data flows, data structures, file designs, input and output designs, and program specifications.

515* International Telecommunications Management. Prerequisites: graduate standing and consent of program director. Investigation of the relationships of institutions that affect the use of telecommunication. The various parts of the federal government involved, such as the Department of Commerce, the FCC and the Department of State. The role of international institutions, including the ITU, UNESCO, and the various satellite organizations such as INTELSAT.

516* Telecommunications Practicum. Lab 3. Prerequisites: graduate standing and consent of program director. Application of knowledge and skills gained in core courses in an organizational environment to solve telecommunications management problems. Integration of concepts and adaptation of theory to fit organizational reality.

520* Network Design and Management. Prerequisites: ECEN 5553 and consent of program director. Technical as well as managerial aspects of developing an integrated communication network. Systems analysis and design of the communications networks covering voice, data and video. Management of a network.

530* Advanced Topics in Telecommunications Management. Prerequisites: graduate standing and consent of program director. Advanced topics in the interdisciplinary field of telecommunication management, such as legal and regulatory issues, electronic commerce, internet and intranet development.

535* Advanced Telecommunications Management Lab. 2-3 credits, maximum 3. Lab 2-3. Prerequisites: consent of program director. Advanced state-of-the-art topics in voice, data and video. Hands-on network experiments beyond coverage in the required TCOM 5012 lab.

5990* Directed Studies in Telecommunications Management. 1-6 credits, maximum 6. Prerequisites: graduate standing and consent of program director. Special advanced topics, projects and independent study in telecommunications management.

Theater (TH)

1500 Theater Practicum. 1 credit, maximum 6. Lab 2. Laboratory experience in theater production, acting and crew assignments. Graded on a pass-fail basis.

1533 Voice and Diction. Freeing the natural voice; development of proper breathing techniques, resonance, and range; use of International Phonetic Alphabet in developing articulation and pronunciation; exercises in phrasing and intonation; preliminary dicta work.

2413 (H)Introduction to the Theater. Character, plot, thematic, historical and production analyses of various types of plays scripts; understanding the work of various theater artists; developing appreciative audiences.

2513 Oral Interpretation. Reading aloud effectively; training in voice improvement, platform techniques, selection criteria and audience analysis.

2543 Acting I. Lab 4. Ensemble techniques and creative improvisation; vocal and physical development for the actor; theories and techniques of acting; fundamental scene and character analysis; scene performance workshops.

2553 Introduction to Stage Design. Lab 2. Prerequisites: 2663, 2673 or consent of instructor. An integrated overview of the theory and practice of design for the stage.

2663 Stage Technology. Lab 6. Elementary techniques of stagecraft and costume for the stage. Basic stagecraft skills. Practical experience preparing departmental productions.


3023 (H)Theater History I. Aesthetic and social relationships of theater and western civilization from primitive times to the mid-17th century.

3123 (H)Theater History II. Aesthetic and social relationships of theater and western civilization from the mid-17th century through the 19th century.

3223 (H)Theater History III. Aesthetic and social relationships of theater and western civilization from 1900 to the present.

3400 Upper-division projects. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Individual or group study of techniques, history, or literature of the theater. Required written summary of the project and self-evaluation of its results, or a term paper.

3733 Stage Movement for Actors. Techniques and exercises to build the actor's awareness and abilities for use of the body instrument on stage; preparation and readiness routines; rhythms, postures, and movement patterns appropriate to various styles of theater and specific character roles.

3734 Acting II. Prerequisite: 2543. Continuation and refinement of 2543. Textual and character analyses, characterization and inner techniques. Audition techniques and realistic comedy through scene work with contemporary plays.


4123* (H)Stage Costume History I. Comprehensive history of theatrical costume from ancient Egypt to 1700. Impact of fashion on the stage.

4143* Acting III. Prerequisite: 3743. Continuation and refinement of 3743. Performance techniques in classic to modern styles. Shakespeare to Miller.

4183* Scene Design for Theater and Television. The designer's approach to the script; execution of sketches, models and working drawings.

4323* (H)Stage Costume History II. Comprehensive history of theatrical costume from 1700 to the present. Impact of fashion on the stage.

4403 Senior Honors Project. Prerequisites: departmental invitation, senior standing, Honors Program participation. A guided reading and research program ending with an honors thesis or performance under the direction of a faculty member, with second faculty committee member. Required for graduation with departmental honors in theater.

4593* Lighting for Theater and Television. Lab 2. Stage lighting design, elementary electricity, design of lighting instruments. Practical experience in lighting in preparing and running departmental productions.

4753* Stage Management. Prerequisite: consent of instructor. Procedures and skills of effective stage management. Authoritative coordination of performers and technicians during rehearsal and performance periods. Maintenance and use of the production prompt book, notation of ground plan and blocking; scene shifts; cues for lighting, sound, special effects, and performers; opening and calling the show; post-show wrap-up. Practical experience in stage managing student directed scenes.

4953* Directing. Prerequisite: 2543. Play analysis for production, problems in staging, and the role of the director. Planning and direction of scenes in laboratory situations.

4963* Theater Graphic Techniques. Fundamentals of theater graphic techniques to communicate theatrical design ideas.

4973* Stage Costume Design. Lab 4. Approaches to basic costume design including research, conceptual analysis, figure drawing, and executions of sketches and renderings.
Scenography. Prerequisites: proven experience in scenery, lighting and costume design and consent of instructor. Scenographic design processes for the advanced theater design student. Investigation of design styles and theories and the designer's whose works advanced these theories; practical application of designing scenery, lighting and costumes.

Script Analysis. Analytical and interpretive techniques in studying play scripts for theatrical production. Emphasis on writing skills appropriate to script analysis.

Problems in Advanced Acting. Prerequisite: 4143 and consent of instructor. Experimentation in psychological realism. Concentration on analysis, technical skills, and contacting the emotions. Special preparations for professional interviews and auditions.

Seminar in Theater. 1-3 credits, maximum 12. Prerequisite: consent of instructor. Individual or group studies of techniques, history or literature of the theater. A term paper or written report and self-evaluation of the study or project required.


Individual Theater Projects. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Individual projects in directing, acting, or design and technology for a specified theater production, with concept, realization, and self-evaluation under faculty guidance.

Problems in Advanced Directing. Prerequisites: 4953, consent of instructor. Problems in directing period styles, especially Shakespeare. Restoration comedy, absurdist drama, and early genre drama. Preparation, rehearsals and staging of a complete production by each student.

Veterinary Anatomy, Pathology and Pharmacology (VAPP)

5000* Masters Thesis and Research. 1-6 credits, maximum 6 for PHSI; 1-6 credits, maximum 8 for VPATH. Prerequisite: graduate standing. Research in physiological sciences and veterinary pathology. Graduate credit in meeting requirements for M.S. degree.

5110 Problems in Physiology. 1-5 credits, maximum 20. Prerequisite: consent of instructor. Investigations in physiology for graduate and advanced undergraduate students.

5224* Integrative Vertebrate Cell Structure and Function. Prerequisites: BIOL 3653; ZOOL 3204 or ZOOL 4215; consent of instructor. The relationship between structure and function underlying essential processes occurring within individual cells and in interactions among cells. Emphasis on integration of knowledge of morphology, metabolism and physiology to facilitate a comprehensive understanding of the function of vertebrate organisms at the cellular level.
620* Topics in Advanced Pharmacology and Toxicology. 1-5 credits, maximum 15. Prerequisite: consent of instructor. Selected topics in advanced pharmacology and toxicology such as cardiopulmonary, gastrointestinal or neuropharmacology; chemotherapeutics; heavy metal, chemical or plant toxicology or bio-toxicology. Repeatable; re-enrollment permits study of additional topics.

622* Fertilization and Early Development. Prerequisite: consent of instructor. Gametogenesis, fertilization, and the activation of embryonic development, described at the cellular and molecular level. Emphasis on current literature.

623* Laboratory in Electron Microscopy. Lab 12. Prerequisite: consent of instructor. Student learns to prepare specimens for, and to operate, the electron microscope, and techniques for printing and preparation of electron micrographs for publication.

6440* Applied Veterinary Agronomics. 1-3 credits, maximum 6. Lab Applications of soil-plant-animal interrelationships to the practice of veterinary medicine.

6524* Pathology of Infectious Diseases. Prerequisite: 5425. Pathology of domestic and exotic infectious diseases of food and companion animals and methods employed in diagnosis.

6550* Problems in Functional Morphology. 1-3 credits, maximum 12. Lab 3-9. Prerequisite: consent of instructor. Investigations in comparative, gross, developmental or histologic morphology for graduate students.

6560* Advanced Pathology Techniques and Special Problems. 1-6 credits, maximum 20. Prerequisite: graduate standing in biological sciences and consent of instructor. Investigations of contemporary techniques and methods used in diagnosis, technical work and research in pathology.

6564* Veterinary Toxicology. Lab 2. Prerequisite: third-year standing in the College of Veterinary Medicine or consent of instructor. Veterinary toxicological problems and therapeutics. Identification of selected poisonous plants and discussions of their toxicity.

6570* Seminar. 1-6 credits, maximum 6. Consideration of literature and research problems pertaining to physiological sciences.

6612* Poultry and Laboratory Animal Diseases. Prerequisite: 5425 or consent of instructor. Biological characteristics, husbandry, diagnosis, prevention, and treatment of diseases of domestic poultry and selected species of animals used in teaching and biomedical research.

6701* Veterinary Physiological Science Topics. Lab 1. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Elective topics in physiological sciences related to veterinary medicine. Course can fulfill one of elective options of fourth-year veterinary medical degree requirements.

6733 Diagnostics. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Participation in animal necropsy, clinical pathology, and other investigative methods to study four diseases, prognosis, prevention and treatment of diseases. Graded on a pass-fail basis.

6811* Differential Diagnosis. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Exercises in the differential diagnosis of diseases of domestic animals.

6910* Seminar. 1-2 credits, maximum 6. Prerequisite: medical degree or graduate standing in biological sciences. For students with medical degrees: interpretation of histologic materials. For students with graduate standing in biological sciences: review of literature and discussion of research problems.

6920* Diagnostic Pathology. 1-4 credits, maximum 20. Prerequisite: graduate standing in the College of Veterinary Medicine or written consent of department head. Weekly review of current cases submitted to the department and the methods employed in diagnosis. Examination of necropsy reports, specimens, and preparations. Students required to formulate diagnoses.

6930* Laboratory Animal Pathology. Prerequisite: 6701 or consent of instructor. Etiology and pathogenesis of spontaneous and experimentally induced diseases of common-used species of laboratory animals.

6950* Advanced Systemic Pathology. 2-4 credits, maximum 12. Prerequisite: 5425, graduate standing, consent of instructor. Total credit not to exceed six for the M.S. degree and 12 for the Ph.D. Re-enrollment permits the study of two to four different groups of organs and systems of the animal body. A consideration of the pathogenesis and the morphological, biochemical, and comparative aspects of lesions found in organs and tissues of the domesticated animals.

6963* Advanced Clinical Pathology. Lab 3. Prerequisite: 5425 or equivalent; graduate standing and consent of instructor. Applied clinical biochemistry, organ function tests and related cytoclogic examination.

6970* Advanced Hematology. Lab 3. Prerequisite: 5425 or equivalent; graduate standing and consent of instructor. The etiology and pathogenesis of the diseases of the blood and bone marrow.

Veterinary Clinical Sciences (VCS)

5000* Thesis. 3 credits, maximum 3. Prerequisite: senior standing with registration for graduate credit or graduate standing. Research problem for credit in meeting requirements of the master's degree, under the supervision of a graduate faculty member and with consent of the department head.

5000* Thesis. 1-6 credits, maximum 6. Prerequisite: senior standing with registration for graduate credit or graduate standing. Research problem for credit in meeting requirements of the M.S. degree under the supervision of a graduate faculty member and with permission of the department head.

5110* Special Problems. 1-6 credits, maximum 6. Prerequisite: graduate standing or consent of department head. Special research problems in veterinary microbiology and parasitology.

5113* Veterinary Immunology. Lab 3. Prerequisite: first-year standing in the College of Veterinary Medicine or consent of instructor. Basic principles of immunology and their application to veterinary medicine.

5120* Current Topics in Veterinary and Biomedical Science. 1 credit, maximum 4. Prerequisite: a minimum of one undergraduate introductory course in microbiology. Development of oral presentation skills, critical thinking and deductive reasoning through the use of discussion of current literature from the field of veterinary and biomedical science as it pertains to the study of infectious disease in humans and animals.

5213* Diseases and Parasites of Wild Animals. Lab 1. Prerequisite: consent of instructor. A systematic approach to bacterial, viral and parasitic diseases of wild animals. Principles of disease transmission as it relates to individuals and populations of wild animals. Principles applicable to all areas of zoology, veterinary medicine and wildlife management.

5224* Veterinary Bacteriology and Mycology. Lab 2. Prerequisite: first-year standing in the College of Veterinary Medicine or consent of instructor. The basic principles of bacteriology and mycology that are applicable to the understanding of the pathogenesis, diagnosis, treatment, and control of bacterial and fungal infections of veterinary importance.

5242* Veterinary Biometry and Principles of Public Health. Prerequisite: first-year standing in the College of Veterinary Medicine. Statistics applied to biological observations applicable to veterinary medicine and principles of public health and epidemiology.

5245* Veterinary Metabolism and Nutrition. Prerequisite: consent of instructor. Functional metabolism in domestic animals; metabolic disorders using certain diseases as models. Principles of veterinary nutrition and their application in the prevention and treatment of diseases of animals.

5312* Veterinary Virology. Lab 3. Prerequisite: second-year standing in the College of Veterinary Medicine or consent of instructor. Viruses responsible for disease in domesticated animals.

5404* Techniques in Parasitology. Lab 1. Prerequisite: corequisite: 5425; consent of instructor. Helminthology or concurrent enrollment. Experimental application of basic research and teaching techniques in helminthology and protozoology. Individual participation and analysis of experimental situations and techniques applicable to all areas of zoology.
5413* Basic Reproductive Physiology. Prerequisite: ZOOL 3204. Female and male reproductive processes, the influences of environmental factors upon these processes and the application of reproductive physiology to animal production. Same course as ANSI 5113.

5523* Advanced Helminthology. Lab 3. Prerequisite: senior or graduate standing in zoology or parasitology or graduate standing or consent of department head. Structure, taxonomy, life cycles and host-parasite relationships of helminth parasites affecting invertebrate and vertebrate animals.

5533* Veterinary Virology. Prerequisites: 5313, MICR 4124 or equivalent. Discussion of theoretical and practical problems relating to the molecular biology of virus replication including virus structure and replication strategies, virus-host cell interactions, and anti-viral mechanisms.

5613* Biology of Parasites. Prerequisites: graduate standing, general parasitology, or consent of instructor. A systematic and ecological approach to the study of parasitology. Host-parasite relationships, physiology, ecology and behavioral aspects of parasitic organisms.

5723* Parasitic Protozoa. Lab 3. Prerequisite: graduate standing in zoology or entomology or consent of instructor. Structure, life cycle, physiology, host-parasite relationships, and diagnosis concerned with protozoan parasites.

5833* Veterinary Diagnostic Microbiology. Lab 2. Prerequisite: graduate veterinarian status or consent of instructor. Laboratory methods employed in the isolation of microorganisms and application of these methods in the diagnosis of specific animal diseases.

6000* Research Thesis. 1-11 credits, maximum 45. Prerequisite: candidacy for the Ph.D. degree. Research problems for graduate students to meet thesis requirement of the Ph.D. degree.

6110* Seminar. 1-6 credits, maximum 6. Prerequisite: graduate standing. Subjects for study and discussion for graduate students.

6120* Advanced Physiology of Selected Systems. 2-10 credits, maximum 10. Prerequisite: 5125 or ZOOL 4213. Advanced studies in gastrointestinal, cardiovascular, respiratory, excretory and neuroendocrine physiology. Each part of this sequential course may be taken for two hours credit. Student should ascertain the topics before registering for this course a second time.

6203* Advanced Concepts in Veterinary Immunology. Prerequisite: 5113 or BIOL 3653 or MICR 3254. Induction of immune responses, host defense mechanisms, immunoregulation, antigen presentation and immune recognition involving B and T lymphocytes, using contemporary research publications.

6273* Comparative Neurophysiology. Lab 2. Prerequisite: 5263. Physiology of mammalian nervous systems.

6410* Endocrine Control of Fuel Metabolism. 1-3 credits, maximum 3. Lab 0-2. Prerequisite: consent of instructor. Emphasis on cellular and molecular aspects of hormone action in target tissues as basis for understanding endocrine regulation of organ and whole body metabolism. Special reference to endocrine pancreas regulation of ketone, carbohydrate (glucose) and lipid (FFA) metabolism in pregnancy, lactation, fasting, obesity and diabetes. Content applicable to health and disease in humans and domestic animals. Course offered in spring semester or alternate years.

6613* Public Health and Preventive Medicine. Prerequisite: third-year standing in the College of Veterinary Medicine or consent of instructor. The relationship of zoonotic diseases to community and environmental health. Epidemiological principles in the practice of veterinary preventive medicine.

6701* Veterinary Physiological Science Topics. Lab 1. Prerequisite: fourth-year standing in College of Veterinary Medicine. Elective topics in physiological sciences related to veterinary medicine. Course can fulfill one of elective options of fourth-year veterinary medical students.

6753* Advanced Veterinary Epidemiology. Prerequisite: STAT 2013 or equivalent. The application of epidemiologic techniques to disease investigations in veterinary medicine. A group discussion format. Also a project involving the application of epidemiologic principle to population disease problems.

6763* Special Topics in Veterinary Immunology. Prerequisite: one course in immunology or consent of instructor. Recent advances of current interest in veterinary immunology. The subject matter varies from year to year.

Veterinary Medicine (VMED) 5111 Veterinary Medical Orientation I. Prerequisite: first-year standing in the College of Veterinary Medicine. Veterinary medical terminology, history and ethics of the profession, veterinary surveys of the biological kingdom, selected techniques and clinical presentations, and special topics. Graded on a pass-fail basis.

5155* Cell and Tissue Form and Function I. Prerequisite: first-year standing in the College of Veterinary Medicine or consent of instructor. Cell and tissue organization and structure at the microscopic level and physiology of organ systems. (8-week module).

5126* Cell and Tissue Form and Function II. Prerequisite: 5155 or consent of instructor. Continuation of VMED 5115. (8-week module).

5144* Gross and Developmental Anatomy. Prerequisite: first-year standing in the College of Veterinary Medicine or consent of instructor. Embryology and anatomy of domestic mammals using the dog as the primary model. Integrated lecture-discussion-laboratory format. The integration of developmental gross, radiographic and applied aspects of veterinary anatomy as they relate to a topographical appreciation of the living individual. An overview of domestic bird and laboratory animal anatomy.

5152* Zootechnology. Prerequisite: first-year admission to College of Veterinary Medicine fail second-year anatomy, identification, animal production and marketing systems and animal handling and restraint as it applies to production and marketing.

5162 Jurisprudence and Ethics. Prerequisite: first-year standing in College of Veterinary Medicine. Introduction to veterinary jurisprudence, ethics, licensing, government regulations, human-animal bond, and evolving issues in animal law and animal welfare.

5211 Clinical Techniques I. Prerequisite: first-year standing in College of Veterinary Medicine. Clinical orientation including rotations in instruction and service units in the College.

5221 Veterinary Medical Orientation II. Prerequisite: 5111. Major breeds of animals; veterinary perspectives concerning animal production and marketing systems; selected techniques and clinical presentations; and special topics.

5234* Comparative Anatomy. Prerequisite: 5144 or consent of instructor. Comparative and functional gross anatomy and developmental anatomy of domestic mammals. The integration of developmental, gross, radiographic, and applied clinical aspects of veterinary anatomy as they relate to a topographical appreciation of the living individual. Integrated lecture-discussion-laboratory format.

5255* Infectious Diseases I. Prerequisite: first-year standing in College of Veterinary Medicine or consent of instructor. Introduction to infection and immunity in domestic animals and the use of epidemiology to study disease in populations. Bacterial, viral, fungal, and parasitic defenses of animals to infectious agents. Basic principles of epidemiology including biometry, disease transmission, use of diagnostic tests, risk assessment and prevention of disease.

5264* General Pathology. Prerequisite: first-year standing in College of Veterinary Medicine or consent of instructor. Cellular and tissue pathology, pigments, inflammation, immunopathology, disturbances of growth and circulation, and neoplasia. Functional disturbances that accompany changes in structures as well as the causes and pathogenesis of diseases.

5313* Epidemiology, Food Safety and Public Health. Prerequisite: second-year standing in the College of Veterinary Medicine or consent of instructor. Principles and uses of epidemiology in veterinary medicine. Introduction to public health and diseases transmissible to humans, potential human health hazards in foods of animal origin and principles of safe food production, processing, handling, and inspection, including pathogen reduction, HACCP regulations, and pre-harvest food safety.
5323* Veterinary Parasitology I. Lab 2. Prerequisite: second-year standing in the College of Veterinary Medicine or consent of instructor. Introduction to the general principles of parasitism and parasites of veterinary medical importance including taxonomy morphology, biology of parasites, modes of transmission, host-parasite relationships, infectious processes and pathogenicity, diagnostic methods, treatment and control measures and public health importance.

5333* Pharmacology I. Prerequisite: second-year standing in College of Veterinary Medicine or consent of instructor. Introduction to the general principles of pharmacodynamics, drug disposition and pharmacokinetics, pharmacological effects, mechanisms of actions, metabolism, disposition, clinical indications and toxic effects of drugs acting on the autonomic, central nervous, cardiovascular, respiratory, and renal systems.

5342* Clinical Anatomy. Lab 6. Prerequisite: second-year standing in College of Veterinary Medicine. Aspects of gross anatomy as they relate to clinical applications.

5354* Infectious Diseases II. Lab 1. Prerequisite: second-year standing in College of Veterinary Medicine or consent of instructor. Important animal diseases caused by bacteria, fungi and viruses covered on a systems basis. Selected diseases covered in depth to convey the mechanisms of infectious disease processes and the relationship of such processes to disease development, diagnosis, treatment and control. The relationship of zoonotic diseases to community and environmental health as well as important zoonoses. Coverage includes the integumentary, respiratory, urinary and hemolympathic systems.

5362* Clinical Pathology. Lab 20. Prerequisite: second-year standing in College of Veterinary Medicine or graduate standing with consent of instructor. Basic concepts pertinent to data interpretation and laboratory methods used in evaluation of disease.

5412* Anesthesiology. Lab 6. Prerequisite: second-year standing in College of Veterinary Medicine. Application of the principles of veterinary anesthesiology to incorporate fundamental aspects of physiology and pharmacology in the anesthetic management of important domestic species.

5423* Veterinary Parasitology II. Lab 2. Prerequisite: second-year standing in the College of Veterinary Medicine or consent of instructor. Principles of diagnostic, treatment, control and prevention of animal diseases produced by arthropod, protozoan, rickettsial, and helminth parasites. A problem-based approach to parasitic diseases affecting the integumentary, respiratory, hemolympathic, reproductive, urinary, nervous/sensory, musculoskeletal, and alimentary systems with emphasis on diseases of domestic animals.

5432* Pharmacology II. Prerequisite: 5333 or consent of instructor. A continuation of 5333 that includes the mechanisms of action, spectra of activity, dispositions, adverse effects and clinical indications for antimicrobial agents, anti-parasitic agents, antitumor agents, anti-inflammatory agents, and drugs used in the therapy of respiratory, gastrointestinal, and endocrine diseases.

5443* Diagnostic Imaging. Lab 13. Prerequisite: second-year standing in the College of Veterinary Medicine. Radiographic theory, techniques, and interpretation. Introduction to alternate methods, including ultrasonography.

5453* Infectious Diseases III. Lab 1. Prerequisite: second-year standing in the College of Veterinary Medicine or consent of instructor. Continuation of 5334.

5474* Cardiopulmonary System. Lab 24. Prerequisite: second-year standing in the College of Veterinary Medicine. Pathogenesis, diagnosis, pathology, medical and surgical treatment, and prevention of diseases related primarily to the cardiovascular and respiratory systems.

5531* Molecular Genetics. Prerequisite: second-year or higher in good standing in the College of Veterinary Medicine or BIOC 5753. The expression, purification, characterization, and application of biological macromolecules in therapeutics and diagnostics relevant to animal and human health.

6511* Correlation Discussion. Lab 15. Prerequisite: third-year standing in the College of Veterinary Medicine. Case-based integration of previously discussed systems (1.5 week module at end of semester).

6523* Surgery. Lab 48. Prerequisite: third-year standing in the College of Veterinary Medicine. Introduction to fundamental principles of surgery. Didactic material followed by surgical laboratories.

6533* Toxicology. Lab 10. Prerequisite: third-year standing in the College of Veterinary Medicine. Diagnosis and management of intoxications involving plant, chemical and biological toxins.

6563* Musculoskeletal System. Lab 9. Prerequisite: third-year standing in the College of Veterinary Medicine. Pathogenesis, diagnosis, pathology, medical and surgical treatment, and prevention of diseases related primarily to the musculoskeletal system.

6574* Gastrointestinal System. Lab 12. Prerequisite: third-year standing in the College of Veterinary Medicine. Pathogenesis, diagnosis, pathology, medical and surgical treatment, and prevention of diseases related to the alimentary system.

6582* Hemolymphatic and Oncology. Prerequisite: second-year standing in the College of Veterinary Medicine. Pathogenesis, diagnosis, pathology, medical and surgical treatment, and prevention of diseases related primarily to the blood and lymphatic system (six-week module).

6610 Basic Science Elective. 1-8 credits, maximum 8. Prerequisite: veterinary medicine student in the College of Veterinary Medicine. Problems in the basic sciences. Graded on a pass-fail basis.

6611* Veterinary Medical Specialty Conference. Prerequisite: third-year standing in the College of Veterinary Medicine. Specialty conferences for third-year veterinary medical students presented by visiting professionals. A limited number of field trips will be conducted in which special presentations will be made.

6620 Clinical Science Elective. 1-8 credits, maximum 8. Prerequisite: veterinary medicine student enrolled in the College of Veterinary Medicine. Problems in the clinical sciences. Graded on a pass-fail basis.

6662* Urinary System. Prerequisite: third-year standing in the College of Veterinary Medicine. Pathogenesis, diagnosis, pathology, medical and surgical treatment, and prevention of diseases related primarily to the urinary system (2.5 week module).

6683* Dermatology and Endocrinology. Prerequisite: second-year standing in the College of Veterinary Medicine. Pathogenesis, diagnosis, pathology, medical and surgical treatment, and prevention of diseases related primarily to skin and the endocrine system (nine-week module).

6721 Veterinary Medical Clinic Conference I. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Presentation and discussion of selected clinical cases by fourth-year students and interdepartmental faculty groups. Graded on a pass-fail basis.

6821 Veterinary Medical Clinic Conference II. Prerequisite: 6711. Presentation and discussion of selected clinical cases by fourth-year students and interdepartmental faculty groups. Graded on a pass-fail basis.

Veterinary Medicine and Surgery (VMS)

5412* Jurisprudence and Medical Economics. Prerequisite: second-year standing in the College of Veterinary Medicine. Veterinary jurisprudence, medical economics, ethics, public relations, records, banking, insurance, U.S.D.A. and F.D.A. regulations. Visiting lecturers in specialty areas assist in this course.

5422 Veterinary Surgery I. Prerequisites: PHSI 5353; completion or enrollment in PHSI 5343, VPATH 5413; second-year standing in the College of Veterinary Medicine. The pathophysiology of surgery including an introduction to techniques in veterinary surgery and anesthesiology.

5441 Clinical and Surgical Techniques I. Prerequisite: second-year standing in the College of Veterinary Medicine. Behavioral traits, physical examination and restraint of animals, introduction to clinical techniques of medicine and surgery relating to clinical handling of animals. Graded on a pass-fail basis.

6003 Elective I. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Continuation of clinical rotations.

6013 Elective II. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Continuation of clinical rotations.

6023 Elective III. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Continuation of clinical rotations.

6033 Elective IV. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Continuation of clinical rotations.

6043 Elective V. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Continuation of clinical rotations.
6503 Elective VI. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Continuation of clinical rotations.

6501* Avian Medicine and Surgery. Prerequisite: third-year standing in the College of Veterinary Medicine. Clinical aspects of diseases of pets, zoo, exotic, and wild birds.

6516* Systemic Medicine and Diseases of Domestic Animals I. Prerequisite: third-year standing in the College of Veterinary Medicine. Diagnosis, prognosis, treatment and prevention of diseases of food and fiber animals.

6523 Veterinary Surgery II. Prerequisites: 5422 and third-year standing in the College of Veterinary Medicine. Lectures and discussions in operative techniques and practices in veterinary surgery.

6533* Diagnostic Imaging. Prerequisite: third-year standing in the College of Veterinary Medicine. Diagnostic imaging with emphasis on radiographic interpretation; also alternate imaging. Presented in a problem-based format.

6542 Clinical and Surgical Techniques II. Prerequisites: 5441 and third-year standing in the College of Veterinary Medicine. Continuation of 5441. Graded on a pass-fail basis.

6614* Systemic Medicine and Diseases of Domestic Animals II. Prerequisite: third-year standing in the College of Veterinary Medicine. Diagnosis, prognosis, treatment and prevention of diseases of horses.

6615* Systemic Medicine and Diseases of Domestic Animals III. Prerequisite: VPATH 6524, third-year standing in the College of Veterinary Medicine. Diagnosis, prognosis, treatment and prevention of diseases of companion animals.

6642 Veterinary Surgery III. Prerequisites: 6523 and third-year standing in the College of Veterinary Medicine. Lectures and discussions in anatomical topics, operative techniques and practice in veterinary surgery.

6653 Clinical and Surgical Techniques III. Prerequisites: 6542, third-year standing in the College of Veterinary Medicine. Continuation of 6542. Graded on a pass-fail basis.

6700 Preceptorship Clinic. 1-8 credits, maximum 8. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Diagnosis, prognosis, prevention and treatment of diseases of animals presented in the preceptorship program. Graded on a pass-fail basis.

6703* Intensive Care Clinic. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Receiving and managing of emergency and critical care cases in companion animals. Graded on a pass-fail basis.

6710 Non-OSU Clinic. 1-8 credits, maximum 8. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Approved clinical rotations off the OSU campus. Graded on a pass-fail basis.

6713* Radiology Clinic. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Diagnostic radiography, ultrasound, and other special imaging modalities.

6720 Special Clinic I. 1-8 credits, maximum 8. Prerequisite: fourth-year standing in the College of Veterinary Medicine or graduate veterinarian. Special assignments for introductory clinical studies in the following: selected species clinic; herd-health program; necropsy, clinical pathology and parasitology; diagnostic laboratory; and special aspects of the basic sciences.

6723* Equine Medicine Clinic I. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Diagnosis, prognosis, treatment and prevention of equine medical diseases.

6730 Special Clinic II. 1-8 credits, maximum 8. Prerequisite: fourth-year standing in the College of Veterinary Medicine or graduate veterinarian. Special assignments for continuing clinical studies in the following: selected species clinic; herd-health program; necropsy, clinical pathology and parasitology; diagnostic laboratory; and special aspects of the basic sciences.

6733* General Medicine and Surgery Clinic I. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Receiving and managing emergency and general medical and surgical cases in companion animals.

6743* Small Animal Medicine Clinic I. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Diagnosis, treatment and prevention of companion animal medical diseases.

6753* Small Animal Surgery Clinic I. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Diagnosis, prognosis, treatment and prevention of companion animal surgical diseases.

6763* Food Animal Medicine Clinic I. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Diagnosis, prognosis, treatment and prevention of food animal medical and surgical diseases.

6773 Production Medicine Clinic I. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Health studies of animals in herds, bands and flocks entered in health programs of the Boren Veterinary Medical Teaching Hospital. Continuation of 6773.

6783* Food Animal Surgery Clinic I. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Diagnosis, prognosis, treatment and prevention of food animal surgical diseases.

6803* Clinic Pool I. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Semi-elective clinical assignment.

6811 Special Lectures and Discussions. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Special lectures and discussions of selected topics in veterinary medicine and surgery.

6813* Anesthesiology Clinic. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Management of clinical anesthesia in various domestic species.
Zoology (ZOOL)

2104 Human Anatomy. Lab 3. Prerequisite: BIOL 1604.gross anatomy of the human body and its systems based on comparisons with nonhuman mammals dissected in the laboratory. Minor emphasis on embryology and histology.

3013* Biological Microtechnique. Lab 3. Prerequisite: BIOL 1604. Techniques for preparation of biological materials for microscopic examination. Same course as BOT 3013.

3104* Invertebrate Zoology. Lab 4. Prerequisite: BIOL 1604. Morphology, physiology, reproduction and ecology of major invertebrate groups.

3113 (N) Human Evolution. An evolutionary perspective on human biology. No credit for students with prior credit in 3133.

3115* Vertebrate Morphology. Lab 6. Prerequisite: BIOL 1604. Comparative gross anatomy of representative vertebrates with consideration given to embryology, histology and evolution.

3123* Human Heredity. The impact of genetics on human endeavor. No credit for students with prior credit in BIOL 3024.

3133* Evolution. Prerequisite: 3123 or BIOL 3024. Development of the evolutionary concept: specialization, evolutionary mechanisms and phylogenetic concepts.

3143 Oceanography. Prerequisite: CHEM 1225. Ocean basins, geology, chemistry, biology, waves, tides, ocean exploration, ocean communities, and resources.

3153 (N) Animal Behavior. Prerequisite: junior standing. Survey of theory and application in basic and applied animal behavior. Interdisciplinary analysis of animal behavior in the field, captive settings and laboratories.

3204* Physiology. Lab 2. Prerequisites: BIOL 1114; CHEM 1215 or 1314. Anatomy and function of the human body. Human and domestic animal physiology considered in laboratories. No credit for students with prior credit in 4215.


3502 Wildlife Law Enforcement. Prerequisites: junior standing and consent of instructor. Survey of state and federal wildlife laws with emphasis on Oklahoma statutory and regulatory laws pertaining to wildlife. Lectures, guest lectures, videotapes, and field exercises.

3513* Principles of Conservation Biology. Prerequisites: 60 credit hours including BIOL 3034. Application of ecological principles to the maintenance and restoration of biological diversity at genetic, population, and community levels.

3700 Readings and Special Studies in Zoology. 1-3 credits, maximum 6. Prerequisites: BIOL 1604 and consent of instructor. Discussion of selected readings.

4103* General Parasitology. Lab 2. Prerequisite: BIOL 1604; ZOOL 3104 recommended. Fundamentals of parasitism with emphasis on: life cycles, disease conditions, epidemiology, diagnosis, treatment, historical significance, terminology, taxonomy and parasitological techniques.

4113 Conservation Genetics. Prerequisites: BIOL 3024 or equivalent. Principles of population genetics as they pertain to issues in conservation biology. Evolutionary relationships, hybridization, natural selection, factors affecting small populations, gene flow, captive populations, and META populations. No credit for students with credit in 5113.

4114* Biology of Fishes, Amphibians and Reptiles. Lab 5. Prerequisite: BIOL 1604. Systematics, evolution, and natural history of fishes, amphibians and reptiles: laboratory emphasis on Oklahoma species. Offered spring semester of even-numbered years. Weekend field trips required.

4124* Biology of Birds and Mammals. Lab 3. Prerequisite: BIOL 1604. Classification, identification, evolution, zoogeography, life histories, and techniques of study for wild birds and mammals. Weekend field trips required.

4134* Embryology. Lab 4. Prerequisite: 3115, BIOL 3014. Biochemical basis of development with emphasis on gene regulation. Comparative development of sea urchin, frog, chick and pig. Experiments using frog and mouse, including the molecular level.

4125* Mammalian Physiology. Prerequisites: BIOL 1604; CHEM 3015 or CHEM 3053. Descriptive and functional analysis of the mammalian nervous, cardiovascular, musculoskeletal, respiratory, renal, endocrine, and digestive organ systems. For majors in biological, agricultural, or human environmental (including premedical, pre-dental and pre-veterinary) sciences.

4222* Mammalian Physiology Laboratory. Lab 6. Prerequisite: 4215. Laboratory experiments that illustrate function of organs, organ systems or mechanisms of whole body physiological control. For students majoring in basic biological sciences.

4231 Seminar in Physiology. Oral and written communication in the physiological sciences; critical review of physiological literature.

4243 Introductory Pharmacology. Prerequisite: 3204 or 4215. Major drug classes based on their predominant use or principal activity in the body; basis for drug action; and modification of drugs and their action by physiological processes.


4264* Cell Physiology. Lab 3. Prerequisite: BIOC 3653 or BIOL 3014. Cellular activities and fundamental physiological processes. Same course as CLML 4264.

4273 Comparative Physiology. Prerequisites: 3204 or 4215. Comparative, environmental and ecological physiology of nonhuman animals, with emphasis on vertebrates. Thermoregulation, osmoregulation, comparative aspects of respiratory, circulatory, digestive, muscle, and sensory physiology, and adaptations to extreme environments. Same course as 5273.

4283* Endocrinology. Prerequisites: 3204 or 4215, and CHEM 3015 or consent of instructor. Mechanisms of endocrine, autocrine and paracrine regulation in non-human species, with emphasis on vertebrates. Function of the hypothalamus, pituitary, adrenal, thyroid, testes, ovary and pancreas; hormonal effects on various target tissues; homeostatic control of endocrine function; comparative endocrinology.

4303* Environmental Toxicology. Prerequisites: BIOL 1114 or equivalent; CHEM 1215 or 1314; junior standing. Introduction to the basic theories, principles, and techniques of environmental toxicology. Comparative study of the groups of toxicants (e.g. heavy metals, PCB’s, insecticides) and discussion of the environmental problems created by these chemicals and their implications for survival of populations (including humans) on earth.

4414* Fisheries Management. Lab 4. Prerequisite: BIOL 3034. Techniques and principles involved in management of fishes. Field trip fee required.

4434* Limnology. Lab 3. Prerequisite: BIOL 3034. Physical, chemical and biological factors in lakes and streams.

4510 Wildlife Management. Prerequisite: BIOL 3034 or FOR 3213. Biological basis for the management of wildlife populations and habitats, with emphasis on current management problems.

4523* Wildlife Management Techniques. Prerequisite: 4513, ENGL 3323 strongly recommended. The semistructured format includes problem identification, project planning and design, land use surveys and mapping, wildlife populations and habitat analysis, data interpretation, development of project area research and management recommendations, and report preparation and presentation.

4533* Zoo Biology and Management. Prerequisite: 4 hours of zoology or biology. Conservation and propagation of endangered species, animal acquisition and transport, restraint, sanitation and animal health, exhibit planning and design, public relations, administration and research. Lectures by professional zoo staff members. Extension course taught at the Oklahoma City and Tulsa zoos.

4700 Undergraduate Research Problems. 1-4 credits maximum 4. Prerequisite: consent of instructor. Participation in faculty research or execution of a problem formulated by the student.

4755 Honors Study in Zoology. 1-5 credits, maximum 5. Prerequisite: Honors Program participation. Individual study in the development of zoological concepts. Extensive reading, literature search and special experimentation. An individual problems course for the gifted student.
5000* Research for Master's Thesis. 1-6 credits, maximum 6. Independent research for the M.S. thesis under the supervision of a graduate faculty member.

5010* Graduate Seminar. 1-3 credits, maximum 10. Discussion of selected topics.

5020* Special Problems. 1-4 credits, maximum 10. Prerequisite: graduate standing and consent of instructor. A report of results obtained is to be placed in department files.

5030* Teaching Zoology. 1-4 credits, maximum 4. Prerequisite: consent of instructor. Supervised teaching, of the behavior of animals in their natural environment, especially in terms of natural selection and adaptation. A synthesis of ethology, population genetics, sociobiology, and evolutionary theory. Largely descriptive and generalized within limited emphasis on mathematical theory.

5112* Advanced Herpetology. Selected advanced aspects of evolution, systematics, biogeography, natural history, physiology, husbandry, nutrition, ecology, behavior, and population biology of reptiles and amphibians as drawn from the primary literature.

5113* Conservation Genetics. Prerequisite: course in genetics strongly recommended. Theory and principles of population genetics as they pertain to issues in conservation biology. Evolutionary relationships, hybridization, natural selection, factors affecting small populations, gene flow, captive populations, META populations, and data analysis. No credit for students with credit in 4113.

5123* Behavioral Ecology. Prerequisite: course in ecology strongly recommended. Analysis and description of the behavior of animals in their natural environment, especially in terms of natural selection and adaptation. A synthesis of ethology, population genetics, sociobiology, and evolutionary theory. Largely descriptive and generalized with limited emphasis on mathematical theory.

5133* Evolutionary Ecology. Lab 2. Prerequisite: course in ecology strongly recommended. Ecological concepts dealing with contemporary evolutionary processes, not phylogeny. Life history traits, R and K selection, sociality, kin and group selection, speciation, competition, predation, plant-animal coevolution, niche theory, species diversity and biogeography. General models and mechanisms, with examples drawn from all kingdoms.

5153* Ecosystem Analysis. Prerequisite: ecology and organic chemistry strongly recommended. Theory and principles of ecosystem ecology focusing on metabolism and biogeochemical cycles in terrestrial and aquatic systems. Application of principles to current issues of environmental change and management. Same course as BOT 5153.

5163* Population Ecology. Lab 3. Prerequisites: BIOL 3034, MATH 513. Theory and principles of predicting and analyzing population abundance and dynamics. Life history theory, foraging theory, habitat selection, population genetics, and species interactions.

5273* Comparative Physiology. Prerequisites: 3204 or 4215 or equivalent. Comparative, environmental and ecological physiology of nonhuman animals, with emphasis on vertebrates. Thermoregulation, osmoregulation, comparative aspects of respiratory, circulatory, digestive, muscle, and sensory physiology, and adaptations to extreme environments. Same course as 4273.

5314* Wildlife Toxicology. Lab 6. Examination of methods used for evaluation of toxic responses of wildlife to pollutants; demographic surveys, biomarkers, toxicity tests. Emphasis on terrestrial ecosystems.

5323* Principles of Toxicology. Basic toxicological principles, mechanism of toxicity, and toxicological testing procedures. Toxic effects of environmental exposure to xenobiotics.

5413* Principles of Ecotoxicology. Integration of major processes involved with transport, exposure and response of biological systems to xenobiotics.

5424* Analysis of Environmental Contaminants. Lab 6. Analytical methods for measuring environmental contamination or pollution; toxicity bioassay, gas chromatography, atomic absorption, infrared and ultraviolet spectrometry.

5432* Fisheries Science. Prerequisite: 4414 or equivalent or consent of instructor. Principles of fisheries science as they relate to fish and aquatic biota, their habitats, and the humans who utilize them.

5463* Stream Ecology. Lab 1. Prerequisite: course in ecology strongly recommended. Ecology of streams and rivers with emphasis on physical and chemical processes, adaptations of aquatic biota to riverine environments, and human impacts on riverine ecosystems.

5533* Wildlife Nutritional Ecology. Prerequisite: 4523. Basic nutritional principles for application in solving wildlife and fisheries management problems. Importance of nutrition in regulating wild animal populations through examination of the effects of malnutrition on recruitment, growth, disease, and survival. Techniques and skills for assessing both the nutritional suitability of the habitat and condition of the population.


5573* Grassland and Desert Wildlife Ecology. Prerequisite: course in ecology strongly recommended. Ecology of grasslands and deserts with emphasis on vertebrate species diversity, adaptations to semi-arid and arid ecosystems, and management problems associated with such habitats.

5583* Wetland Wildlife Ecology. Lab 3. Prerequisite: 4513 or consent of instructor. Ecology of various types of wetlands with emphasis on the management problems for waterfowl and fur-bearers.

5593* Diseases and Parasites of Wild Animals. Lab 2. A systematic approach to bacterial, viral and parasitic diseases of wild animals. Principles of disease transmission as it relates to individuals and populations of wild animals. Principles are applicable to all areas of zoology, veterinary medicine and wildlife management. Same course as VPARA 5213.

6000* Research for Ph.D. Dissertation. 1-15 credits, maximum 30. Independent research for the Ph.D. dissertation under the supervision of a graduate faculty member.
Index

A
Abbreviations of Course Listings, 199
Academic Regulations, 45, 164
Accounting, 93, 200
Accreditation, 9, 152
see also specific colleges
Adding Courses, 17
Administrations
University, 3
Admission
Application, 11
Freshman, 11
International Student, 13
Nonresident, 11, 13
Readmission, 11, 13, 161
Requirements, 11
Resident, 11, 12
Special, 12
Transfer, 11, 12
Admission to the Graduate College
Chart, 162
Departmental or Program Requirements, 161
International, 160
Test Scores, 160
Transfer Credits, 161
Adult Education, 107, 269
Advanced Standing, see Credit by Exam
Advertising and Sales, 80
Advisement, 29
Aerospace/Mechanical Engineering, 124, 284
Aerospace Studies (Air Force), 83, 201
African-American Studies, 66
Agribusiness, 56, 96
Agricultural Communications, 55, 201
Economics, 56, 201
Education, 57, 203
engineering/Biosystems, 59, 118
Agricultural Sciences and Natural Resources, College of, 54
see also specific subjects
Agriculture, 57, 157, 204
Mechanized, 288
Alcoholic Beverages and Other Drugs, 43
Allied Arts, 35
ALPHA Program, 16
Alumni Programs and Services, 37
American Studies, 54, 204
Anatomy/Veterinary Pathology and Pharmacology, 141, 318
Ancient and Medieval Studies, 67
Animal Science, 58, 204
Anthropology, 206
Apartments, University, 25
Rates, 22
Appeals, Grade, see Academic Regulations
Application Admissions, 11
Housing, 11
Applied Behavioral Studies, 206
Applied Educational Studies, 101
Applied Health and Educational Psychology, 102
Architecture 126, 207
Area Studies Certificates, 66
Art, 70, 208
Arts, Allied, 35
Arts, Bartlett Center for the Performing Arts, 33
Arts and Sciences, College of, 65, 210
see also specific subjects
Assault Prevention, Sexual, 43
Assessment Program, 30
Assistantships, Teaching and Research, 155
Astronomy, 210
Athletics Program Mission, 8
Auditing
Faculty and Staff, 17
Fee, 21
see also Academic Regulations
Aviation and Space Education, 107, 211
B
Bachelor’s Degrees, 53
see also specific colleges
Bartlett Center for the Studio Arts, 33
Bartlett Independent Living Center, 33
Behavioral Studies, Applied, 206
Biochemistry, 212
Biochemistry and Molecular Biology, 58, 70
Biological Science, 213
see also Zoology
Biomedical Sciences, 141, 213
Biosystems and Agricultural Engineering, 59, 118
Biosystems Engineering, 214
Botany, 71, 215
Branch Campus
College of Osteopathic Medicine, 138
OSU-Oklahoma City, 38
OSU-Okmulgee, 39
OSU-Tulsa, 39
Broadcasting/Journalism and, 80, 273
Business Administration, College of, 92
see also specific subjects
Department of, 216
Master of, 94, 280
Business Communications, 217
Business Education, 217
Business Honors, 217
Business Professions, 217
Calendar
University, 6
Graduate College, 150
Career Services, 31
Cell and Molecular Biology, 82, 218
Certificates, Area Studies, 66
Geographic Information Systems, 77
Gerontology Graduate, 158
Chemical Engineering, 119, 218
Chemistry, 72, 219
Child Development/Family Relations and, 134, 250
Children, Students with, 26
Civil Engineering, 221
Civil and Environmental Engineering, 121
Classification of students, see Academic Regulations
College of Agricultural Sciences and Natural Resources, 54
Arts and Sciences, 65
Business Administration, 92
Education, 100
Engineering, Architecture and Technology, 114
Graduate, 150
Human Environmental Sciences, 132
Osteopathic Medicine, 138
Veterinary Medicine, 140
Colvin Center, 33
Communications
Agricultural, 55, 201
Mass, 280
Speech, 39, 313
Communication Sciences and Disorders, 73, 224
Computer Engineering/Electrical and, 123, 240
Computer Systems/Management
Science and, 98
Computer Science, 73, 226
Computing and Information Services, 31, 154
Construction Management
Technology, 129, 228
Control Systems Engineering, 114
Correspondence Study/Independent, 28
Costs
Auditing, 21
Estimated, 22
Faculty/Staff Members, 21
Graduate Assistants, 21
Nonresident Tuition, 19
Obligation, 22
Osteopathic Medicine, 20
Residence Hall Rates, 22
Resident Tuition, 19
Special Class Charges, 21
Special Services, 20
University Apartments, 22
Veterinary Medicine, 20
Counseling Services, 26
Counseling and Psychological Services, 103, 229
Course Numbering, 198
Credits, see Academic Regulations
Credit by Exam, 28
Crime Prevention, 42
Statistics, 42
Curriculum and Educational Leadership, 104
Curriculum and Instruction, 105, 230
D
Degree Requirements, see Academic Regulations
Degree Programs Offered, 53
University Studies, 28
Dentistry, 31
Design, Housing and Merchandising, 133, 233
Disability Services/Student, 26
see also Facilities and Housing
Dishonesty or Misconduct, Academic, see Academic Regulations
Disruption of the Educational Process, Regents’ Resolution, 40
Doctoral Degrees, 169
see also specific departments
Dropping Courses, 17
Dues/Alcoholic Beverages and Other, 43
E
Ecology, Wildlife and Fisheries, see Zoology
Economics, 216
Economics and Legal Studies in Business, 74, 95
Education, College of, 100, 237
see also specific subjects
Educational Leadership, 105, 237
Educational and School Psychology, 103, 238
Educational Studies, School of, 106
Educational Studies/Applied, 102
Educational Technology, 240
Electrical and Computer Engineering, 122, 240
Electrical Engineering Technology, 130, 244
Employment, see Financial Aid
Engineering, Architecture and Technology, College of, 114, 245
see also specific subjects
Admission, 11
General, 257
Science, 245
Technology, 128, 257
Engineering and Technology Management, 246
English, 75, 246
English Composition Requirement, see Academic Regulations
Enrollment, see Academic Regulations
Index 325
F
Facilities, 8, 33, 153
Family Relations and Child Development, 134, 250
Family Services, Center for, 32
Financial Aid/Scholarships and, 23
Finance, 96, 253
Financial Aid/Scholarships and, 23
see also specific colleges
for Graduate Students, 155
Grants, 24
Loans, 24
Scholarships, 23
Work-Study, 24
Fire Protection and Safety Technology, 130, 254
Food Science, 158
Foreign Language Credit for Native Speakers, see Academic Regulations
Foreign Languages and Literatures, 78, 255
see also specific subjects
Forestry, 61, 255
Former Students, Readmission, 11, 13, 161
Foundation, OSU, 38
Fraternities/Sororities, see Greek Life
French, 257
Freshman Admission, 11
Enrollment, 16
G
Gardiner Art Gallery, 33
General Education, 9
see also specific colleges
Course codes, 200
Requirements, see Academic Regulations
General Engineering, 257
General Technology, 257
Genetics, 258
Genetics/Microbiology and Molecular, 82
Geographic Information Systems, Certificate, 77
Geography, 77, 258
Geology, 77, 259
German, 261
Gerontology
Certificate, 158
Institute, 28
see also Family Relations and Child Development
Grades and Grading, 18
see also Academic Regulations
Graduate Calendar, 150
College, 150, 261
Council and Members, 151
Enrollment, 162
Programs, see specific departments
Regulations, 164
Graduation Requirements, see Academic Regulations
see also specific colleges
Greek, 261
Greek Life, 35
Grants, see Financial Aid
H
Health Center, 26
Health, Applied, and Educational Psychology, 102
Health and Human Performance, 104, 262
Higher Education, 108
History, 78, 264
Honor Roll, see Academic Regulations
Honor and Service Organizations, 35
see also specific colleges
Honors Program, 27, 266
see also specific colleges
Horticulture and Landscape Architecture, 62, 266, 274
Hospital, see Health Services
Hospitality Administration, 137
Hotel and Restaurant Administration, 137, 266
Housing Application, 11
Greek Life, 35
Mobility Impaired Student, 25
Residence Halls, 25
University Apartments, 25
Housing/Design and Merchandising, 133, 233
Human Environmental Sciences, College of, 132, 268
Human Performance/Health and, 104, 262
Human Resource Management, 97
I
Identification Cards, 17
Independent and Correspondence Study, 28
Independent Living Center, Bartlett, 33
Industrial Engineering and Management, 123, 270
Infectious Diseases, 142, 319
Interdisciplinary Programs, 157
International Business, 39
International Student Admission, 13
Graduate Admission, 160
Status Maintenance Fee, 21
Students and Scholars, 35
International Studies, 272
Certificate, International Studies, 67
Intramurals, 36
J
Japanese, 272
Journalism and Broadcasting, 80, 273
L
Landscape Architecture/Horticulture and, 62, 266, 274
Latin, 275
Law, Pre-, 27
see also specific colleges
Lectures, 36
Library Science, 277
Loans, see Financial Aid
M
Major fields, see specific colleges
Degree Programs offered
Management, 97, 277
Management Information Systems/Accounting Information Systems, 98
Management Science and Computer Systems, 98
Management Science and Information Systems, 278
Manufacturing Systems Engineering, 158
Marketing, 98, 279
Mass Communications, 280
Master of Business Administration, 94, 280
Master's Degrees, 165
see also specific departments
Mathematics, 81, 281
Math Learning Resource Center, 32
Matriculation, see Academic Regulations
Mechanical and Aerospace Engineering, 124, 284
Mechanical Engineering Technology, 130, 287
Mechanized Agriculture, 288
Medical Technology, 82, 288
Medicine
Osteopathic, 138
Pre-, 27
see also specific colleges
Veterinary, 140
Medieval/Ancient Studies, 67
Mentor, Student Academic, 30
Merchandising/Design, Housing and, 133, 233
Microbiology, 82, 289
Microbiology and Molecular Genetics, 82
Military Science, 84, 290
Military Service Fee Refund Policy, 21
Military Studies, Departments of, 83
Aerospace Studies, 83, 201
Military Science, 84, 290
Minority Programs and Services, see Multicultural Development and Assessment Center
Minors, 66
Mission of the University, 8
Mission/Athletics Program, 8
Molecular Genetics/Microbiology and, 82
Multicultural Development and Assessment Center, 27
Museum of Higher Education-Old Central, 33
Music, 84, 290
N
National Student Exchange, 29
Native American Studies, 67
Native Speakers, Foreign Language Credit for, see Academic Regulations
Natural and Applied Sciences, 158
Natural Science, 294
Nonresidents of Oklahoma Costs, 19
Freshmen, 11
Pre-engineering, 13
Transfers, 13
Nontraditional Student Services, 36
Nutritional Sciences, 136, 294
O
Occupational Education Studies, 106, 295
Off-campus Program, 158
Oklahoma City, OSU-, 38
Okmulgee, OSU-, 39
Old Central/Oklahoma Museum of Higher Education, 33
Organization and Leadership, 109
Organizations
Honor and Service, 35
see also specific colleges
Residence Hall, 36
Osteopathic Medicine, College of, 138
Osteopathic Medicine, Pre-, 27
P
Parking Fees, 21
Regulations, 17