



## VII Department of Instruction

### **Biology (BIO)**

Dr. George B. Noland, *Chairman*

Any 300-400 upper level undergraduate course in biology may be taken for graduate credit under the usual conditions.

#### **BIO 501. SEMINAR**

**ZERO-ONE CREDIT HOUR**

The development, presentation, and discussion of papers dealing with Biological problems. Open only to advanced undergraduate and graduate Biology Majors.

#### **BIO 502. VERTEBRATE ZOOLOGY**

**FOUR CREDIT HOURS**

An advanced course dealing with the morphology, physiology, ecology and distribution of representative vertebrate groups. Three hours lecture and one three-hour lab per week.

#### **BIO 509. ECOLOGY**

**THREE CREDIT HOURS**

The course deals with the mutual relations between organisms and their environment. Some aspects of biological productivity of lakes will be included. Three hours lecture.

#### **BIO 512. RADIATION BIOLOGY**

**FOUR CREDIT HOURS**

A course in the theory and principles of ionizing radiation. Application of radioactive tracers to biological problems will be considered. Two hours lecture and two two-hour labs per week.

#### **BIO 514. BIOCHEMISTRY**

**FOUR CREDIT HOURS**

Lectures, selected readings and laboratory assignments dealing with carbohydrates, lipids, amino acids, proteins, enzymes, nucleic acids and the metabolism of those compounds. Three hours lecture and one three-hour lab per week.

#### **BIO 515. BACTERIAL PHYSIOLOGY**

**THREE CREDIT HOURS**

A study of the metabolic and biosynthetic activities of bacteria, accompanied by a laboratory period designed to familiarize the student with some of the basic biochemical techniques used in the study of bacterial physiology. Three hours lecture.

#### **BIO 517. ENDOCRINOLOGY**

**FOUR CREDIT HOURS**

A functional analysis of the mechanisms and activity of the endocrine system. Emphasis will be placed on hormonal regulation of metabolism and growth. Three hours lecture and one three-hour lab per week.

**Bio 518. CYTOLOGY****FOUR CREDIT HOURS**

A study of cell structure at the organelle and the molecular levels. Where possible, fine structure will be related to cell function. Two hours lecture and two three-hour labs per week.

**Bio 519. VIROLOGY****THREE CREDIT HOURS**

Lectures, selected readings and laboratory assignments dealing with the biology of plant, animal and microbial viruses. Tissue culture techniques will be considered. Two hours lecture and one three-hour lab per week.

**Bio 521. BIOCHEMICAL GENETICS****THREE CREDIT HOURS**

An analysis of the nature of the gene and gene action. Particular attention will be given to genetic control of protein synthesis and to recent advances in biochemical and physiological genetics. Two hours lecture and one three-hour lab per week.

**Bio 522. IMMUNOLOGY AND ADVANCED PATHOGENIC BACTERIOLOGY****THREE CREDIT HOURS**

Discussion of epidemiology, host-parasite relationships, and antigenicity with emphasis on the chemical aspect of immune response.

**Bio 523. ADVANCED MICROBIOLOGY****THREE CREDIT HOURS**

Lectures and readings dealing with current concepts in basic and applied microbiology.

**Bio 530. COMPARATIVE ANIMAL PHYSIOLOGY****FOUR CREDIT HOURS**

Organized on a function-system basis, the course deals with environment-organism interaction and with integrative systems of the principal phyla of animals. Three hours lecture and one three-hour lab per week.

**Bio 531. EXPERIMENTAL EMBRYOLOGY****FOUR CREDIT HOURS**

Morphological and physiological aspects of development will be considered along with an introduction to teratology. Three hours lecture and one three-hour lab per week.

**Bio 532. VERTEBRATE MORPHOLOGY****FOUR CREDIT HOURS**

The general biology of vertebrates with emphasis on their structural, functional and behavioral adaptations, comparative anatomy and evolutionary history. Three hours lecture and one three-hour lab per week.

**Bio 534. VERTEBRATE PALEONTOLOGY****FOUR CREDIT HOURS**

The origin, evolution, dispersal and geologic history of the major groups of the Chordates with emphasis on the morphology and paleoecology of the higher classes. Three hours lecture and one three-hour lab per week, plus one field trip. Laboratory sessions to take place at the Dayton Museum of Natural History.

**Bio 537. BIOSYSTEMATICS****THREE CREDIT HOURS**

A study of the principles of classification, stressing the evidence used in phylogenetic and evolutionary schema.

**Bio 538. ECOLOGY II****FOUR CREDIT HOURS**

A study of the coactions of animals and plants within their environment. Particular emphasis will be given to trophic structure and bioenergetics. Three hours lecture and one three-hour lab per week.

**Bio 540. PHYSIOLOGY OF HIGHER PLANTS****FOUR CREDIT HOURS**

Principles covering photosynthesis, respiration, mineral nutrition, solute transport and growth in higher plants. Three hours lecture and one three-hour lab per week.

**BIO 550. BIOMETRICS****THREE CREDIT HOURS**

The design and analysis of experiments in quantitative biology. Rectilinear and curvilinear regression, correlation, and the distribution function of various statistics will be considered.

**BIO 552-553. BIOLOGICAL INSTRUMENTATION****THREE CREDIT HOURS EACH TERM**

A course designed to introduce the student to the theory and use of techniques and instruments of modern biology. Required of all graduate students. One hour lecture and two three-hour labs per week.

**BIO 554. ELECTRON MICROSCOPY****FOUR CREDIT HOURS**

Principles and application of electron microscope in the study of biological materials. Emphasis will be placed on fixation, dehydration, embedding, and sectioning of animal and plant tissues. Two hours lecture and two three-hour labs per week.

**BIO 596. CURRENT BIOLOGICAL PROBLEMS****THREE CREDIT HOURS**

The consideration of recent developments in biological thought and procedure. By permission of Chairman only.

**BIO 599. THESIS****THREE-SIX CREDIT HOURS****BIO 699. PH.D. DISSERTATION****ONE-SIX CREDIT HOURS****Business Administration (MBA)****William J. Hoben, *Dean*****MBA 501. MANAGERIAL ACCOUNTING****THREE CREDIT HOURS**

Practical emphasis on the accountant's role in business measurement techniques, communication, prediction, and decision-making based upon the use of relevant accounting information.

**MBA 503. INFORMATION SYSTEMS****THREE CREDIT HOURS**

Latest concepts, methods, and advanced developments in information systems emphasizing the implementation of office automation; the business survey, selection of methods, designing the system, and preparing the report; the problems of communication with technical staff specialists. Prerequisite: MBA 501.

**MBA 504. TAX FACTORS IN BUSINESS DECISIONS****THREE CREDIT HOURS**

An organized review of the provisions of the Federal Income Tax Code and tax laws on business decisions, including selection of the legal form of the business entity, corporate reorganization, acquisitions, and mergers, employee compensation and benefits, alternative methods of capital gains and ordinary income, and interactions of income, estate and gift taxes. Prerequisite: MBA 501.

**MBA 510. BUSINESS INVESTIGATION AND ANALYSIS****THREE CREDIT HOURS**

Business research methodology; problem definition and research design; application of statistical decision methods; introduction to mathematical analysis of business problems. Prerequisite: Bus 313.

**MBA 512. QUANTITATIVE METHODS FOR BUSINESS DECISIONS****THREE CREDIT HOURS**

Application of mathematical and statistical methods to business decision-making in the fields of marketing, production, finance and related areas; basic nature and method of operations research; the use of such techniques as linear programming, queuing problems, Monte Carlo method and Bayesian statistics. Prerequisites: Bus 313 and mathematics through differential and integral calculus; differential equations desirable.

**MBA 520. FINANCIAL POLICIES OF ENTERPRISES** **THREE CREDIT HOURS**  
 A study of finance with emphasis upon the financial policies and problems of business, especially within the corporation. Consideration is given to institutions and other investors in supplying funds for enterprise. Prerequisite: MBA 501.

**MBA 521. PROBLEMS OF FINANCE** **THREE CREDIT HOURS**  
 The application of principles of finance to the financial management of corporate enterprise with special attention to the financing of expansion. Reading assignments, cases, individual reports and discussion of current financial problems. Prerequisite: MBA 520.

**MBA 530. MARKETING MANAGEMENT** **THREE CREDIT HOURS**  
 Major areas of marketing are examined from the viewpoint of the marketing executive. Presents and develops concepts for analytical purposes, but is primarily oriented to decision-making.

**MBA 531. SEMINAR IN CONSUMER BEHAVIOR** **THREE CREDIT HOURS**  
 Identification and analysis of the consumer market through use of concepts from the behavioral sciences emphasizing the family life cycle, social class and family life styles.

**MBA 532. PHYSICAL DISTRIBUTION MANAGEMENT** **THREE CREDIT HOURS**  
 The logistics of business as a basis for marketing action. Integrates plant location, warehousing and transportation into modern marketing strategy.

**MBA 540. MANAGERIAL ECONOMICS** **THREE CREDIT HOURS**  
 Examination of the scope and method of managerial methods; introductory cases in managerial economics; demand analysis, forecasting demand, cases in demand; short-run cost analysis; long-run costs and production functions, cases in cost analysis; pricing, selected topics in pricing, cases in pricing decisions; capital budgeting, risk and uncertainty, cases in capital budgeting and uncertainty. Prerequisites: Bus. 313 and MBA 510 (or MBA 512).

**MBA 541. LABOR RELATIONS AND LABOR ECONOMICS** **THREE CREDIT HOURS**  
 A study of labor relations and labor economics; collective bargaining, wage determination, structure and operation of labor markets, direction of the labor movement, theories of industrial peace and conflict; current problems and trends in labor relations.

**MBA 550. GOVERNMENT AND BUSINESS** **THREE CREDIT HOURS**  
 Analysis of the economic aspects and consequences of government regulations over social and business activities; a study of government and business relations.

**MBA 560. OPERATIONS MANAGEMENT** **THREE CREDIT HOURS**  
 An analysis of the principles of organization and management; the theory of organization and the principles of planning, directing and controlling product development, plant layout and location, equipment, inventory and production standards.

**\*MBA 570. BUSINESS AND SOCIETY** **THREE CREDIT HOURS**  
 Business is presented as a private and quasi-public institution between community and society with definite functions of its own as well as those which foster the dignity of man and the interests of the common good.

\*Required of all students.

**MBA 581. ADMINISTRATIVE MANAGEMENT PRACTICES** **THREE CREDIT HOURS**

An in-depth analysis of concepts, principles, and theories of the management process with emphasis upon application in administrative decisions and practice. The relating of administrative management practices to the systems concept and environmental factors. Prerequisite: A Principles of Management course.

**MBA 582. HUMAN RELATIONS IN INDUSTRY** **THREE CREDIT HOURS**

The application of psychology to the problems of human behavior and human relations; the problems of motivation, morale, conflict, discipline, leadership, emotions and decision-making are considered and analyzed in lectures, cases and discussions.

**MBA 583. ADVANCED MANAGEMENT SEMINAR** **THREE CREDIT HOURS**

An analysis in depth of several strategically important areas of management in which theory, research, and practice have progressed significantly in recent years; the applicability, potential and actual, of the newer concepts. Areas considered are: long range planning, management organization development, systems management, executive decision-making, organizational behavior, control techniques, and other selected topics.

**MBA 584. MULTI-NATIONAL BUSINESS POLICY** **THREE CREDIT HOURS**

Examines changes in the structure, organization, and policies of Multi-National business firms and international trade in general. Analyzes their implications relative to the composition of exports, international marketing processes, terms of trade, and determinants of payments and exchange-rate movements.

**\*MBA 590. BUSINESS POLICIES AND ADMINISTRATIVE MANAGEMENT****THREE CREDIT HOURS**

The correlation of theory and practice in the development of business policies. Emphasis will be on the problems of executive management, decision-making and administrative action.

\*Required of all students.

**MBA 595. INDIVIDUAL RESEARCH****ONE TO SIX CREDIT HOURS**

Individual research and study in subject areas encompassed by the MBA curriculum under the guidance and direction of faculty. No regular class schedule, but meetings arranged for presentation and discussion of individual research projects.

**Chemistry (CHM)****Dr. John J. Lucier, S.M., *Chairman*****CHM 540. INTRODUCTION TO QUANTUM MECHANICS** **THREE CREDIT HOURS**

An introduction to the concepts of quantum mechanics with applications to chemical systems.

**CHM 541. TOPICS IN PHYSICAL CHEMISTRY** **THREE CREDIT HOURS**

Modern aspects of Physical Chemistry. Subject matter may include the solid state, electrochemistry, or mathematical methods of Physical Chemistry.

**CHM 542. STATISTICAL THERMODYNAMICS** **THREE CREDIT HOURS**

A treatment of ensembles and their partition functions with applications to solid, liquid and vapor states. Bose-Einstein and Fermi-Dirac statistics will be developed.

**CHM 543. THERMODYNAMICS AND KINETICS** **THREE CREDIT HOURS**  
 First, second, and third laws will be covered to develop free-energy functions for use in chemical equilibrium. Phenomenological and mathematical characterization of kinetic systems.

**CHM 544. COORDINATION CHEMISTRY** **THREE CREDIT HOURS**  
 A course dealing in recent developments in the Chemistry of coordination compounds. Special emphasis will be placed on ligand field theory, substitution processes, and ligand stabilization of metal ions.

**CHM 545. INORGANIC REACTIONS AND STRUCTURE** **THREE CREDIT HOURS**  
 A survey of modern inorganic chemistry including non-aqueous solvents, trends in the periodic table, acid base theory, and reaction mechanisms.

**CHM 546. SPECIAL TOPICS IN MODERN ANALYTICAL CHEMISTRY** **THREE CREDIT HOURS**  
 Modern analytical methods. Subject matter may include NMR, EPR, electroanalytical methods, GLC, mass spectroscopy, neutron activation analysis, IR, visible and UV methods.

**CHM 547. BONDING IN INORGANIC COMPOUNDS** **THREE CREDIT HOURS**  
 Topics will include atomic theory; bonding theories, especially molecular orbital theory; the ionic model; band theory of metals; and the structure of solids. Prerequisite: Quantum Chemistry.

**CHM 548. ADVANCED ORGANIC CHEMISTRY I** **THREE CREDIT HOURS**  
 A course dealing with nucleophilic substitution, B elimination, and condensation reactions, free radicals, carbanions, acidities, and linear free energy relationships.

**CHM 549. ADVANCED ORGANIC CHEMISTRY II** **THREE CREDIT HOURS**  
 Topics discussed include the Chemistry of multiple bond systems, resonance aromaticity, electrocyclic additions, carbenes, oxidation reduction, electrophilic substitution and addition reactions.

**CHM 550. SPECIAL TOPICS IN ORGANIC CHEMISTRY** **THREE CREDIT HOURS**  
 Modern physical organic chemistry, spectroscopy, photochemistry, molecular rearrangements, stereochemistry and natural products.

**CHM 551. GENERAL BIOCHEMISTRY I** **THREE CREDIT HOURS**  
 Subject matter will include the chemistry of proteins and carbohydrates, enzymes, bioenergetics, glycolysis and the tricarboxylic acid cycle. Prerequisites: Chm 314, or 316 and 302 or equivalent.

**CHM 552. GENERAL BIOCHEMISTRY I** **THREE CREDIT HOURS**  
 Topics will include electron transport and oxidative phosphorylation, lipid metabolism, nitrogen metabolism, nucleic acid and protein synthesis, biochemical genetics, regulation, hormones and nutrition. Prerequisites: Chm 551.

**CHM 553. TOPICS IN BIOCHEMISTRY** **THREE CREDIT HOURS**  
 Topics of current interest in biochemistry will be discussed. Prerequisite: Chm 551, 552 or permission of instructor.

**CHM 554. DIRECTED READINGS** **ONE TO THREE CREDIT HOURS**

**CHM 560-561. RESEARCH** **THREE CREDIT HOURS EACH TERM**

THE FOLLOWING COURSES ARE OFFERED BY THE DEPARTMENT OF CHEMISTRY IN COOPERATION WITH OTHER DEPARTMENTS AND SCHOOLS OF THE UNIVERSITY. THESE COURSE OFFERINGS ARE NOT APPLICABLE TO THE MASTER'S DEGREE IN CHEMISTRY.

**CHM 501. PRINCIPLES OF CHEMISTRY I** THREE CREDIT HOURS  
The subjects treated in this course are: atomic structure, chemical bonding, chemical equilibrium, inorganic nomenclature, theory of solutions, acid-base concepts, periodic properties of the elements, radiochemistry and nuclear reactions. Prerequisite: One year of College Chemistry.

**CHM 502. PRINCIPLES OF CHEMISTRY II** THREE CREDIT HOURS  
The subjects treated in this course are: thermodynamics, chemical kinetics, redox reactions, organic chemistry (nomenclature, functional groups, preparation and properties of organic compounds). Prerequisite: Chm 501.

**CHM 525-526. PRINCIPLES OF ORGANIC CHEMISTRY** THREE CREDIT HOURS EACH TERM  
An introduction to the fundamentals of Organic Chemistry. Prerequisite: Chm 124.

**CHM 525L-526L. PRINCIPLES OF ORGANIC CHEMISTRY** ONE CREDIT HOUR  
Laboratory course to accompany Chm 525-526. One three-hour lab per week.

**CHM 527-528. THEORETICAL PRINCIPLES OF CHEMISTRY** THREE CREDIT HOURS EACH TERM  
Prerequisite: Chm 215 or equivalent. Corequisite: Mth 218.

**CHM 527L-528L. THEORETICAL PRINCIPLES OF CHEMISTRY** ONE CREDIT HOUR  
Laboratory course to accompany Chm 527-528. One three-hour lab per week.

**CHM 529. INORGANIC CHEMISTRY** THREE CREDIT HOURS  
The nature of the chemical bond, periodicity, electron distribution in atoms, coordination compounds, the nucleus and its reactions. Prerequisite: Chm 303-304.

**CHM 530. PHYSICAL CHEMISTRY** THREE CREDIT HOURS  
A concise treatment of Theoretical Chemistry. Prerequisite: Chm 124.

**CHM 531. IDENTIFICATION OF ORGANIC COMPOUNDS** ONE CREDIT HOUR  
An analytical course, applying functional groups, physical properties and instrumental methods to the identification of organic compounds. Prerequisite: Chm 315-316.

**CHM 531L. IDENTIFICATION OF ORGANIC COMPOUNDS** TWO CREDIT HOURS  
Laboratory course to accompany Chm 531. Two three-hour labs per week.

**CHM 532. SPECIAL TOPICS IN THEORETICAL CHEMISTRY** THREE CREDIT HOURS  
A treatment of special topics surveyed in Chm 527-528. Prerequisite: Chm 304.

**CHM 533. INTERMEDIATE ORGANIC CHEMISTRY** THREE CREDIT HOURS  
Modern theory of Organic Chemistry and reaction mechanisms. Prerequisite: Chm 215 or equivalent.

## Communication Arts (COM)

George C. Biersack, *Chairman*

### COM 501. INTRODUCTION TO GRADUATE STUDY IN COMMUNICATION

THREE CREDIT HOURS

A survey of professional literature in the field of communication; an introduction to scholarly writing of graduate papers. Individual and group projects. Each student will be required to demonstrate oral proficiency of a research project to a reviewing panel of staff members.

### COM 506. ETHICS OF COMMUNICATION

THREE CREDIT HOURS

An investigation into the general ethical principles of persuasion and into the special ethics of platform communication, business communications, conference responsibilities, broadcast-journalism reporting, classroom communication, theatrial message and forensic behavior. Students will be given an opportunity to investigate in depth one or more of the specific areas of ethical communication.

### COM 511. PERSUASION TECHNIQUES

THREE CREDIT HOURS

A review of the development of the Classical Tradition of Persuasion from 600 B.C. to the present. The principles of Classical Rhetoric based upon the theories of Aristotle, Cicero, and Quintilian are examined in order to determine their effect upon modern theories and techniques in oral communication. A comprehensive analysis of the modern approach to persuasion will be supplemented by research projects in the area of business and industry.

### COM 516. BARRIERS TO EFFECTIVE COMMUNICATION

THREE CREDIT HOURS

Examination of those circumstances that prevent effective communication in all areas of personal and group relationships. Consideration will be given to misunderstanding arising from the problems of language, semantics, and the lack of factual knowledge. These elements and their misuse will be studied in such situations as private conversations, business, industrial management, interdepartmental communications, and politics.

### COM 521. THE INVESTIGATION OF LISTENING PROBLEMS

THREE CREDIT HOURS

Studies dealing with the importance and complexities of listening. A comprehensive study of the place of listening in our society and its direct relationship to the various forms of communication. Investigation will be made into an analysis of the many related skills involved in effective listening and to the reasons for poor listening habits. Research will be pursued to demonstrate how listening can be improved along with specific procedures for refining the skills necessary for good reception.

### COM 526. STUDIES IN COMMUNICATION SKILLS

THREE CREDIT HOURS

This course, for senior majors in Communication Arts and Graduate students, is designed to develop and implement the basic skills in oral communication. It stresses comprehensive study of the nature and types of speech situations in the business and professional areas such as the interview, group discussions, the technique of mediation, goodwill and the after-dinner situations. Particular stress will be placed upon the composition and development of lecture length speeches.

**COM 531. PROBLEMS SEMINAR****THREE CREDIT HOURS**

This seminar is designed to offer the student an opportunity to gain practical experience that will supplement his theoretical background. Arrangements will be made for an internship position in a particular business or industry or a specialized area in Communication Arts such as Dramatics, Public Address, Forensics, Radio, and/or Television. The student will submit progress reports as assigned in the seminar sessions. The director of the seminar will collaborate with the director of the internship program within the specialized area.

**COM 536. COMMUNICATION DESIGNS****THREE CREDIT HOURS**

Investigation of contemporary communication design methods in organizational structures, with emphasis on scholastic and experimental approaches. Individual and group projects.

**COM 541. STAGE DESIGN****THREE CREDIT HOURS**

A study of modern theories of scene design; style, balance composition and unity of the stage setting coordinated with lighting theories and techniques.

**COM 546. DEVELOPMENT OF DRAMATIC FORM AND CRITICISM****THREE CREDIT HOURS**

An analytic study of plays and criticism from the major periods of Western drama for the purpose of distinguishing the kinds of drama and the critical standards and evolution of drama in performance.

**COM 551. PROBLEMS IN DRAMATIC PRESENTATION****THREE CREDIT HOURS**

A study of the interpretative problems concerned in the script and the psychological and technical means of projecting dramatic values to the audience.

**COM 556. THEATRE SEMINAR****THREE CREDIT HOURS**

Application of principles of theatre to be selected in the student's field of interest and applied to specific projects.

**COM 561. RHETORICAL CRITICISM****THREE CREDIT HOURS**

Comprehensive study of Classical and Contemporary Rhetorical theory and criticism; study of the contributions of the classicists and modern scholars of Rhetoric.

**COM 566. ADVANCED ARGUMENTATION AND DEBATE****THREE CREDIT HOURS**

Advanced principles of argumentation and debate, including analysis, evidence, and proof. Consideration of the Brief and its construction.

**COM 571. HISTORY OF PUBLIC ADDRESS****THREE CREDIT HOURS**

This course will be basically a survey of great orators and speakers from the period of the Golden Age of Greece through the Roman, Patristic, Medieval, Reformation, and Contemporary Periods in French and British Public Address. It will culminate in a study of American Public Address from early colonial times until the present. An analysis of a highly selective list of great orations and speeches will reinforce the historical and biographical materials.

**COM 598. THESIS****THREE CREDIT HOURS****COM 599. THESIS****THREE CREDIT HOURS**

Proposal submitted by the Candidate for the M.A. Degree must be approved by the director and his graduate committee.

**EQUIVALENT OF THESIS REQUIREMENT****SIX CREDIT HOURS**

The student may select from the following courses his option program: Stage Design (3), Development of Dramatic Form and Criticism (3), Problems in Dramatic Presentation (3), Theatre Seminar (3), Rhetorical Criticism (3), Advanced Argumentation and Debate (3), History of Public Address (3).

**Economics (ECO)****Dr. George E. Matlin, *Chairman***

Prerequisite for enrolling in any of the following courses for credits toward the M.S. in Education degree is Eco 201-202 Principles of Economics or the equivalent.

**Eco 501. ADVANCED PRINCIPLES OF ECONOMICS** **THREE CREDIT HOURS**

A review and analysis of the fundamental principles underlying the economic system.

**Eco 503. HISTORY OF ECONOMIC DOCTRINE** **THREE CREDIT HOURS**

Development of economic concepts and theories from the Mercantilists to the present period.

**Eco 505. CONSUMER ECONOMICS** **THREE CREDIT HOURS**

A study of the economic forces which influence the consumer in his choice and use of goods and services; and of the public and private agencies which afford protection, information, and assistance to the consumer.

**Eco 507. CURRENT ECONOMIC PROBLEMS** **THREE CREDIT HOURS**

An analysis and discussion at an advanced level of current economic issues and problems.

**Eco 520. ECONOMICS OF GOVERNMENT** **THREE CREDIT HOURS**

A survey of government and business relationships in the American economy and the impact of government on private enterprise.

**Eco 525. GRADUATE SEMINAR IN ECONOMICS** **THREE CREDIT HOURS**

Special studies and discussions of economic problems and trends.

**Education****Dr. Joseph J. Panzer, S.M., *Dean***

**EdE 500. MATHEMATICS IN THE ELEMENTARY SCHOOL** **THREE CREDIT HOURS**

A graduate course (or workshop) designed for teachers and school supervisors of the Modern Arithmetic Program. Demonstration of how the logical patterns of mathematical thought which are inherent in arithmetic can be readily acquired by pupils.

**EdF 501. ADVANCED PSYCHOLOGY OF LEARNING** **THREE CREDIT HOURS**

A conscious effort to relate learning theories and current issues in the psychology of learning to major aspects of growth and development.

**EdF 502. COMPARATIVE PHILOSOPHIES OF EDUCATION** **THREE CREDIT HOURS**

The historical development of educational philosophies; evaluation of major current philosophies; significant problems of the present day in educational philosophy. Prerequisite: EdF 419 Philosophy of Education, or equivalent where the student has already achieved a norm for evaluating the theories of modern education.

**EdF 503. RESEARCH METHODOLOGY AND STATISTICS** **THREE CREDIT HOURS**

Designed to develop an understanding of the nature of research: methods, research techniques, sources, evaluation of research studies, basic statistics. Prepares the student for writing the Research Project using the historical, descriptive, experimental, or philosophical approach.

**EdF 504. ADVANCED CHILD AND ADOLESCENT PSYCHOLOGY** **THREE CREDIT HOURS**  
Deals with the principal areas of growth and development through adolescence with special emphasis on mental development.

**EdA 506. SCHOOL ADMINISTRATION** **THREE CREDIT HOURS**  
General principles governing the administrative functions of planning, organizing, and controlling are presented and applications are made in the administration of both elementary schools and secondary schools.

**EdA 507. INTERNSHIP EXPERIENCES IN SCHOOL ADMINISTRATION** **THREE CREDIT HOURS**  
The internship is intended to give school administration majors opportunities to associate with people in various administrative positions in both public and parochial school systems for the purpose of becoming aware of on-the-job problems, duties, responsibilities, and challenges. Students are urged to have a variety of experiences and must submit written evaluations for each experience. Prerequisite: The advisor's approval of a planned series of internship experiences in various areas of educational administration. The student will develop his planned series of experiences with the assistance of an advisor.

**EdA 509. SCHOOL SUPERVISION** **THREE CREDIT HOURS**  
A course in planning, organizing, and administering instructional supervision in public and private (parochial) school systems. Field observation required.

**EdA 510W. CURRICULUM OF THE CATHOLIC ELEMENTARY SCHOOL** **TWO CREDIT HOURS**  
A curriculum development workshop designed for implementation in the Catholic elementary schools. It includes consideration of the necessity of a complete system of Catholic education and the principles which dictate this necessity.

**EdA 511. ELEMENTARY SCHOOL CURRICULUM** **TWO CREDIT HOURS**  
A fundamental course in curriculum development designed to prepare the student for effective participation in cooperative efforts to improve the curriculum. Attention is directed to curriculum issues and to desirable instructional practices in the major areas of curriculum.

**EdA 512. SECONDARY SCHOOL CURRICULUM** **TWO CREDIT HOURS**  
A fundamental course in curriculum development designed to prepare the student for effective participation in cooperative efforts to improve the curriculum. Attention is directed to curriculum issues and to desirable instructional practices in the major curriculum areas.

**EdA 513. ELEMENTARY SCHOOL EVALUATION** **TWO CREDIT HOURS**  
Centers attention on systematic, total school self-evaluation as the basis for school improvement programs.

**EdA 514. SECONDARY SCHOOL EVALUATION** **TWO CREDIT HOURS**  
Centers attention on systematic, total school self-evaluation as the basis for school improvement programs.

**EdA 515. SCHOOL LAW** **TWO CREDIT HOURS**  
Problems in school administration which may give rise to court action.

- EdA 516. SCHOOL PLANT** **TWO CREDIT HOURS**  
 The course will cover types of school facilities, considerations in working with architects, remodeling and new construction, site selection, government financing, space utilization, and other aspects dealing with the overall educational plant.
- EdA 517. SCHOOL FINANCE** **TWO CREDIT HOURS**  
 A course for school administrators covering principles of school finance, technical problems of budgeting, source of income, purchasing, accounting, and debt service.
- EdF 518. SCHOOL AND THE SOCIAL ORDER** **THREE CREDIT HOURS**  
 The relationship of the school to the total cultural pattern and the development of interaction between school and community are appraised and concrete suggestions are presented. The nature of the individual child and his relations with society and culture; the special culture of the school and its accompanying social world; school, teacher, and community relations.
- EdA 521. SCHOOL PUBLIC RELATIONS** **TWO CREDIT HOURS**  
 Covers philosophy and techniques of school-community relations for educational leaders. Attention given to parent contacts, citizens' participation, press, radio, television, printed material and other media.
- EdC 522. PRINCIPLES AND TECHNIQUES OF GUIDANCE** **THREE CREDIT HOURS**  
 An introduction to the scope, aims, and techniques of guidance; an introductory treatment of the basic guidance services and how the counselor and the teacher can make efficient use of them.
- EdC 524. EDUCATIONAL AND OCCUPATIONAL INFORMATION** **TWO CREDIT HOURS**  
 Selection, utilization, and evaluation of educational and occupational information materials; familiarization with standard labor market data, current requirements for admission into college curricula, and available sources of placement; a usable knowledge of printed and personal reference sources in these fields.
- EdC 525. USE OF COMMUNITY RESOURCES IN GUIDANCE** **TWO CREDIT HOURS**  
 Familiarization with availability of services in appraisal, guidance; local information and placement (methods of procedure and cooperation with medical, pastoral, social welfare, mental, educational, industrial, labor, commercial, governmental and recreational agencies).
- EdS 527W. BUSINESS SYSTEMS AND DATA PROCESSING** **THREE CREDIT HOURS**  
 A graduate workshop in business automation, related procedures, and equipment; designed to develop a program of approach the secondary schools can use in educating students in office automation and business data processing. Explanation of the Business Office Education Program of the Department of Education, State of Ohio, is included. This workshop fulfills a requirement for BOE certification. Prerequisite: High School Certification in Business Education.
- EdC 530. PSYCHOLOGY OF INDIVIDUAL DIFFERENCES** **TWO CREDIT HOURS**  
 Nature, extent, and significance of variability; hereditary and cultural influences; theories of intelligence; trait organization; group differences.
- EdC 531. DYNAMICS OF PERSONALITY** **THREE CREDIT HOURS**  
 Required of all graduate students who are enrolled in the School Counseling, School Psychology, and Pupil Personnel programs. Personality theory and abnormal psychology are discussed with emphasis on dynamics of personal behavior.

**EdC 532. LEARNING DISABILITIES****THREE CREDIT HOURS**

Etiological, diagnostic, theoretical, remedial factors and practical application to learning disabilities are described.

**EdC 533. PSYCHOMETRICS****TWO CREDIT HOURS**

Lectures and demonstrations in the principles and application of psychological measurement, with particular emphasis on standardized group tests of intelligence and scholastic achievement, interest tests, personality tests, and other areas pertinent to the graduate function. Practicum in test selection, use, and interpretation.

**EdC 535. PRACTICUM I: TEST INTERPRETATIONS AND CASE STUDIES****TWO CREDIT HOURS**

Supervised experiences in typical school guidance policies and practices. Such experience will include: vocational guidance, educational guidance and curriculum structures, cumulative folder, test and profile interpretations. Prerequisites: EdC 522, 533. (533 may be taken concurrently).

**EdC 539. ADMINISTRATION OF A SCHOOL GUIDANCE PROGRAM****TWO CREDIT HOURS**

Planning, developing and administering school testing and guidance services and group guidance in the homeroom. This course covers also such matters as in-service training of guidance personnel, facilities, supplies, assembling and disseminating educational and occupational information, and liaison with both teachers and school administrators.

**EdC 543. PRINCIPLES AND TECHNIQUES OF COUNSELING****THREE CREDIT HOURS**

Basic theories, principles and techniques of counseling. A consideration of directive, non-directive and eclectic techniques as a function of the intelligence and grade-level of the child; ethical considerations.

**EdC 545. PRACTICUM II: COUNSELING TECHNIQUES****THREE CREDIT HOURS**

Supervised experience in counseling, using role-playing and actual counseling cases. Both group and individualized instruction and supervision. Prerequisites: EdC 524, 533, 543.

**EdF 550. HISTORY OF HIGHER EDUCATION IN THE UNITED STATES****THREE CREDIT HOURS**

A study of the growth and development of American colleges and universities: multiplication and variety; methods of instruction; aims; administration; innovations and conflicts; values of students, faculty and administrators; public opinion.

**EdC 551. PERSONNEL SERVICES IN HIGHER EDUCATION****TWO CREDIT HOURS**

A study of personnel services in higher education: development and principles, theory and practice of administration, trends and research.

**EdC 552. SEMINAR: COLLEGE PERSONNEL SERVICE PROBLEMS****THREE CREDIT HOURS**

This course and the internship in College Personnel Service are integrated over three trimesters. Problems encountered during the internship and present-day problems of campus life are treated.

**EdC 533. INTERNSHIP IN COLLEGE PERSONNEL SERVICES****THREE CREDIT HOURS**

A three-trimester experience in three college personnel services under the instruction and supervision of staff members of the same services working closely with the coordinator of College Personnel Work.

**EdE 559. RESEARCH AND MATERIALS IN MATHEMATICS INSTRUCTION****THREE CREDIT HOURS**

A study of research and trends in contemporary mathematics. Particular attention to new materials and to action research.

**EDE 560. SOCIAL STUDIES THROUGH UNIT TEACHING** **THREE CREDIT HOURS**  
 Designed to help organize the teaching of social science in units. Emphasis on local relevance, concept formation, group dynamics, and individualizing of learning. Actual application in the classroom.

**EDE 561. ANALYSIS OF INSTRUCTION** **THREE CREDIT HOURS**  
 To enable the teacher to increase his awareness of the effect that his teaching behavior has upon pupils; to increase his proficiency in distinguishing between his expectations and the resulting pupil behavior; to become expert in recognizing and overcoming the natural defensive reaction when outcomes in pupil behavior differ from teacher expectations.

**EDE 562. NEW MEDIA AND METHODS IN ELEMENTARY EDUCATION** **THREE CREDIT HOURS**  
 A study of new problems, trends, innovations in the elementary school. Actual use and evaluation in the classroom.

**EDE 563. SUPERVISION OF STUDENT TEACHING** **THREE CREDIT HOURS**  
 Demonstration of procedures and use of instruments to determine the student teacher's readiness and to guide his progress. Prerequisites: EdE 561, 562.

**EDE 564. ADVANCED SCIENCE IN ELEMENTARY SCHOOL** **THREE CREDIT HOURS**  
 This course or workshop is designed to train elementary school teachers to integrate science with all phases of the curriculum—by research projects in the basic areas of astronomy, biology, chemistry, geology, physics, and air-age education. Teachers also have the opportunity to study and evaluate the visual aids now available in the field of science. Prerequisite: EdE 460 Science in the Elementary School or another college course in physical science.

**EDE 565W. PRACTICUM IN SCIENCE INSTRUCTION** **THREE CREDIT HOURS**  
 A two week workshop at the Glen Helen Outdoor Education Center in Yellow Springs, Ohio. Application of inquiry and discovery approach to the study of biotic communities, geologic formations, and balance of nature. (There is an additional fee for board and room.)

**EDE 566. INNOVATIONS AND TRENDS IN LANGUAGE ARTS** **FOUR CREDIT HOURS**  
 A survey of research and trends in Language Arts instruction, particularly in areas of grammar, spelling, and writing.

**EDE 567. SURVEY OF RESEARCH IN READING INSTRUCTION** **THREE CREDIT HOURS**  
 A basic course for experienced teachers concerned with the psychology of learning Reading and with current problems and trends. The first course in a program designed to prepare specialists in Reading.

**EDE 568. DIAGNOSIS AND CORRECTION OF READING DIFFICULTIES** **FOUR CREDIT HOURS**  
 A study of common causes for Reading disabilities and of types of observation and measurements to be used in identifying disabilities. Practicum in use of machines and materials with individuals and groups.

**EDE 570. SUPERVISION AND CURRICULUM IN READING** **THREE CREDIT HOURS**  
 A study of selected curricula and the processes of planning a sound curriculum in Reading at different levels. It outlines the role of the Reading supervisor, providing guidelines for effective implementation of Reading programs. Prerequisite: EdE 568.

**EdA 571W. EVALUATION OF CATHOLIC ELEMENTARY SCHOOLS TWO CREDIT HOURS**

This workshop is designed to enable Catholic school administrators to engage in depth studies relative to the evaluative criteria. The participants will engage likewise in discovering ways and means of implementing the criteria in their own schools or school systems.

**EdC 572. THE SCHOOL PSYCHOLOGIST: ROLE AND FUNCTION TWO CREDIT HOURS**

Selected topics of current significance in the profession of school psychology, with special emphasis on ethics, interpersonal relationships in the school and community, research methodology and current practices in the field.

**EdC 576. CHILD AND ADOLESCENT PERSONALITY EVALUATION I FOUR CREDIT HOURS**

History and objectives of intelligence testing. Methods utilized in the construction of intelligence tests. Intensive experience in administering the Wechsler, Binet, and Illinois Test of Psycholinguistic Abilities.

**EdC 577. CHILD AND ADOLESCENT PERSONALITY EVALUATION II FOUR CREDIT HOURS**

History and rationale of projective tests. Instruction in the administration and use of the Rorschach, Bender Gestalt, TAT, and such other projectives commonly used by the school psychologist. Laboratory experience is provided.

**EdC 580. GUIDANCE IN THE ELEMENTARY SCHOOL THREE CREDIT HOURS**

A study of the most important concepts and techniques of guidance, with emphasis on the functions and responsibilities of the elementary teacher and counselor.

**EdC 581. COUNSELING IN THE ELEMENTARY SCHOOL THREE CREDIT HOURS**

An introduction to the principles and techniques of counseling elementary school children.

**EdC 583. GROUP PROCESS THREE CREDIT HOURS**

This course has two purposes: (1) to enable the counselor to work effectively with groups; and (2) to achieve the formation of deeper counselor self-understanding by actually participating in the group process. (One quarter of class time is devoted to lectures and three quarters to participation.)

**EdC 584. CHILD STUDY PROJECT I THREE CREDIT HOURS**

The primary aim of this program in the first year is to encourage participants to sharpen their awareness of factors that shape the child's motivations and affect his behavior and learning in the classroom.

**EdC 585W. CHILD STUDY LEADERSHIP I TWO CREDIT HOURS**

This workshop is designed to train school personnel for leadership roles in the Child Study Project. It provides training to persons who plan to be group leaders in the Child and Youth Study Project. Besides exploring the processes inherent in the Child Study Project, participants work on skills that will enable them to be more effective group discussion leaders.

**EdC 586. CHILD STUDY PROJECT II THREE CREDIT HOURS**

The second year of the Child and Youth Study Project is designed to continue and extend the understanding of the children and youth with whom we work. During the first year, the approach toward better understanding of children and youth was made through a study of the youth from an external frame of reference. The second year seeks to deepen understanding and increase sensitivity through a study of the subject from an internal frame of reference.

**EdC 587W. CHILD STUDY LEADERSHIP II** **TWO CREDIT HOURS**  
 An advanced Child Study workshop that focuses on (1) group leadership skills, and (2) the processes inherent in child study Project II. Those school personnel who complete this workshop should be able to lead productive second year Child Study Project Groups. Prerequisite: EdC 584 or EdC 585W.

**EdS 588. SEMINAR AND PRACTICUM IN PERSONAL KNOWLEDGE** **THREE CREDIT HOURS**  
 This experience focuses upon the understanding and development of subjectivities through personal encounter and reading. Students are encouraged to explore personal meanings which are not discursive, not nomothetic, and not repeatable. Required of all students pursuing the master high school teacher concentration in the humanities.

**EdS 589. SEMINAR AND PRACTICUM IN THE STUDY OF LEARNING ENVIRONMENTS** **THREE CREDIT HOURS**  
 Study and participation in writing behavioral objectives, in becoming aware of verbal and non-verbal behavior, in micro-teaching, and in becoming aware of the impact of teacher expectations. Required of all students pursuing the master high school teacher concentration in the humanities.

**EdF 590. EDUCATIONAL RESEARCH DESIGN** **THREE CREDIT HOURS**  
 This course has two major emphases: Part I is devoted to basic processes of scientific inquiry into educational problems; Part II is devoted to selected techniques which stress in greater detail specific methodological problems.

**EdF 591. RESEARCH PROJECT** **THREE CREDIT HOURS**  
 Prerequisite for registration: Completion of EdF 503 Research Methodology, and approval of Preliminary Plan.

**EdF 592. GRADUATE SEMINAR** **(NON-CREDIT)**  
 Required of all degree-seeking students in the last term of their enrollment. Designed as a culminating experience, with emphasis on integration of the total graduate program.

**EdF 593. INTERPRETATION OF STATISTICS** **THREE CREDIT HOURS**  
 The emphasis of this course is placed upon descriptive and inferential statistics. Descriptive statistics are used to describe observations of groups of individuals. Inferential statistics are used to make inferences about the total parameters in terms of observed samples and to draw valid inferences and interpretations.

**EdC 594-595. INTERNSHIP FOR SCHOOL PSYCHOLOGISTS** **TWELVE CREDIT HOURS**  
 A job-related program for nine months under the immediate supervision of a trained school psychologist. The internist will be given a stipend, made available from the State of Ohio Foundation funds.

**EdF 596-697. INTERNSHIP IN EDUCATION RESEARCH** **TWELVE CREDIT HOURS**  
 Investigation of the literature of education research; experiences in developing research design; applications of data processing; conduct of major research activity. The South-western Ohio Educational Research Council and area schools are used as a locus of operations.

**EdS 598. INTERNSHIP IN TEACHING** **EIGHT CREDIT HOURS**  
 A full semester of directed teaching experiences under the supervision of a faculty advisor and of selected master teachers in local area schools. Weekly seminars on campus.

**EdC 599. INTERNSHIP EXPERIENCES IN GUIDANCE AND COUNSELING****THREE CREDIT HOURS**

These Internship Experiences are designed to provide students with the opportunity to work on professional problems in guidance and counseling under the direction of the staff of the School of Education. Prerequisite: Permission, Chairman of Department of Counselor Education.

**Chemical Engineering (CME)****Dr. Michael A. Bobal, *Chairman*****CME 507. ADVANCED THERMODYNAMICS****THREE CREDIT HOURS**

Applications of the laws of thermodynamics—Phase equilibria in ideal and nonideal systems—Chemical Equilibrium.

**CME 508. ADVANCED TOPICS IN CHEMICAL ENGINEERING****THREE CREDIT HOURS**

Study and discussion of current problems in Chemical Engineering Research. Prerequisites: Cme 521, Cme 581, Cme 582.

**CME 521. ADVANCED TRANSPORT PHENOMENA****THREE CREDIT HOURS**

Applications of the principles of momentum and heat transfer to steady state and transient problems. Potential flow, boundary layer theory. Prerequisite: Cme 581.

**CME 522. SEPARATION PROCESSES****THREE CREDIT HOURS**

A study of mass transfer in Binary and Multicomponent systems. Absorption. Distillation. Extraction.

**CME 541. PROCESS DYNAMICS****THREE CREDIT HOURS**

Application of dynamic analysis techniques to the study of non-steady state chemical processes.

**CME 542. CHEMICAL ENGINEERING KINETICS****THREE CREDIT HOURS**

Theory of absolute reaction rates, mass and heat transfer in catalytic beds.

**CME 581. ADVANCED CHEMICAL ENGINEERING CALCULATIONS I****THREE CREDIT HOURS**

Applications of ordinary and partial differential equations to engineering problems. Classical methods of solution.

**CME 582. ADVANCED CHEMICAL ENGINEERING CALCULATIONS II****THREE CREDIT HOURS**

Analysis and design of processes and the solution of the resulting differential equations by computer techniques.

**CME 598. SPECIAL PROBLEMS IN CHEMICAL ENGINEERING****TWO TO SIX CREDIT HOURS**

Particular assignments to be arranged and approved by the Chairman of the department.

**CME 599. GRADUATE ENGINEERING THESIS****THREE TO SIX CREDIT HOURS**

Students engaged in thesis research must enroll for this course for a total of six credit hours.

**Civil Engineering (CIE)****Seymour J. Ryckman, *Chairman*****\*CIE 500. ADVANCED STRUCTURAL ANALYSIS****THREE CREDIT HOURS**

Methods of moment-areas, matrix analysis, moment distribution and virtual work. Includes consideration of such problems as frames of variable cross section, plates and shells, space frames and plastic design. Prerequisite: Cie 407, Egm 304.

\*open for enrollment of undergraduate student.

**\*CIE 502. PRESTRESSED CONCRETE** **THREE CREDIT HOURS**  
 Discussion of the properties of concrete and prestressing steel. Theory and design of prestressed concrete beams, slabs, circular tanks and rigid frames. Prerequisite: Cie 407.

**\*CIE 520. ADVANCED SOIL MECHANICS** **THREE CREDIT HOURS**  
 Treatment of the theories of conventional soil mechanics. Detailed study and analysis of the static and dynamic properties of soils, with applications to foundation behavior. Prerequisite: Cie 312.

**\*CIE 524. FOUNDATION DESIGN** **THREE CREDIT HOURS**  
 Analysis of earth pressure, stability of natural slopes and bearing capacity of soil; design of spread foundations, pile foundations, beams on elastic foundations, anchored bulkheads, caissons, and cofferdams. Prerequisite: Cie 312.

**\*CIE 540. HIGHWAY GEOMETRIC DESIGN** **THREE CREDIT HOURS**  
 Design controls and criteria, vehicle capacity, sight distance, intersection and interchange design. Prerequisite: Cie 405.

**\*CIE 544. TRAFFIC ENGINEERING** **THREE CREDIT HOURS**  
 Characteristics of traffic, including the road user, the vehicle, origin, and destination surveys; traffic regulation, control devices and aids, design, administration and planning. Prerequisite: Cie 405.

**CIE 558. TRAFFIC ENGINEERING RESEARCH** **THREE CREDIT HOURS**  
 Problems in control or capacity restraints based on studies of local situations.

**\*CIE 560. ADVANCED SANITARY ENGINEERING** **THREE CREDIT HOURS**  
 Stream pollution control and design of water and waste treatment plants and sewers. Prerequisites: Cie 433, Cie 434.

**\*CIE 562. INDUSTRIAL WASTE TREATMENT** **THREE CREDIT HOURS**  
 Nature and quality of specific industrial wastes and water supplies, treatment and disposal of industrial wastes. Prerequisites: Cie 433, Cie 434.

**\*CIE 580. HYDROLOGY AND SEEPAGE** **THREE CREDIT HOURS**  
 The deposition, movement and infiltration of water as related to the hydrologic cycle and groundwater hydraulics; a study of the theory of flow in porous media with application to dams, excavations, and other foundation problems. Prerequisites: Cie 307, Cie 312.

**\*CIE 582. ADVANCED HYDRAULICS** **THREE CREDIT HOURS**  
 Problems and study involving open channel flow, draw down curves, hydraulics of dams, spillway, models, and water distribution systems. Prerequisite: Cie 307.

**CIE 598. SPECIAL PROBLEMS IN CIVIL ENGINEERING** **TWO TO SIX CREDIT HOURS**  
 Subject material in Civil Engineering and assignments to be arranged and approved by the Department Chairman and the Director of Engineering Graduate Programs.

**CIE 599. THESIS** **THREE TO SIX CREDIT HOURS**  
 Thesis topic to be arranged by student with approval of Thesis Advisor. Student must enroll for this course with total credit of 6 credit hours.

**\*Open for enrollment of undergraduate students.**

**Electrical Engineering (ELE)**Dr. Bernhard M. Schmidt, *Chairman***ELE 502. NETWORK SYNTHESIS****THREE CREDIT HOURS**

Synthesis of linear passive networks using classical pole-zero techniques; conditions for physical realizability; approximating network functions and design to meet specific requirements; analysis and synthesis of linear active networks. Prerequisites: Ele 332, Ele 413. (Open for enrollment of undergraduate students.)

**ELE 505. QUANTUM ELECTRONICS: PRINCIPLES****THREE CREDIT HOURS**

Principles of quantum theory; classical and quantum statistics; many-particle systems; electromagnetic interactions with materials. Prerequisite: Ele 440 or equivalent. (Open for enrollment of undergraduate students.)

**ELE 506. SOLID STATE DEVICES****THREE CREDIT HOURS**

Introduction to the theory of solid state electron devices. Bulk devices, junction devices, devices involving electric, magnetic, optical, and acoustical interactions. (Open for enrollment of undergraduate students.)

**ELE 507. ELECTROMAGNETIC FIELDS I****THREE CREDIT HOURS**

Fundamental concepts; introduction to waves; theorems of electromagnetics; plane wave function; cylindrical wave functions. Prerequisite: Ele 334.

**ELE 508. ELECTROMAGNETIC FIELDS II****THREE CREDIT HOURS**

Spherical wave functions; perturbational and variational techniques; microwave networks. Prerequisite: Ele 507.

**ELE 509. ANALYSIS OF LINEAR SYSTEMS****THREE CREDIT HOURS**

Modern methods of analysis of transient phenomena in electrical, mechanical, and thermal linear systems involving lumped and distributed parameters. (Consent of instructor.)

**ELE 513. COMMUNICATION THEORY****THREE CREDIT HOURS**

The application of Fourier series and integrals to the analysis of communication problems; theory of random signals, autocorrelation, power density spectra, and optimum filters. Prerequisite: Ele 413.

**ELE 514. ANALYSIS OF NON-LINEAR SYSTEMS****THREE CREDIT HOURS**

An advanced study of methods of analysis of non-linear systems with applications in the fields of electric circuit theory and control systems. Prerequisite: Ele 509.

**ELE 515. AUTOMATIC CONTROL THEORY****THREE CREDIT HOURS**

Representation and analysis of feedback control systems; Nyquist plots; Bode diagrams; the root-locus method and signal-flow diagrams; introductory treatment of sampled data systems. (Consent of instructor.)

**ELE 517. RANDOM PROCESSES IN SYSTEM THEORY I****THREE CREDIT HOURS**

A coherent, semiformal introduction to the theory of probability and random processes as applied to system theory. Topics to be treated are the axioms of probability; the concept of random variable, distributions, density; function of random variables; stochastic processes; stationary processes; linear mean square estimation; Markov processes. Prerequisite: Ele 331 or consent of instructor.

**ELE 518. ESTIMATION THEORY AND ITS APPLICATIONS** **THREE CREDIT HOURS**  
 A unified approach to the theory of estimation as applied to engineering problems of communication and control. Review of probability and linear dynamical systems, analysis of discrete and continuous linear stochastic systems; frequency and time domain solution of the linear estimation problem; applications to current engineering problems of communication and control. Prerequisite: Ele 517.

**ELE 521. CONDUCTORS AND DIELECTRICS** **THREE CREDIT HOURS**  
 Ionic and metallic conduction; thermoelectric phenomena; conductors for various engineering application; physics of "non-conductors"; ferro-electricity; electrets; piezoelectricity; optical properties; specialty materials. Prerequisite: Ele 525 or consent of instructor. Corequisite: Ele 505.

**ELE 522. MAGNETIC MEASUREMENTS** **THREE CREDIT HOURS**  
 Magnetic material properties; quantities and units. Field generation; measurement of field strength, static magnetization and induction; permeability, induction and iron losses, etc. at power frequencies; resonance phenomena; special measurements; magnetostriction, magnetocaloric and magneto-optic effects. Prerequisite: Ele 525 or consent of instructor.

**ELE 523. PERMANENT MAGNETS** **THREE CREDIT HOURS**  
 Definition and basic types; engineering uses of permanent magnets; physics of permanent magnets' fine particle theory. Measurement of permanent properties; design with permanent magnets; present research activities. This course is designed to prepare students for research work on permanent magnets. Corequisite: Ele 525 or consent of instructor.

**ELE 524. MAGNETIC MATERIALS AND SUPERCONDUCTORS I** **THREE CREDIT HOURS**  
 Description of bulk magnetic properties. The magnetic circuit. Atomic magnetism. Types of magnetic order and spin structures. Intrinsic magnetization. Molecular field theory. Magnetic domains. Relations between technical magnetization and domain structure. Prerequisite: Ele 334 or consent of instructor.

**ELE 525. MAGNETIC MATERIALS AND SUPERCONDUCTORS II** **THREE CREDIT HOURS**  
 Magnetic anisotropies. Magnetostriction and stress effects. Eddy currents. Magnetic losses. Magnetic resonance phenomena. Thin films, fine particles. Engineering applications of magnetic materials. Superconductivity; phenomenology, basic theoretical concepts, materials. Applications of superconductors: magnets, magneto-mechanical devices, amplifiers and switching elements, storage devices, bolometers, heat flow valves. Prerequisite: Ele 524.

**ELE 527. RANDOM PROCESSES IN SYSTEM THEORY II** **THREE CREDIT HOURS**  
 A continuation of Ele 517, Random Processes in System Theory I, with emphasis on Markov Processes and Random Dynamical Systems. Prerequisite: Ele 517.

**ELE 531. DIGITAL SYSTEMS THEORY I** **THREE CREDIT HOURS**  
 Switching Circuit Theory: Number systems, truth functions, Boolean algebra, switching devices, codes, relay circuits, threshold logic, and an introduction to sequential circuits. Prerequisite: Ele 313 or consent of instructor. (Open for enrollment of undergraduate students.)

**ELE 532. DIGITAL SYSTEMS THEORY II** THREE CREDIT HOURS  
 Sequential Circuit Theory: Clocked sequential circuits, incompletely specified sequential circuits, pulse-mode circuits, fundamental mode circuits, linear sequential circuits.  
 Prerequisite: Ele 531.

**ELE 533. DIGITAL SYSTEMS THEORY III** THREE CREDIT HOURS  
 Digital Computer Design: Digital arithmetic, switching matrices, digital computer elements, arithmetic and control units, the logic design of a simple digital computer.  
 Prerequisite: Ele 532.

**ELE 534. DIGITAL SYSTEMS THEORY IV** THREE CREDIT HOURS  
 Advanced Sequential Machine Theory: Finite — state machines, regular expressions, lossless machines, bilateral analysis and synthesis procedures, sequential iterative systems. Prerequisite: Ele 532.

**ELE 535. CODING THEORY** THREE CREDIT HOURS  
 The theory of error-correcting, error-detecting codes as applied to the design of reliable digital data systems. Prerequisite: Ele 532.

**ELE 598. SPECIAL PROBLEMS IN ELECTRICAL ENGINEERING** TWO-SIX CREDIT HOURS  
 Particular assignments to be arranged and approved by the chairman of the department.

**ELE 599. THESIS** THREE TO SIX CREDIT HOURS  
 Students engaged in thesis research must enroll for this course for a total of six credit hours.

## Engineering Mechanics (EGM)

**EGM 501. EXPERIMENTAL STRESS ANALYSIS** THREE CREDIT HOURS  
 A study of the experimental analysis of stress as an aid to design for strength and economy with emphasis on electrical strain gauges. Also covered are photoelasticity, brittle coatings, photoelastic coatings, analogies, structural similitude. Two hours lecture and one three-hour lab per week. Prerequisite: Egm 304.

**EGM 519. ANALYTIC DYNAMICS** THREE CREDIT HOURS  
 Kinematics, relative motion, constraints and generalized coordinates, Hamilton's principle, Lagrange's equations, variational principles. Applications to particle dynamics and rigid body motion. Prerequisites: Egm 301, Mth 219, or equivalent.

**EGM 530. APPLIED ELASTICITY** THREE CREDIT HOURS  
 Equations of equilibrium and continuity; solution of two-dimensional problems in rectangular and curvilinear coordinates by means of stress functions; St. Venant's principle; energy methods; stress concentrations; introduction to three-dimensional and thermal stress problems; application of finite difference equations. Prerequisite: Egm 304.

**EGM 539. THEORY OF PLASTICITY** THREE CREDIT HOURS  
 Fundamentals of elasticity and plasticity, yield criteria, plastic stress-strain relations, theories of work hardening. Extremum principles. Application to problems of bending, torsion, plane stress and plane strain. Slip line and limit analysis. Prerequisite: Mee 533.

**EGM 598. SPECIAL PROBLEMS IN ENGINEERING SCIENCE** TWO TO SIX CREDIT HOURS  
 Particular assignments to be arranged and approved by the Chairman, Graduate Study Committee, School of Engineering.

## Industrial Engineering (INE)

Robert I. Mitchell, *Chairman*

- INE 501. ANALYSIS OF ENGINEERING DATA** **THREE CREDIT HOURS**  
 A study of statistical techniques especially applicable to industrial experimentation and research. Principles of analysis of variance and design of experiments and multiple correlation. Emphasis upon the theory underlying various techniques.
- INE 502. SIMULATION TECHNIQUES IN OPERATIONS RESEARCH** **THREE CREDIT HOURS**  
 The construction of models which simulate real systems, the use of random numbers in obtaining sample observation of the model, and the inference of system properties from samples of observations of the model.
- INE 503. MATHEMATICAL PROGRAMMING OF INDUSTRIAL PROBLEMS** **THREE CREDIT HOURS**  
 Development of analytical techniques for the solution of engineering and economic problems. Construction of mathematical models, with emphasis on linear models and linear programming.
- INE 504. INDUSTRIAL DYNAMICS** **THREE CREDIT HOURS**  
 Experimental and quantitative approaches are used for designing corporate structures and policies compatible with organization growth and stability objectives. Information feed-back systems, decision making policy, computer simulation and experimental model approaches to the design of large systems are among the topics studied.
- INE 506. ADVANCED WORK STUDY** **THREE CREDIT HOURS**  
 Introduction to the latest developments in assembly methods, including selection of cycle time, assembly line balancing, sequencing of mixed models, and automatic assembly methods. Technical, economic and human aspects of both processing and assembly work.
- INE 507. ADVANCED WORK MEASUREMENT** **THREE CREDIT HOURS**  
 An advanced study of work standards, how they are developed, evaluated and used. Predetermined time systems, time study techniques and Work Measurement Sampling are studies with particular emphasis on the statistical aspects of work measurement.
- INE 508. ADVANCED QUALITY CONTROL** **THREE CREDIT HOURS**  
 Principles and applications of the latest quality control procedures. Design of quality control systems and procedures. Recent developments in statistical quality control such as multi-level continuous acceptance sampling, variable sampling, and life testing.
- INE 515. QUEUING THEORY AND APPLICATION** **THREE CREDIT HOURS**  
 Emphasizes application of theory to Industrial Engineering. Topics include machine interference, mathematical queuing models, a study of case histories (with solutions) including marketing models, servicing problems, Markovian models. Includes Monte Carlo techniques and computer simulation models.
- INE 516. INVENTORY THEORY AND APPLICATION** **THREE CREDIT HOURS**  
 Theory and application of inventory control with respect to costs of ordering and manufacturing, holding and storage, shortage penalty costs, revenues, and discount rates. Topics include: forecasting, material control, input capacity and scheduling, stochastic inventory models, dynamic inventory models including real time computerized inventory control models.

**INE 517. RANDOM PROCESSES IN SYSTEM THEORY I** **THREE CREDIT HOURS**

A coherent, semiformal introduction to the theory of probability and random processes as applied to system theory. Topics to be treated are the axioms of probability; the concept of random variable, distributions, density; function of random variable; expectation and Lebesgue Integration; sequences of random variables; stochastic processes; linear mean square estimation; Markov processes. Prerequisite: Ele 322 and working knowledge of LaPlace transforms or consent of instructor.

**INE 518. ESTIMATION THEORY AND ITS APPLICATIONS** **THREE CREDIT HOURS**

A unified approach to the theory of estimation as applied to engineering problems of communication and control. Review of probability and linear dynamical systems, analysis of discrete and continuous linear stochastic systems; frequency and time domain solution of the linear estimation problem; applications to current engineering problems of communication and control. Prerequisite: Ine 517.

**INE 521-522. OPERATIONS RESEARCH** **SIX CREDIT HOURS**

Study of methods of operations research, including formulating problems, weighing the objectives, construction of models, deriving solutions, testing the models and implementing results. Emphasis upon applications of operations research to industrial problems. Prerequisites: Ine 501, Ine 503, or equivalent.

**INE 524. DISCRETE TIME SERIES** **THREE CREDIT HOURS**

Emphasis is placed on Industrial applications of open loop statistical forecasts. Techniques of describing a time series by very general classes of functions are studied. These include but are not limited to trigonometric functions that make it possible to describe any cyclical process accurately and easily.

**INE 525. SYSTEM RELIABILITY AND MAINTAINABILITY** **THREE CREDIT HOURS**

Application probability and statistical theory to the design of reliability systems in the broadest sense; theory behind and techniques to be used in designing evaluation methods and procedures for determining reliability of component parts and total systems. Prerequisite: Ine 521, or equivalent.

**INE 527. RANDOM PROCESSES IN SYSTEM THEORY II** **THREE CREDIT HOURS**

A continuation of Ine 517, Random Processes in System Theory I, with emphasis on Markov Processes and Random Dynamical Systems. Prerequisite: Ine 517, or Ele 517.

**INE 528. DESIGN AND ANALYSIS OF EXPERIMENTS** **THREE CREDIT HOURS**

Covers advanced topics in statistical experiments with emphasis on the design aspects. Topics include confounding, fractional replication, factorial and nested designs. Prerequisite: Ine 501, or equivalent.

**INE 530. ADVANCED TOPICS IN LINEAR PROGRAMMING** **THREE CREDIT HOURS**

Main emphasis on computational techniques and applications of linear programming to industrial problems, primal-dual algorithm, decomposition principle, assignment, transportation and transshipment problems, network flow algorithm and integer programming. Prerequisite: Ine 503.

**INE 531. NON-LINEAR AND DYNAMIC PROGRAMMING** **THREE CREDIT HOURS**

Development of the theory and computational techniques of non-linear and dynamic programming. Includes applications of optimization methods, non-linear programming problems, stochastic programming, gradient methods, dynamic programming, Kuhn-Tucker theory and quadratic programming. Prerequisites: Ine 503, Ine 521.

**INE 541. PRODUCTION ENGINEERING** **THREE CREDIT HOURS**  
The design of systems of men and machines for the production process; forecasting, scheduling, production and inventory control, staffing, plant layout, and equipment replacement. Prerequisites: Ine 502, 521, or equivalent.

**INE 542. ANALYSIS AND DESIGN OF CONTROL SYSTEMS** **THREE CREDIT HOURS**  
Use of mathematical models, data-gatherings and statistics in defining the design problem. Systems logic, queuing theory, game theory, linear programming, simulation and human engineering applied to the design of large-scale work systems. Prerequisites: Ine 502, 521, or equivalent.

**INE 543. ADVANCED PRODUCTION CONTROL** **THREE CREDIT HOURS**  
Analysis of modern, quantitative techniques of production planning and control. Design of production control systems using methods of mathematical programming, probabilistic and deterministic models. Prerequisites: Ine 521, 522, or equivalent.

**INE 544. ADVANCED TOPICS IN RELIABILITY AND MAINTAINABILITY** **THREE CREDIT HOURS**  
The exact content of this course will vary from year to year. The major emphasis will be to study the latest research in the field and evaluate the impact these developments will have on future practices in reliability and maintainability. Prerequisites: Ine 508, 525, or equivalent.

**INE 590. SEMINAR IN ENGINEERING MANAGEMENT** **THREE CREDIT HOURS**  
An analysis in depth of strategically important areas of engineering management which are being influenced by technological innovations. Will include guest lectures on selected topics, team studies, and the correlation of administrative practice with theory.

**INE 598. SPECIAL PROBLEMS IN INDUSTRIAL ENGINEERING** **TWO TO SIX CREDIT HOURS**  
Particular assignments to be arranged and approved by the chairman of the student's advisory committee.

**INE 599. MS THESIS IN INDUSTRIAL ENGINEERING** **THREE TO NINE CREDIT HOURS**  
Students engaged in Master's thesis research must register for this course and continue registering each semester until the thesis is completed for a total credit of not more than nine hours (usually six hours).

## **Mechanical Engineering (MEE)**

Dr. Howard E. Smith, *Chairman*

Students who have completed work equivalent in nature to the stated prerequisite courses may be enrolled in these courses with the consent of the instructor.

**MEE 501. PRINCIPLES OF MATERIALS I** **THREE CREDIT HOURS**  
The electronic, atomic, submicroscopic, microscopic and macroscopic structures of crystalline solids are presented. Specific topics include bonding, electron theory of metals, crystals, dislocations, phase diagrams, phase transformations, and diffusion. Prerequisite: Mth 219.

**MEE 502. PRINCIPLES OF MATERIALS II****THREE CREDIT HOURS**

A theoretical approach to the mechanical behavior of crystalline solids is presented, emphasizing the relationship of mechanical properties to the structure of materials. Topics include elasticity, plasticity, strengthening mechanisms, creep, fracture, fatigue, and the mechanical testing of these properties. Prerequisite: Mee 501.

**MEE 503. X-RAY DIFFRACTION ANALYSIS****THREE CREDIT HOURS**

The fundamentals of X-ray diffraction and its application to the study of materials. The generation and detection of X-rays, elements of crystallography and the diffraction of X-rays by crystals. The laboratory includes both single and polycrystalline X-ray diffraction procedures. Two hours lecture and one three-hour lab per week. Prerequisite: Mee 501.

**MEE 504. ELECTRON PROBE MICROANALYSIS****THREE CREDIT HOURS**

An introduction to electron and X-ray optics and specimen interactions. The design and applications of the scanning electron microscope and the electron probe micro-analyzer. Laboratory includes the actual operation of the scanning electron microscope and the electron probe microanalyzer, data retrieval and interpretation, and techniques of specimen preparation. Two hours lecture and one three-hour lab per week.

**\*MEE 505. THE PHASE DIAGRAM****THREE CREDIT HOURS**

Thermodynamic properties of solutions and intermediate phases. Equilibrium behavior of phase mixtures. Representation of multi-component phase diagrams. Experimental determination and prediction of phase diagrams. Prerequisite: Mee 302.

**MEE 506. MECHANICAL BEHAVIOR OF MATERIALS****THREE CREDIT HOURS**

Description of the state of stress and strain in materials. Deformation behavior of polymers and crystalline materials. Modes of fracture, creep and fatigue.

**\*MEE 511. CLASSICAL THERMODYNAMICS****THREE CREDIT HOURS**

Equilibrium, first law, second law, state principle, and zeroth law; development of entropy and temperature from availability concepts; chemical potential, chemical equilibrium, and phase equilibrium. Thermodynamics of irreversible processes; Onsager reciprocal relations; application of these concepts to diffusion, electronic phenomena in solids, direct energy conversion, and biological problems.

**\*MEE 512. CONDUCTION HEAT TRANSFER****THREE CREDIT HOURS**

Steady state and transient state conduction. Evaluation of temperature fields by formal mathematics, numerical analysis, and analogic experiments.

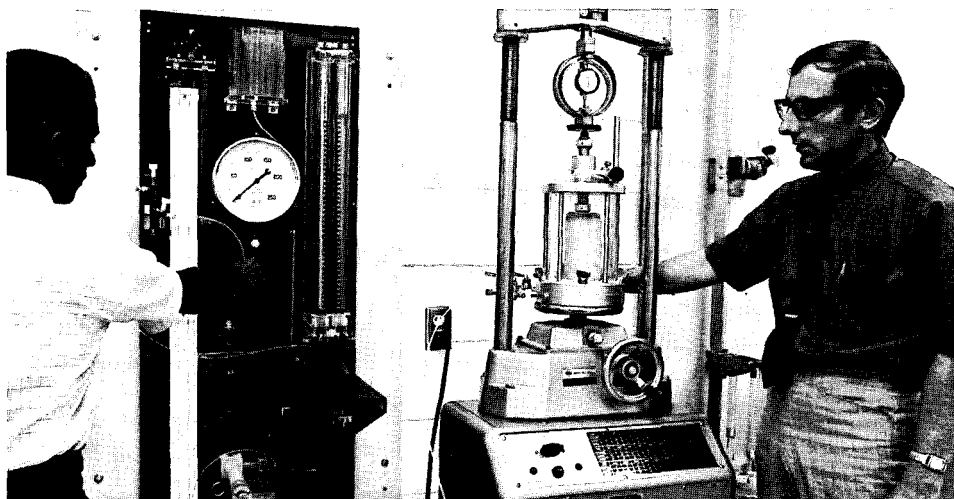
**\*MEE 513. JET PROPULSION****THREE CREDIT HOURS**

Principles of jet propulsion and engine classification, aerothermodynamics, diffuser and nozzle flow, energy transfer in turbo-machinery, turbojet and turbo-fan engines, turbo-prop and turboshaft engines, rocket motors and brief introduction to related materials. Prerequisite: Mee 418.

**\*MEE 514. DIRECT ENERGY CONVERSION****THREE CREDIT HOURS**

Introduction to the principles of direct energy conversion. The following topics are discussed: irreversible thermodynamics; semiconductors; thermoelectric, thermomagnetic, photovoltaic, and thermionic devices; magnetohydrodynamics; fuel cells. Prerequisites: Mee 302, Mee 303.

\*Open for enrollment of undergraduate students with the consent of the department chairman.



**\*MEE 515. STATISTICAL THERMODYNAMICS** **THREE CREDIT HOURS**  
 Microscopic thermodynamics; Kinetic theory; Virial theorem of Clausius; transport phenomena; Gibbs, Boltzmann, Bose-Einstein, Fermi-Dirac Statistics. Connection between statistical and thermodynamic quantities. Applications to Perfect and Real gases, liquids, crystalline solids, and thermal radiation. Information theory, irreversible thermodynamics. Prerequisites: Mee 301, Mth 219.

**\*MEE 516. CONVECTION HEAT AND MASS TRANSFER** **THREE CREDIT HOURS**  
 Development of governing differential equations for convection. Methods of solution including similarity methods, integral methods, superposition of solutions, eigenvalue problems. Turbulent flow convection; integral methods, eddy diffusivities for heat and momentum. Extensions to mass transfer. Prerequisite: Mee 410.

**MEE 517. RADIATION HEAT TRANSFER** **THREE CREDIT HOURS**  
 Fundamental relationships of radiation heat transfer. Radiation characteristics of surfaces. Geometric considerations in radiation exchange between surfaces. Emissivity and absorptivity of gases. Introduction to radiative exchange in gases. Prerequisite: Mth 403.

**MEE 518. SOLID STATE ENERGY CONVERSION** **THREE CREDIT HOURS**  
 A study of thermoelectric devices and solar cells with applications to power generation and cooling. Emphasis on complete design including contact resistance, temperature dependent properties and heat transfer. Two hours lecture and one three-hour lab per week. Prerequisite Mee 410.

**MEE 521. VISCOUS FLOW** **THREE CREDIT HOURS**  
 Fundamentals of viscous flow. Navier-Stokes and boundary layer equations. Exact and approximate solutions of these equations. Thermal boundary layers and boundary layers in incompressible flow. Prerequisite: Mee 418; Corequisite: Mth 403.

**\*Open for enrollment of undergraduate students with the consent of the department chairman.**

**MEE 522. POTENTIAL FLOW****THREE CREDIT HOURS**

Fundamental equations, kinematics and dynamics of fluid flow. Principles of irrotational flow. Conformal representation of two-dimensional flow. Prerequisite: Mee 308; Co-requisite: Mth 404.

**\*MEE 523. COMPRESSIBLE FLOW****THREE CREDIT HOURS**

Fundamental equations of compressible flow, introduction to flow in two and three dimensions. Two-dimensional supersonic flow, small perturbation theory, method of characteristics, oblique shock theory. Introduction to unsteady one dimensional motion and shock tube theory. Prerequisite: Mee 418.

**MEE 524. MAGNETOHYDRODYNAMICS****THREE CREDIT HOURS**

An introduction to the dynamics of electrically conducting fluids. Fundamental concepts of electromagnetic and fluid fields from macroscopic point of view. Channel flows, boundary layers. Magnetohydrodynamic propulsion and power generation. Brief introduction to kinetic theory of plasmas. Prerequisites: Mee 523, Mth 403.

**\*MEE 525. PRINCIPLES OF MECHANICS OF FLIGHT****THREE CREDIT HOURS**

Power required and power available. Calculation of steady-state performance characteristics of aerospace vehicles. Dynamic analysis of systems with many degrees of freedom; dynamic stability and response of the rigid vehicle; influence of structural elasticity in vehicle dynamics; aero-elastic stability problems. Prerequisite: Mth 219.

**\*MEE 531. KINEMATIC SYNTHESIS OF MECHANISMS****THREE CREDIT HOURS**

Synthetic design of mechanisms generating a predetermined motion. Introduction to spatial mechanisms.

**\*MEE 532. ENVIRONMENTAL ACOUSTICS AND VIBRACOUSTICS****THREE CREDIT HOURS**

Physics of sound propagation. Physiological and legal aspects of sound. Measurement and analysis of sound and vibrations. Vibration and sound control techniques, source modifications, path modifications, receiver modifications. Acoustic considerations in machine design. Prerequisite: Mth 219.

**\*MEE 533. STRUCTURAL ANALYSIS I****THREE CREDIT HOURS**

Elastic Analysis—Basic principles of stress and strain, introduction to Theory of Beams, and Elastic Instability. Prerequisites: Egm 303, Mth 219.

**\*MEE 534. STRUCTURAL ANALYSIS II****THREE CREDIT HOURS**

Plates and Shells Analysis—Cylindrical bending of plates, circular and rectangular plates under symmetric and unsymmetric loadings; stability of plates; membrane theory of shells. Prerequisite: Egm 304.

**\*MEE 535. MECHANICAL VIBRATIONS****THREE CREDIT HOURS**

Multi-degree of freedom systems, Lagrange's equations, transient vibrations, vibrations of continuous systems. Matrix and numerical methods. Introduction to finite element method. Introduction to nonlinear vibrations. Prerequisite: Mee 416.

**\*MEE 536. FEEDBACK CONTROL SYSTEMS****THREE CREDIT HOURS**

Study of automatic control with particular emphasis on process control (hydraulic, pneumatic and mechanical systems), stability analysis, introduction to the numerical control of machine tools.

\*Open for enrollment of undergraduate students with the consent of the department chairman.

**MEE 537. MATRIX STRUCTURAL ANALYSIS****THREE CREDIT HOURS**

Matrix formulations of structures using direct and energy approaches; displacement, force and combined methods; the finite element technique. Applications to spring-mass systems, bars, beams, trusses, plates and shells. Computer solution of selected problems. Prerequisite: Mee 534.

**MEE 538. INTRODUCTION TO AEROELASTICITY****THREE CREDIT HOURS**

Description of the deformation characteristics of aircraft structures. Deformations under aerodynamic loads; differential equations, integral equation, energy methods of analysis. Galerkin's method. Wing divergence, control surface effectiveness, aeroelastic effects on load distribution, flutter. Prerequisites: Mth 219, Mee 533.

**MEE 539. THEORY OF PLASTICITY****THREE CREDIT HOURS**

Fundamentals of elasticity and plasticity, yield criteria, plastic stress-strain relations, theories of work hardening. Extremum principles. Application to problems of bending, torsion, plane stress and plane strain. Slip line and limit analysis. Prerequisite: Mee 533.

**MEE 550. MECHANICAL ENGINEERING PROJECT****ONE TO SIX CREDIT HOURS**

Student participation in a departmental research, design, or development project under the direction of a project advisor. To obtain credit, the student must show satisfactory progress in the project as determined by a committee presided over by the project advisor and must present a written report and a seminar to the faculty of the Mechanical Engineering Department and other interested persons.

**MEE 551. MATERIALS SCIENCE IN ENGINEERING PROJECT****ONE TO SIX CREDIT HOURS**

Student participation in a materials science in engineering project under the direction of a project advisor. To obtain credit, the student must show satisfactory progress in the project as determined by a committee presided over by the faculty advisor and must present a written report and a seminar to the faculty of the Mechanical Engineering Department and other interested persons.

**MEE 597. SPECIAL TOPICS IN MATERIALS SCIENCE IN ENGINEERING****ONE TO SIX CREDIT HOURS**

Special assignments in materials science in engineering subject matter to be arranged and approved by the student's faculty advisor and department chairman.

**MEE 598. SPECIAL PROBLEMS IN MECHANICAL ENGINEERING****ONE TO SIX CREDIT HOURS**

Special assignments in Mechanical Engineering subject matter to be arranged and approved by the student's Faculty Advisor and the Department Chairman.

**English (ENG)****Dr. B. J. Bedard, *Chairman*****Dr. M. H. Means, *Assistant Chairman***

Prerequisite for enrolling in any of the following courses for graduate credit is at least twenty-four semester hours in literature. All 500 level courses normally meet for two hours but yield three hours credit. The starred courses can be repeated for graduate credit when the topic or content changes.

- \*ENG 505. CREATIVE WRITING** **THREE CREDIT HOURS**  
Supervised practice in writing in various literary forms. Conducted both by group discussions and by individual conferences and critiques. Permission of Chairman required.
- \*ENG 514. STUDIES IN MEDIEVAL LITERATURE** **THREE CREDIT HOURS**  
A treatment of the principal forms and movements in the literature of the Middle Ages, usually read in translation.
- ENG 516. CHAUCER I** **THREE CREDIT HOURS**  
An intensive analysis of *The Canterbury Tales*.
- ENG 517. CHAUCER II** **THREE CREDIT HOURS**  
A study of *Troilus and Criseyde* and the minor poems of Chaucer. Eng 516 is *not* a prerequisite.
- \*ENG 522. STUDIES IN SIXTEENTH CENTURY LITERATURE** **THREE CREDIT HOURS**  
A treatment of the non-dramatic literature of the English Renaissance.
- ENG 526. SHAKESPEARE I** **THREE CREDIT HOURS**  
A consideration of the development of Shakespeare's art from the beginning to *Twelfth Night*. The course includes the early comedies and tragedies, the histories, and the romantic comedies.
- ENG 527. SHAKESPEARE II** **THREE CREDIT HOURS**  
An analysis of Shakespeare's development from *Hamlet* to *The Tempest*. The course includes the major tragedies, problem plays, and dramatic romances. Eng 526 is *not* a prerequisite.
- \*ENG 532. STUDIES IN SEVENTEENTH CENTURY LITERATURE** **THREE CREDIT HOURS**  
A consideration of the principal poets and prose writers of the Stuart, Commonwealth, or Restoration Periods.
- \*ENG 536. STUDIES IN DRAMA TO 1642** **THREE CREDIT HOURS**  
A survey of English drama from the beginning to the closing of the theatres.
- \*ENG 538. STUDIES IN MILTON** **THREE CREDIT HOURS**  
A treatment of the major and minor poems and related prose of Milton.
- \*ENG 542. STUDIES IN EIGHTEENTH CENTURY LITERATURE** **THREE CREDIT HOURS**  
A study of the writers of the Augustan, Post-Augustan, and Pre-Romantic Ages.
- \*ENG 546. STUDIES IN THE NOVEL** **THREE CREDIT HOURS**  
A consideration of the development and characteristic forms of the novel.
- \*ENG 552. STUDIES IN ROMANTICISM** **THREE CREDIT HOURS**  
The nature and progress of English Romanticism as revealed in the principal poets of the early part of the Nineteenth Century.
- \*ENG 556. STUDIES IN NINETEENTH CENTURY LITERATURE** **THREE CREDIT HOURS**  
A treatment of the significant poets and essayists of the Victorian Age.
- \*ENG 562. STUDIES IN TWENTIETH CENTURY LITERATURE** **THREE CREDIT HOURS**  
A study of significant movements, forms, and writers in the literature of the Twentieth Century.

- \*ENG 566. STUDIES IN DRAMA SINCE 1660** **THREE CREDIT HOURS**  
A selective study of significant developments in drama from the Restoration to the present.
- \*ENG 570. STUDIES IN EARLY AMERICAN LITERATURE** **THREE CREDIT HOURS**  
A study of the cultural and literary roots of American literature.
- ENG 572. THE ROMANTIC AGE IN AMERICAN LITERATURE** **THREE CREDIT HOURS**  
A consideration of the writers of the mid-nineteenth century.
- \*ENG 576. MAJOR AMERICAN WRITERS** **THREE CREDIT HOURS**  
An intensive comparative study of two or three American writers considered in depth.
- \*ENG 582. STUDIES IN AMERICAN LITERATURE SINCE THE CIVIL WAR** **THREE CREDIT HOURS**  
A consideration of the principal movements in poetry, fiction, or drama of the late Nineteenth or Twentieth Century.
- \*ENG 587. STUDIES IN THE HISTORY OF CRITICISM** **THREE CREDIT HOURS**  
A consideration of significant developments in the history of critical thought.
- \*ENG 588. STUDIES IN CRITICISM** **THREE CREDIT HOURS**  
A treatment of significant topics in theoretical and/or practical criticism.
- \*ENG 590. TEACHING OF COLLEGE ENGLISH** **ONE CREDIT HOUR**  
Discussion, instruction, and practice in the methods of teaching composition and literature. Required of and open only to Assistants.
- \*ENG 591. STUDIES IN LITERATURE** **ONE TO SIX CREDIT HOURS**  
An analysis of selected literary problems or areas.
- ENG 595. RESEARCH AND BIBLIOGRAPHY** **THREE CREDIT HOURS**  
An introduction to the methods and tools of literary scholarship. Required of all degree applicants.
- ENG 599. THESIS** **THREE-SIX CREDIT HOURS**

## History (HST)

Dr. Leroy Eid, *Chairman*

Courses numbered 5—also appear in the undergraduate catalogue. Enrollment is open to both graduate students and advanced undergraduate students. Courses numbered 6—are restricted to graduate students. The particular emphasis of starred (\*) courses will be announced each term. They may be repeated for graduate credit when the topic and content changes.

- HST 502. MAIN CURRENTS IN ANCIENT HISTORY** **THREE CREDIT HOURS**  
Aspects of the civilizations of the Ancient Near East, Greece, and Rome selected because of their integration into Western Civilization. Emphasized topics: the Hebrew world view and value system, Greek democracy, Roman political and social institutions.

**HST 504. EARLY EUROPE****THREE CREDIT HOURS**

From the Diocletian reform of the Roman Empire to the mid-eleventh century, the course examines the decline of Rome and the construction of European Civilization. Emphasized topics: Byzantine and Islamic contributions, barbarian migrations, development of Christianity and the institutional Church, Carolingian Empire and the revival of learning, and the emergence of European monarchies.

**HST 506. THE RISE OF EUROPEAN STATES****THREE CREDIT HOURS**

Political and social aspects from the mid-eleventh to the mid-fourteenth century. Topics include: evolution of towns and commerce, crusading movement, rise of universities, medieval art and culture, and political construction and interaction of European monarchies.

**HST 507. RENAISSANCE AND REFORMATION****THREE CREDIT HOURS**

The development of European history from the 14th to the middle of the 17th century. Emphasis on the economic, political, social, and religious aspects of the Renaissance, Protestant Revolution, and Catholic Reformation.

**HST 508. EARLY MODERN SPAIN AND PORTUGAL****THREE CREDIT HOURS**

A history of Spain and Portugal from the 15th century to the 18th century; Catholic Kings, Charles V, Phillip II, Henry the Navigator; and the Later Hapsburgs will be dealt with in detail; Spain and Portugal in Europe and the wider world.

**HST 511. ERA OF ABSOLUTISM, ENLIGHTENMENT****THREE CREDIT HOURS**

Designed to bridge the gap between the later Reformation and the era of the French Revolution. Intellectual and cultural developments will be covered, with emphasis on political, economic and social trends of the Old Regime.

**HST 513. THE REVOLUTIONARY ERA, 1789-1918****THREE CREDIT HOURS**

A historical analysis of the European nations and peoples emphasizing the themes of War and Revolution. The course covers the revolutions of the period as well as ideological, scientific, and technological developments.

**HST 514. TWENTIETH CENTURY EUROPE****THREE CREDIT HOURS**

Topics included: causes and outcome of World War I; internal policies of nations between the two World Wars; diplomatic actions leading to World War II; and the impact of World War II.

**HST 515. SOVIET UNION SINCE 1917****THREE CREDIT HOURS**

A detailed survey and analysis of the historical development of the U.S.S.R. from the Revolution of 1917 to the present time.

**HST 516. MILITARY HISTORY SINCE 1789****THREE CREDIT HOURS**

This course touches upon the evolving concept and philosophy of war, the development and inter-relationships of weapons, tactics and strategy, and the role of military affairs in politics.

**HST 524. THE PARLIAMENTARY CONCEPT IN ENGLISH HISTORY****THREE CREDIT HOURS**

A study of the origins and development of common law and parliamentary government in England, stressing the medieval period.

- HST 526. TUDOR-STUART ENGLAND** **THREE CREDIT HOURS**  
 A study of England—1485 to 1714. For the Tudor period, chief emphasis will be given to the development of the national state, royal absolutism, and the Reformation. The evolution of the constitutional question will be the main theme in the treatment of the Stuart era and Cromwellian Interregnum. The social, economic and cultural aspects of the period, as well as its diplomacy, will be fully covered.
- HST 527. ENGLAND IN THE 18TH CENTURY** **THREE CREDIT HOURS**  
 A survey of the changes in British political, social and economic institutions. The neo-classical and Romantic movements, Wesleyism, and the beginnings of Evangelicalism will be studied.
- HST 532. NORTH AFRICA IN MODERN TIMES** **THREE CREDIT HOURS**  
 A study of Morocco, Algeria, Tunisia, and Libya since the 16th century. Stress is placed on the institutional histories of these countries which enabled them ultimately to expel European imperialism.
- HST 536. SOUTH AFRICA IN MODERN TIMES** **THREE CREDIT HOURS**  
 The establishment of the Bantu people and institutions and their subjection to assaults by Boers and British. Such study seeks to illuminate the present dominant governmental policy of apartheid.
- HST 537. WEST AFRICA IN MODERN TIMES** **THREE CREDIT HOURS**  
 West Africa's significance since the 18th century, with special references to the slave trade, the commercial revolution, religious ferment, imperialistic rivalry, and the recent independence movement.
- HST 538. THE MIDDLE EAST, 19TH AND 20TH CENTURIES** **THREE CREDIT HOURS**  
 A survey of the Ottoman Empire, Iran, Egypt, and the modern states of the Middle East, emphasizing the development of nationalism and the place of the Middle East in international politics.
- HST 543. MODERN CHINA** **THREE CREDIT HOURS**  
 A survey of the political, cultural and international developments in China from the eighteenth century to the present.
- HST 546. SOUTHEAST ASIA** **THREE CREDIT HOURS**  
 A survey of the cultural and political history of Southeast Asian countries, emphasizing recent developments.
- HST 547. DIPLOMATIC HISTORY OF THE FAR EAST SINCE 1840** **THREE CREDIT HOURS**  
 A survey of the diplomatic relations of China, Korea, and Japan among themselves and with other powers. The course selects major diplomatic events from 1840 to the present.
- HST 548. JAPAN SINCE PERRY** **THREE CREDIT HOURS**  
 A historical study of the economic, social, and political developments of modern Japan from the end of the "Seclusion" to the present time.
- HST 552. REVOLUTION AND CONFEDERATION** **THREE CREDIT HOURS**  
 The course will treat the following topics: the problems of empire-relationships since 1754; the causes, conduct, and consequences of the American Revolution; the postwar problems leading to the adoption of the Federal Constitution.

**HST 553. AMERICAN COLONIAL HISTORY****THREE CREDIT HOURS**

A study of the foundations of American Nationality: European background of America, development of the colonial system, transplanting of ideas and institutions from the Old World, growth of democratic tendencies.

**HST. 554. THE AGE OF JEFFERSON AND JACKSON****THREE CREDIT HOURS**

Emphasizes the whole range of historical, cultural, social and political trends that are traditionally associated with the presidencies of Jefferson and Jackson. The period covered extends from the 1790's to the 1850's.

**HST 555. THE OLD SOUTH****THREE CREDIT HOURS**

A study of political, social, economic, and cultural history, emphasizing presiding themes of pre-Civil War Southern life—ruralism, cotton culture, extractive economics, slavery, developing political minority status in the nation. A general knowledge of American History is a prerequisite.

**HST 556. CIVIL WAR AND RECONSTRUCTION****THREE CREDIT HOURS**

Remote and immediate causes of the Civil War, especially from 1850 to 1861: problems of North and South during the war; consequences of the war; efforts to create a new Union, 1865-1877; problems created by those efforts.

**HST 572. APPALACHIA AND THE NEW SOUTH****THREE CREDIT HOURS**

A study and appraisal of the internal and external forces that have shaped the Southern states since the Civil War. All aspects of Southern life will be considered.

**HST 574. THE GILDED AGE, 1877-1900****THREE CREDIT HOURS**

A study in the political, diplomatic, economic, social, and cultural developments of the age. The rise of big business, organized labor, and the Populist revolt will be studied.

**HST 575. THE PROGRESSIVE PERIOD, 1900-1920****THREE CREDIT HOURS**

A study in depth of the major historical trends that dominated these years which saw the universal acceptance of America's claim to world power. Due attention will be placed on cultural as well as political developments.

**HST 576. BETWEEN THE WARS****THREE CREDIT HOURS**

Intensive study of chief facets of United States history from 1919 to 1941. Topics emphasized include: Normalcy, the Depression, the evolving New Deal, and the approach to World War II.

**HST 577. CONTEMPORARY AMERICAN HISTORY****THREE CREDIT HOURS**

Diplomatic and domestic history of the United States since the beginning of World War II. Topics include: Wartime Conference Diplomacy, the War, Russia and the Cold War, Cultural Trends of Mid-Century, Social Equality and the Politics of Protest.

**HST 578. INTERPRETATIONS IN AMERICAN HISTORY****THREE CREDIT HOURS**

Specific topics will be chosen for investigation and interpretation as determined by the instructor. The objective of the course is to study new interpretations of historical events. A general knowledge of American History is a prerequisite.

**HST 582. THE HISTORY OF MEXICO****THREE CREDIT HOURS**

Study of Mexican history since 1820. Origins of revolution of 1910 and its development to the present emphasize Mexico's struggle for democracy. Diplomatic and cultural relations between Mexico and the U.S. are considered.

- Hst 583. THE HISTORY OF BRAZIL** THREE CREDIT HOURS  
 A history of Brazil since 1908 emphasizing the Empire, slavery, the early Republic, Getulio Vargas, and the contemporary scene. Economic and social history will be stressed.
- Hst 584. CARIBBEAN SINCE 1801** THREE CREDIT HOURS  
 Study of the cultural, social, economic and political history of the islands and the northern shore of South America in modern times, stressing areas that have gained independence or autonomy.
- Hst 600. HISTORIOGRAPHY** THREE CREDIT HOURS  
 The course will concentrate on a study of the principal historians and the chief contributions to the development of historical writing. Some familiarity with historical method will be required in the composition of research papers.
- \*Hst 610. STUDIES IN EARLY EUROPEAN HISTORY** THREE CREDIT HOURS  
 Selected developments in government, law, urban life, and learning from Rome's decline to the 15th century. Byzantine and Islamic contributions are included.
- \*Hst 620. STUDIES IN MODERN EUROPEAN HISTORY** THREE CREDIT HOURS
- \*Hst 630. STUDIES IN AFRICAN AND MID-EAST HISTORY** THREE CREDIT HOURS
- \*Hst 640. STUDIES IN ASIAN HISTORY** THREE CREDIT HOURS
- Hst 650. THE PHILOSOPHY OF HISTORY** THREE CREDIT HOURS  
 After surveying the various metaphysical interpretations of the meaning of history, the course then analyzes the literature concerned with the epistemological problems of writing history.
- \*Hst 660. STUDIES IN U.S. HISTORY BEFORE 1877** THREE CREDIT HOURS
- \*Hst 670. STUDIES IN U.S. HISTORY AFTER 1877** THREE CREDIT HOURS
- \*Hst 680. STUDIES IN LATIN AMERICAN HISTORY** THREE CREDIT HOURS
- \*Hst 696. SPECIAL STUDIES** ONE TO THREE CREDIT HOURS  
 Tutorial readings or research in special fields. By permission of the Chairman only.
- Hst 699. THESIS** THREE TO SIX CREDIT HOURS

## Information Science (ISC)

Dr. Samuel M. Bower, *Director*

- ISc 501-2. INTRODUCTION TO INFORMATION SCIENCE** SIX CREDIT HOURS  
 Overview of the psychological and scientific principles that underly information. Emphasis is on explaining the foundations of information processing and communication concepts relating such foundations to the development of information systems. Required of all students in program during first year.
- ISc 503. INTRODUCTION TO CYBERNETICS** THREE CREDIT HOURS  
 This course involves the study of the theories of information processing in complex systems. It discusses aspects of cybernetics, fundamentals of feedback control theory, self-adaptive systems, biological control system, and other related areas. Prerequisite: ISc 501.

**ISc 510. COMPUTERS AND RESEARCH DESIGN** **THREE CREDIT HOURS**

An introduction to computer technology with emphasis on the use of computers in facilitating experimentation in both the physical and social sciences. The course concerns both the hardware and software aspects of computers and the coupling of such knowledge with scientific methodology. Students are required to include 510L.

**ISc 510L. COMPUTERS AND RESEARCH DESIGN LAB** **ONE CREDIT HOUR**

Students are expected to design an experiment in their particular field of interest, write a computer program, and process the data through the computer for analysis and the determination of experimental conclusions.

**ISc 515. MATHEMATICS AND INFORMATION SCIENCE** **THREE CREDIT HOURS**

Introduction to those mathematical areas needed by the information scientist for the theoretical analysis of information handling problems and the design of system models.

**ISc 516. ADVANCED STATISTICAL APPLICATION TO INFORMATION SCIENCE**

**THREE CREDIT HOURS**

Extend statistical analytical concepts to those normally encountered in the information science literature. Prerequisite: Six hours in Statistics either at the graduate or undergraduate level. ISc 515.

**ISc 520. COMMUNICATION THEORY** **THREE CREDIT HOURS**

Introduction to the principles of communication in general and to the concepts of communication and information theory in particular. Prerequisite: ISc 501.

**ISc 525. FOUNDATIONS OF BEHAVIORAL THEORY** **THREE CREDIT HOURS**

This course is intended for the student with less than nine hours in psychology. The material studied is highly condensed to bring into perspective the more important of the available psychological data and theory. Primarily oriented for the student who has majored in physical science or engineering. Required of all students admitted with less than nine undergraduate credit hours in psychology.

**ISc 550. INFORMATION SYSTEM TECHNOLOGY** **THREE CREDIT HOURS**

Survey of the technology used in information systems. Consideration will be given to technological needs for specialized information environments such as medicine, industry evaluating information presentation technologies. Prerequisite: ISc 501.

**ISc 553. INFORMATION PRESENTATION** **THREE CREDIT HOURS**

Various methods of presenting data are surveyed and studied. Mechanical and electronic methods of presenting information are considered in detail. Basic psychological data on the visual, auditory sensory systems are studied to provide the student with the basis of evaluating information presentation technologies. Prerequisite: ISc 501.

**ISc 560. ORGANIZATION AND RETRIEVAL OF INFORMATION** **THREE CREDIT HOURS**

Basics of information storage and retrieval in library, management, and scientific environments are studied. Stress is placed on prevailing research findings on psychological problems of information availability and utilization. Emphasis is on the study of organization and retrieval theory rather than on the related mechanics. Prerequisite: ISc 501.

**ISc 561. DESIGN OF MANAGEMENT INFORMATION DECISION SYSTEMS**

**THREE CREDIT HOURS**

To formulate design principles based upon a review of some of the critical issues discussed in the literature and upon the synthesis of ideas formulated in open class discussion of the literature and a series of exemplary design problems.

**ISC 565. SOCIOLOGY OF INFORMATION SYSTEMS** **THREE CREDIT HOURS**  
 An assessment of the philosophical foundations of information and the ethical, moral, political, and social implications of the development of large, complex data processing systems. Prerequisite: ISC 501.

**ISC 570. HUMAN COMMUNICATION** **THREE CREDIT HOURS**  
 Introduction to the sciences related to human communication: psychoacoustics, linguistics, and semantics. Emphasis is on the study of speech production and perception, and the development, structure and use of natural language. Prerequisite: ISC 520.

**ISC 571. MAN-MACHINE COMMUNICATION** **THREE CREDIT HOURS**  
 Introduction to man-machine communication problems. Emphasis is on methods and techniques which permit communication between man and machine by human forms of natural languages: character recognition, speech recognition, and speech synthesis by machine. Prerequisite: ISC 570.

**ISC 575. ARTIFICIAL INTELLIGENCE** **THREE CREDIT HOURS**  
 A study of computer models of concept learning, pattern recognition, problem solving, human rote memory, adaptive systems, simulations of individuals belief systems, neuroticism, and the psychotherapeutic communication process.

**ISC 576. COMPUTATIONAL LINGUISTICS** **THREE CREDIT HOURS**  
 A study of computer models of sentence and text understanding, computer question answering systems, and natural language processing by computer. Prerequisite: ISC 575.

**ISC 580. HUMAN INFORMATION PROCESSING** **THREE CREDIT HOURS**  
 Intended as an advanced course in behavioral theory for students possessing at least nine hours in psychology. The course applies contemporary notions in learning, perception, decision making to the developments in Information Science. Prerequisite: ISC 525, for students with less than nine hours Psychology.

**ISC 590. GRADUATE SEMINAR** **ONE CREDIT HOUR**  
 Enable the student to be familiar with the interest of other graduate students in the program; listen to lectures from the graduate students on research proposals, thesis, etc. Attend lectures of distinguished individuals in the field. Required of all students during Fall and Spring semesters.

**ISC 596. PRACTICUM IN THE DEVELOPMENT OF INFORMATION SYSTEMS** **THREE CREDIT HOURS**  
 Provide experience to the student in working with information problems. Students are assigned to other departments and activities of the university of specific projects. Prerequisite: Permission of advisor.

**ISC 597. READINGS** **ONE TO THREE CREDIT HOURS**  
 Allow individuals interested in specific areas of information to read intensively on the subject with the general guidance of his advisor.

**ISC 598. SPECIAL PROBLEMS** **ONE TO THREE CREDIT HOURS**  
 Areas in Information Science of particular interest to the student are pursued. Where dictated individual research is initiated. Permission of advisor.

**Mathematics (MTH)**

Dr. Kenneth C. Schraut, *Chairman*

**MTH 513. FUNDAMENTAL CONCEPTS OF ABSTRACT ALGEBRA** **FOUR CREDIT HOURS**

An introduction to the basic concepts of abstract algebra such as number postulates, groups, rings, fields, mappings, classes, and sets, as well as certain concepts taken from the classical theory of polynomial rings. A study of the relation of this material to the topics of high school algebra.

**MTH 514. FUNDAMENTAL CONCEPTS OF ANALYSIS** **FOUR CREDIT HOURS**

This course will include the concepts of number, sequence, function of a single real variable, limit, continuity, integration, differentiation, infinite series and the relationship of these concepts to the material in the high school curriculum.

**MTH 515. FUNDAMENTAL CONCEPTS OF LINEAR ALGEBRA AND VECTOR GEOMETRY** **FOUR CREDIT HOURS**

This course will include a study of the basic concepts of linear algebra such as linear independence, bases, linear transformations and matrices, determinants and systems of equations, as well as an introduction to vector geometry using the methods of linear algebra.

**MTH 516. FUNDAMENTAL CONCEPTS IN THE FOUNDATIONS OF GEOMETRY** **FOUR CREDIT HOURS**

An examination of the various types of geometry, from an axiomatic point of view, including incidence geometries, affine geometries, projective geometries, as well as a more detailed study of the classical Euclidean, hyperbolic and elliptic geometries.

**MTH 517. FUNDAMENTAL CONCEPTS OF PROBABILITY AND STATISTICS** **FOUR CREDIT HOURS**

Probability functions, conditional probability, Bayes Theorem, independent events, probability distributions including the binomial, Poisson, uniform, normal, and gamma distributions, moments and moment generating functions, Chebyshev's inequality, the law of large numbers, distribution of functions of random variables, the central limit theorem.

**MTH 518. FUNDAMENTAL CONCEPTS OF STATISTICS WITH COMPUTER APPLICATIONS** **FOUR CREDIT HOURS**

Introduction to the Spectra 70/46 time sharing equipment using BASIC language. Descriptive statistics, Analysis of variance, computer simulation techniques, regression and correlation procedures.

*NOTE: The above courses are normally offered only in the summer term in connection with the National Science Foundation sponsored Teacher's Institute. These courses may not be applied toward the regular Master's degree program in Mathematics.*

**MTH 519-520. STATISTICAL INFERENCE** **THREE CREDIT HOURS EACH TERM**

Sample spaces, Borel fields, random variables, distribution theory, characteristic functions, exponential families, minimax and Bayes procedures, sufficiency, efficiency, Rao-Blackwell theorem, Neyman-Pearson Lemma, uniformly most powerful tests, multivariate normal distributions.

**MTH 521. REAL VARIABLES I** **THREE CREDIT HOURS**

The topology of the real line, continuity and differentiability, Riemann and Stieltjes integrals, Lebesgue measure, relationship between Riemann integrability-Jordan content and measure, Lebesgue integral.

- MTH 522. REAL VARIABLES II** **THREE CREDIT HOURS**  
 Absolute continuity, differentiation and integration, the classical Banach spaces, Fourier series, extensions of the Lebesgue integral. Prerequisite: Mth 521.
- MTH 523. MEASURE THEORY AND INTEGRATION I** **THREE CREDIT HOURS**  
 General theory of measure and integration over abstract spaces, abstract  $L_p$  spaces; product measures, Fubini's theorem, finite signed measures, Jordan-Hahn decomposition, Radon-Nikodym theorem, Riesz Representation theorem. Prerequisite: Mth 521.
- MTH 524. MEASURE THEORY AND INTEGRATION II** **THREE CREDIT HOURS**  
 Integration over locally compact spaces, Baire measures, Borel measures, regular measures, content, Riesz-Markov theorem, advanced topics. Prerequisite: Mth 522, 523 and 571.
- MTH 525. COMPLEX VARIABLES I** **THREE CREDIT HOURS**  
 Fundamental concepts, analytic functions, integration, singularities and series.
- MTH 526. COMPLEX VARIABLES II** **THREE CREDIT HOURS**  
 Entire, meromorphic, periodic and multiple-valued functions; analytic continuation, conformal mapping, and other topics. Prerequisite: Mth 525 or equivalent.
- MTH 531. ADVANCED DIFFERENTIAL EQUATIONS I** **THREE CREDIT HOURS**  
 Existence and uniqueness theorems, linear equations and systems, self-adjoint systems and boundary value problems, numerical methods. Prerequisite: Mth 403 or equivalent.
- MTH 532. ADVANCED DIFFERENTIAL EQUATIONS II** **THREE CREDIT HOURS**  
 Asymptotic behavior and stability, Liapounov's theorems, perturbation theory. Prerequisite: Mth 531.
- MTH 535. PARTIAL DIFFERENTIAL EQUATIONS I** **THREE CREDIT HOURS**  
 Classification of partial differential equations; methods of solution for the wave equation, Laplace's equation, and the heat equation; numerical solutions, applications. Prerequisite: Mth 403 or equivalent.
- MTH 536. PARTIAL DIFFERENTIAL EQUATIONS II** **THREE CREDIT HOURS**  
 Existence and uniqueness theorems, canonical form, Green's theorems and operational methods, boundary value problems. Prerequisite: Mth 535.
- MTH 545. SPECIAL FUNCTIONS** **THREE CREDIT HOURS**  
 The special functions frequently encountered in engineering and the physical sciences are studied. The hypergeometric function and generating functions are used throughout to develop the theory. The theories of infinite products and asymptotic expansions are also discussed. Prerequisites: Mth 404 or 461.
- MTH 551. METHODS OF MATHEMATICAL PHYSICS I** **THREE CREDIT HOURS**  
 Linear transformations and matrix theory, linear integral equations, calculus of variations, eigenvalue problems. Prerequisite: Mth 403 or equivalent.
- MTH 552. METHODS OF MATHEMATICAL PHYSICS II** **THREE CREDIT HOURS**  
 Linear and non-linear oscillators, partial differential equations and potential theory, functional transformations, special functions. Prerequisite: Mth 551.

**MTH 555-556. ADVANCED NUMERICAL ANALYSIS** **THREE CREDIT HOURS EACH TERM**  
 Quadrature methods and the numerical solution of ordinary differential equations; matrices and large scale linear systems; norms and spectral radii of matrices; modern iterative matrix methods, including the successive overrelaxation method; numerical solution of partial differential equations. Considerations will be given to methods suitable for use on digital computers. Prerequisite: Consent of instructor.

**MTH 561. MODERN ALGEBRA I** **THREE CREDIT HOURS**  
 Groups, rings, integral domains and fields; extensions of rings and fields; polynomial rings and factorization theory in integral domains; groups with operators; modules and ideals.

**MTH 562. MODERN ALGEBRA II** **THREE CREDIT HOURS**  
 Finite and infinite field extensions, algebraic closure, constructible numbers and solvability by use of radicals, Galois theory, advanced topics in groups and rings. Prerequisite: Mth 561.

**MTH 565. LINEAR ALGEBRA** **THREE CREDIT HOURS**  
 Vector spaces, linear transformations and matrices; determinants, invariant direct-sum decomposition, rational and Jordan canonical forms; inner product spaces, the spectral theorem, bilinear and quadratic forms.

**MTH 571. TOPOLOGY I** **THREE CREDIT HOURS**  
 An axiomatic treatment of the concept of a topological space; various operators on a set that define a topology; bases and subbases; connectedness, compactness; continuity, homeomorphisms, separation axioms and countability axioms; convergence in topological spaces.

**MTH 572. TOPOLOGY II** **THREE CREDIT HOURS**  
 Compactification theory, paracompactness and metrizability theorems, uniform spaces, function spaces, and other advanced topics of current interest. Prerequisite: Mth 571 or equivalent.

**MTH 573. TOPOLOGICAL VECTOR SPACES I** **THREE CREDIT HOURS**  
 The study of various topologies within linear spaces with emphasis on Banach and Hilbert spaces. The Hahn-Banach theorem and its consequences. Closed graph and open mapping theorems. Prerequisites: Mth 522, 565, and 571, or equivalents.

**MTH 574. TOPOLOGICAL VECTOR SPACES II** **THREE CREDIT HOURS**  
 Banach algebras and spectral theory are studied in detail. Prerequisite: Mth 573.

**MTH 575. DIFFERENTIAL GEOMETRY** **THREE CREDIT HOURS**  
 Vector and tensor algebra; covariant differentiation. An introduction to the classical theory of curves and surfaces treated by means of vector and tensor analysis.

**MTH 590. TOPICS IN MATHEMATICS** **THREE CREDIT HOURS EACH TERM**  
 This course will be given upon appropriate occasions and will deal with specialized material not covered in the regular courses. It may be taken more than once in different areas. Prerequisite: Consent of advisor.

**MTH 598. THESIS** **THREE TO SIX CREDIT HOURS**

**Philosophy (PHL)**Dr. Richard R. Baker, *Chairman***PHL 503. PHILOSOPHY OF MAN****THREE CREDIT HOURS**

A philosophical investigation of man's dignity as discovered through an analysis of his nature, his origin, and his destiny. (Only for those students without sufficient philosophical background for PHL 510.)

**PHL 510. PHILOSOPHY OF SCIENCE****THREE CREDIT HOURS**

An examination of the philosophical problems of the natural, social, and management sciences. Topics include: the aims of inquiry; the objects of scientific study; theories; models; hypotheses; laws; measurements; inferences; predictions; explanations.

**PHL 525. THOMISTIC TEXTS AND COMMENTARIES****THREE CREDIT HOURS**

This course features carefully selected philosophical readings from the writings of Aquinas to be submitted to a critical analysis through the aid of commentaries, including a correlation to the primary Grecian, Neoplatonic, Patristic and Arabic historical sources. A reading knowledge of Latin is desirable.

**PHL 540. ARISTOTLE'S *De Anima* AND ST. THOMAS' COMMENTARY****THREE CREDIT HOURS**

A comparative study relative to problems touching on the philosophy of man, as well as some problematics of human knowledge; but principally contrasting the animistic hylomorphism of Aristotle with the synolistic hylomorphism of Aquinas.

**PHL 541. TEXTS OF PLATO****THREE CREDIT HOURS**

A detailed analysis of prescribed texts of Plato. The texts selected may vary from year to year. This course, therefore, may be repeated for credit when the topics vary.

**PHL 542. TEXTS OF ARISTOTLE****THREE CREDIT HOURS**

A detailed analysis of prescribed texts of Aristotle. The texts selected may vary from year to year. This course, therefore, may be repeated for credit when the topic varies.

**PHL 543. TEXTS OF PRESOCRATIC PHILOSOPHERS****THREE CREDIT HOURS**

An in depth study of the origins of philosophical thought from Hesiod and Thales to Socrates. This course will contrast the mythological and scientific traditions for philosophical development.

**PHL 545. MODERN FRENCH PHILOSOPHY****THREE CREDIT HOURS**

An examination of the leading philosophical movements in France with particular emphasis on the rationalism of Descartes, the spiritualistic realism of Bergson, the positivism of Comte, and the existentialism of contemporary philosophers.

**PHL 550. PHILOSOPHY OF HISTORY****THREE CREDIT HOURS**

After surveying the various metaphysical interpretations of the meaning of history, the course then analyzes the literature concerned with the epistemological problems of writing history.

**PHL 553. KANTIANISM I****THREE CREDIT HOURS**

A close analysis of Kant's monumental work, the *Critique of Pure Reason*, with emphasis on its metaphysical implications, followed by a brief study of Kantian ethics in the *Foundations of the Metaphysics of Morals*.

**PHL 554. KANTIANISM II****THREE CREDIT HOURS**

A study of Kantian ethics through a careful analysis of Kant's *Critique of Practical Reason*, with emphasis on the questions of law, freedom, happiness and God.

**PHL 555. MODERN GERMAN PHILOSOPHY** **THREE CREDIT HOURS**  
 A tracing of post-Kantian influences in modern Germanic philosophy through the idealistic developments of Fichte, Schelling and Hegel; stressing their "rationalistic" theological thought, their return to metaphysics and their varying intellectual intuitionisms.

**PHL 556. PHILOSOPHY OF HEGEL** **THREE CREDIT HOURS**  
 A detailed examination of Hegel's *Phenomenology of Mind*, with additional reference to his *Science of Logic*, *Lectures on the Philosophy of Religion*, and *Lectures on the History of Philosophy*.

**PHL 560. MODERN BRITISH PHILOSOPHY** **THREE CREDIT HOURS**  
 A survey of the 17th and 18th century reactionary and transitional empiricists from Bacon and Hobbes through Locke, Berkeley and Hume. Points of stress include: (1) their psychologico-epistemological approach to experience and fact; (2) their relation to positivism; (3) a critique of ideas, the value of knowledge, the notion of substance, causality and realism.

**PHL 565. AMERICAN PRAGMATISM** **THREE CREDIT HOURS**  
 An investigation of Dewey's concept of experience and its roots in the philosophical writings of Peirce and William James.

**PHL 570. EXISTENTIALIST PHILOSOPHY** **THREE CREDIT HOURS**  
 A penetrating study of the existentialist movement, its nature and causes, along with a survey of the position of some of the outstanding existentialists, such as Kierkegaard, Sartre, Jaspers, Heidegger, and Marcel.

**PHL 571. PERCEPTION AND COGNITION** **THREE CREDIT HOURS**  
 A survey of some fundamental and relevant neuro-physiological, psychological, and phenomenological studies on perception, with emphasis on the various epistemological issues that are at stake.

**PHL 575. CONTEMPORARY PHILOSOPHIES OF EVOLUTION** **THREE CREDIT HOURS**  
 A study of the influence of evolutionary thought in Bergson, Pragmatism of James and Dewey, Marxism, contemporary Christian thought, especially that of Teilhard de Chardin.

**PHL 576. CONTEMPORARY PROBLEMS IN THE PHILOSOPHY OF GOD** **THREE CREDIT HOURS**  
 Seminar dedicated to the reading, analysis, and discussion of the works of contemporary philosophies of God. The works of Alfred North Whitehead, Samuel Alexander, Charles Hartshorne, Paul Tillich, Karl Barth, Rudolf Bultmann, Emil Brunner, Dietrich von Bonhoeffer, N. Berdyayev, N. Lossky, R. Niebuhr, H. Cox, A. Hamilton, P. Van Buren, C. B. Daly, I. T. Ramsey, J. Moreau, and of other minor authors will be analyzed.

**PHL 580. CONTEMPORARY NATURALISM AND REALISM** **THREE CREDIT HOURS**  
 An expository and critical study of some areas of contemporary currents in philosophical thought: naturalism, principally the American naturalism of John Dewey; the intentionality and axiological qualities of a realistic philosophy; the philosophy of the human personality in its philosophico-Christian dimensions.

**PHL 585. PHENOMENOLOGY** **THREE CREDIT HOURS**  
 An analysis of the phenomenological method based primarily on a critical study of Husserl's *Cartesian Meditations*, the fundamental commentary of the founder of phenomenology on his own method.

**PHL 590. DIRECTED STUDIES****THREE CREDIT HOURS**

This course is offered to help the graduate student either to fill unavoidable gaps in his previous training or to study in depth a particular problem, philosopher or historical era. It will be given by qualified members of the staff of the Philosophy Department, after recommendation of the Chairman and Director of Graduate Studies in Philosophy.

**PHL 591. SEMINAR****THREE CREDIT HOURS**

Discussions and reports. The topics, authors, and/or problems will be chosen by the professor conducting the seminar and the students.

**PHL 592. ANALYTIC PHILOSOPHY****THREE CREDIT HOURS**

A survey of the trends of philosophic thought in America and England since 1900 as an introduction to the problems and tenor of analytic philosophy.

**PHL 594. SYMBOLIC LOGIC****THREE CREDIT HOURS**

The history of symbolic logic; formalization of language; propositional and predicate calculi; interpretations; logical truth and validity; consistency, completeness and other metatheoretic considerations; systematization of classical syllogistic logic and other topics.

**PHL 598. TEACHING INTERNSHIP IN PHILOSOPHY****ONE CREDIT HOUR**

Participation in seminars on the teaching of philosophy and in the directed teaching of a "Basic Problems in Philosophy" undergraduate course. Required of, and open only to, graduate philosophy assistants.

**PHL 599. THESIS****THREE-SIX CREDIT HOURS****Physics (PHY)****Dr. Joseph Kepes, *Chairman***

Any 300-400 level course in Physics may be taken for graduate credit under the usual conditions. All such courses must have the approval of the department.

**PHY 505. MODERN PHYSICS FOR ENGINEERS****THREE CREDIT HOURS**

Selected topics in atomic physics, the solid state, and nuclear physics; elementary quantum mechanics and application to the free-particle and the one-electron atom; X-rays, elementary particles, cosmic rays will also be studied to some extent.

**PHY 511. CLASSICAL MECHANICS****THREE CREDIT HOURS**

Analytical dynamics; variational techniques; Hamilton's Principle; the Lagrangian, the Hamiltonian, Hamilton-Jacobi and Poisson Bracket formulations of mechanics; Galilean and Lorentz invariance; and relativistic dynamics. Prerequisite: Phy 303-304 or equivalent.

**PHY 512. CLASSICAL THEORY OF FIELDS****THREE CREDIT HOURS**

Hamilton's Principle extended to fields; Lagrangian formulation used to obtain conservation laws, symmetry and invariance principles; the Klein-Gordon, Maxwell, and Dirac equations cited as examples of scalar, vector, and spinor fields; interacting fields and radiative solutions. Prerequisite: Phy 511 or consent of Instructor.

**PHY 515. STATISTICAL MECHANICS****THREE CREDIT HOURS**

Basic assumptions; statistics of independent particles; the Maxwell Boltzman Distribution; Fermi-Dirac, Bose-Einstein Statistics; applications of distribution laws.

**PHY 518. THEORETICAL PHYSICS I** **THREE CREDIT HOURS**

Topics can include calculation techniques in Modern Physics, complex variable theory, dispersion relations, linear vector spaces, operators, matrix mechanics, eigenvalue equations. Prerequisites: MTH 403-4, or consent of instructor.

**PHY 519. THEORETICAL PHYSICS II** **THREE CREDIT HOURS**

Topics can include Orthogonal functions, Dirac delta function, Laplace's equation, Poisson's equation, D'Alembert's equation, transformation theorems, Green's function, Group theory. Prerequisites: Mth 403-4, or consent of instructor.

**PHY 520. ADVANCED SOLID STATE PHYSICS** **THREE CREDIT HOURS**

Crystal structure, thermal properties of solids; insulators; band theory of solids; semiconductors; luminescence. Prerequisite: Phy 525 or consent of instructor.

**PHY 521. ADVANCED NUCLEAR PHYSICS** **THREE CREDIT HOURS**

Basic properties of the nucleus; the deuteron; nuclear binding energies; scattering; nuclear forces; high energy particles. Prerequisite: Phy 525 or consent of instructor.

**PHY 523. ADVANCED ELECTRICITY AND MAGNETISM I** **THREE CREDIT HOURS**

The boundary value problems of electrostatics and magnetostatics in material media; conservation laws; existence and nature of electromagnetic radiation derived from Maxwell's equations; wave guides and Resonant Cavities.

**PHY 524. ADVANCED ELECTRICITY AND MAGNETISM II** **THREE CREDIT HOURS**

Radiating Systems, interference, and diffraction; special applications of electromagnetic theory made to plasmas, charged particle collisions, Cherenkov radiation, Bremsstrahlung, and multipole fields. Prerequisite: Phy 523.

**PHY 525. QUANTUM MECHANICS I** **THREE CREDIT HOURS**

The physical basis of quantum mechanics, wave packets, free particle motion; Schrodinger's equation applied to potential problems; Harmonic Oscillator and the hydrogen atom; three dimensional extrapolation and scattering. Prerequisite: Phy 511.

**PHY 526. QUANTUM MECHANICS II** **THREE CREDIT HOURS**

Linear vector spaces and spin; time dependent and time independent perturbation theory; the formal theory of scattering is developed and the importance of symmetries and rotations is discussed. Prerequisite: Phy 525.

**PHY 531. ADVANCED GRADUATE LABORATORY** **THREE CREDIT HOURS**

Advanced experiments in classical mechanics, electricity, magnetism, atomic, nuclear and solid state physics. Prerequisite: Approval of Graduate advisor.

**PHY 590. GRADUATE THESIS** **UP TO SIX CREDIT HOURS**

A research problem in selected topics of physics resulting in a written thesis.

**PHY 595. GRADUATE SEMINAR** **NO CREDIT**

Weekly Seminars presented by graduate students, faculty and guest lecturers on current topics.

**PHY 599. SPECIAL PROBLEMS IN (NAMED AREA)** **ONE TO THREE CREDIT HOURS**

Laboratory or library work in one of the following selected topics: Solid State Physics, Polymer Physics, X-Rays, Nuclear Physics, Modern Optics, General Physics, Advanced Quantum Mechanics. May be taken more than once.

**Political Science (POL)**

Dr. Antonio E. Lapitan, *Chairman*  
Mr. Lyndon Abbott, *director MPA Program*

Graduate students in Political Science may take certain 400 level courses for graduate credit, with the permission of the Chairman of the Department.

**POL 501. SCOPE AND METHODS OF POLITICAL SCIENCE** **THREE CREDIT HOURS**  
Explores the relation of Political Science to other disciplines, the proper methodologies, and the basic concepts of the study of politics.

**POL 506. POLITICAL GEOGRAPHY** **THREE CREDIT HOURS**  
Basic geopolitical concepts of land, sea, air, and military power are studied in the context of global geostrategy. A series of critical areas are taken in depth.

**POL 508. SEMINAR: AMERICAN FOREIGN POLICY** **THREE CREDIT HOURS**  
Attention will be given to the process of policy development and the substance of American foreign policies in regard to selected areas and problems.

**POL 509. SEMINAR: NATIONAL SECURITY POLICY** **THREE CREDIT HOURS**  
A critical study of the assumptions and content of Post World War II national security policies and an evaluation of the processes by which the policies have been made.

**POL 510. PUBLIC ADMINISTRATION** **THREE CREDIT HOURS**  
A study of the administrative system and the administrative process in the American national government. Structural and behavioral approaches are compared.

**POL 514. HISTORY OF POLITICAL THEORY** **THREE CREDIT HOURS**  
A study of the Western political heritage as fashioned by the great Western political thinkers from Plato through Marx and Lenin.

**POL 520. SEMINAR: POLITICS OF DEVELOPING NATIONS** **THREE CREDIT HOURS**  
A systematic analysis of the political processes and the nature of political development in developing countries.

**POL 521. INTERGOVERNMENTAL RELATIONS** **THREE CREDIT HOURS**  
Interaction of different levels of government in the United States; problems of federalism; interstate compacts; federal-urban problems.

**POL 522-528. SEMINAR: COMPARATIVE POLITICS** **THREE CREDIT HOURS**  
A systematic analysis of the political structures and processes of selected country or countries in each of the following areas with emphasis on their capabilities to maintain political stability.

|                        |                        |
|------------------------|------------------------|
| Pol 522 Soviet Union   | Pol 526 Latin America  |
| Pol 523 Eastern Europe | Pol 527 Far East       |
| Pol 524 Western Europe | Pol 528 Southeast Asia |
| Pol 525 Africa         |                        |

**POL 530. SEMINAR: INTERNATIONAL LAW** **THREE CREDIT HOURS**  
Principles and practice in public international law, including study of sources, institutions, and leading cases.

**POL 535. FISCAL ADMINISTRATION** **THREE CREDIT HOURS**  
Study of tax systems, the budgetary process, and public fiscal management, with emphasis on current practice and problems.

**POL. 540. PROBLEMS IN PUBLIC ADMINISTRATION** **THREE CREDIT HOURS**  
A seminar on selected problems in public management. May be repeated once.

**POL 545. SEMINAR: URBAN POLITICS** **THREE CREDIT HOURS**  
A study of the formal and informal patterns of political action and government in urban areas, relations among government units, community power structure and the formulation and execution of public policy.

**POL 552. GOVERNMENT PLANNING** **THREE CREDIT HOURS**  
Urban land utilization with an emphasis upon zoning, housing, and economic development. Urban renewal and criteria for land-use in inner-city areas are considered.

**POL 557. SEMINAR: STATE GOVERNMENT AND POLITICS** **THREE CREDIT HOURS**  
A study of the political institutions, systems, and processes of state government with consideration of the problems of federalism and constitutional reform.

**POL 560. SEMINAR: AMERICAN POLITICAL THOUGHT** **THREE CREDIT HOURS**  
A study of basic political ideas that have influenced the development of American thought.

**POL 567. STUDIES IN POLITICAL SCIENCE** **THREE CREDIT HOURS**  
Directed research and readings on specific topics in American politics and institutions; public law, theory and methodology; comparative politics; and international relations. May be repeated once.

**POL 569. SEMINAR IN POLITICAL THEORY** **THREE CREDIT HOURS**  
A research seminar with emphasis upon the various facets of classical or contemporary political theory. May be repeated once when the content changes.

**POL 571. SEMINAR: CONSTITUTIONAL LAW** **THREE CREDIT HOURS**  
A study of the judicial process in the development of the American Constitution. Competing constitutional philosophies are explored in the context of landmark cases. Emphasis is placed upon contemporary developments.

**POL 572. ADMINISTRATIVE LAW** **THREE CREDIT HOURS**  
The judicial functions and activities of federal agencies; formal and informal processes in administrative hearings; basic principles of administrative law; judicial interpretation; the question of the increased judicialization of the administrative process.

**POL 573. SEMINAR: CIVIL LIBERTIES** **THREE CREDIT HOURS**  
Concentration on the endless philosophical conflict between the demand for individual liberty on the one hand and the need for authority on the other. Major focus will be on the United States.

**POL 574. SEMINAR: AMERICAN POLITICS** **THREE CREDIT HOURS**  
This course will involve, in each term in which it is offered, an analysis of presidential leadership and politics, statutory regulation of political parties, or demography and political behavior. May be repeated once.

**POL 575. SCIENCE AND PUBLIC POLICY** **THREE CREDIT HOURS**  
A study of the relationship between scientific-technical developments and governmental institutions, policies, and processes.

**POL 576. PUBLIC PERSONNEL ADMINISTRATION** **THREE CREDIT HOURS**  
 A survey of the development of personnel administration in government. Specific questions such as position classification, morale, and recruitment are considered. Supplemented by visiting lecturers from government agencies.

**POL 577. MUNICIPAL GOVERNMENT** **THREE CREDIT HOURS**  
 An analysis of urban government in the United States, with emphasis on contemporary problems of organization of services, urban renewal, and city planning.

**POL 578. STUDIES IN PUBLIC ADMINISTRATION** **THREE CREDIT HOURS**  
 Directed research and readings on specific topics in public administration. May be repeated once.

**POL 581. ORGANIZATIONAL THEORY** **THREE CREDIT HOURS**  
 A study of organization and contemporary bureaucracy in terms of decision-making and rationality; problems of authority; behavioral political, and technical influences on organization; and evaluation of various theoretical approaches to organization.

**POL 582. COMPARATIVE PUBLIC ADMINISTRATION** **THREE CREDIT HOURS**  
 A study of the governmental administrative systems of Europe and the developing countries.

**POL 585. SEMINAR: SOVIET FOREIGN POLICY** **THREE CREDIT HOURS**  
 A study of the basic Soviet foreign policy process, emphasizing the role of the Community Party and its ideology. Discussion of areas of Soviet foreign policy.

**POL 589. SEMINAR: INTERNATIONAL RELATIONS** **THREE CREDIT HOURS**  
 A research seminar with emphasis placed upon the current theory and problems of international relations or organizations. May be repeated once when the content changes.

**POL 595. GOVERNMENT INTERNSHIP** **THREE-SIX CREDIT HOURS**  
 Assignment to appropriate government agencies or units for the purpose of gaining wide experience with the administrative system through a rotating program of work experience.

**POL 599. THESIS** **THREE-SIX CREDIT HOURS**  
 A research monograph demonstrating basic command of appropriate literature and research methodology.

## **Psychology (PSY)**

**Dr. Samuel M. Bower, *Chairman***  
**Dr. Antos C. Rancurello,**  
*Director of Clinical Programs*

**PSY 501. ADVANCED STATISTICS** **THREE CREDIT HOURS**  
 To provide a greater depth of understanding of the basic concepts of statistics and to introduce the students to some advanced statistical methods. Prerequisite: Permission of Instructor.

**PSY 508. ADVANCED EXPERIMENTAL PSYCHOLOGY** **THREE CREDIT HOURS**  
 Theory of scaling; concepts on the transformation of data as applied to problems of sensory and cognitive functions. Prerequisite: Psy 501, permission of advisor. Two hours lecture and one two-hour lab per week.

**PSY 515. ASSESSMENT OF INTELLIGENCE**

**THREE CREDIT HOURS**

Focuses on individual assessment techniques and methods of intellectual appraisal and evaluation with children, adolescents and adults. Emphasizes psychometric theory, instrument development and clinical application of those individually administered instruments for assessing cognitive functioning. Major instruments for which experience in administration, scoring and interpretation will be provided are the Stanford-Binet, Wechsler Intelligence Scale for Children, Wechsler Pre-School and Primary Scale of Intelligence and the Wechsler Adult Intelligence Scale. Prerequisites: Psy 306, Psy 402.

**PSY 516. PROJECTIVE TECHNIQUES**

**THREE CREDIT HOURS**

Survey of the historical background and theoretical rationale underlying the use of personality assessment techniques, particularly projective methods with children, adolescents and adults. The Rorschach and Thematic Apperception Test are emphasized, including administration, scoring methods and interpretation. Other methods and techniques of personality evaluation are also considered. Prerequisites: Psy 567.

**PSY 517. SMALL GROUP FUNCTION**

**THREE CREDIT HOURS**

Analysis of small group theory, research, and techniques with special emphasis on their implications for, and applications in group psychotherapy. Specific issues in theory, techniques, training, and areas of application in group psychotherapy are discussed. Prerequisite: Permission of instructor.

**PSY 519. PRACTICUM IN PROJECTIVE TECHNIQUES**

**THREE CREDIT HOURS**

To give the student a first opportunity to gain familiarity with the administration, scoring, and interpretation of projective tests. The Rorschach and TAT will be emphasized, but the student will also be expected to show progressive mastery of other projective tests. Prerequisite: Psy 516. Permission of instructor. Requires 15-20 hours per week supervised experience in a clinical setting.

**PSY 521. DEVELOPMENTAL PSYCHOLOGY**

**THREE CREDIT HOURS**

Theory and research on psychological development from conception through adolescence, maturation of behavior systems, the role of social learning in development, the effects of early experience on personality development, critical stages in development. Prerequisite: Permission of instructor.

**PSY 522. ADVANCED COGNITIVE PROCESSES**

**THREE CREDIT HOURS**

Basic research paradigms for the experimental investigation of cognitive processes will be discussed. Special attention will be given to the current information processing theories of cognition. Topics will include: selective attention, visual short-term memory, pattern recognition, encoding processes, verbal short-term memory, search and retrieval processes, theories of human memory, and rule learning in concept information. Consideration will be given primarily to current research literature. Prerequisite: Permission of instructor.

**PSY 530. VERBAL LEARNING**

**THREE CREDIT HOURS**

To familiarize the students with the basic approach, concepts, and findings in the area of the psychology of learning. Prerequisite: Permission of instructor.

**PSY 531. LEARNING THEORY**

**THREE CREDIT HOURS**

To familiarize the students with the important learning theories of the past and the present, and the major issues among the theories. Prerequisite: Psy 501 and 530.

**Psy 532. PERCEPTION****THREE CREDIT HOURS**

A systematic study of methods and research findings in the field of human perception, together with an evaluation of theoretical interpretations. Prerequisite: Psy 501 and permission of instructor.

**Psy 533. DECISION PROCESSES****THREE CREDIT HOURS**

The purpose of this course is to provide an understanding of the theoretical and empirical developments in the psychology of human decision-making and choice behavior. The relation of various models of decision behavior to other problem areas in psychology, e.g., learning and perception, are studied. Prerequisite: Psy 501.

**Psy 536. HISTORY OF PSYCHOLOGY AS A HUMAN SCIENCE I****THREE CREDIT HOURS**

General overview of basic theoretical, methodological, and research issues in psychology as they emerged in the history of philosophy and science followed by an in-depth study of the origins of psychology as a science and its subsequent developments from 1875 to 1930. The values of historical standpoints and contributions of psychology during this period are re-integrated into the more comprehensive conception of psychology as a human science. Prerequisite: Permission of instructor.

**Psy 537. HISTORY OF PSYCHOLOGY AS A HUMAN SCIENCE II****THREE CREDIT HOURS**

In-depth study of theoretical, methodological, and research issues in psychology as they became polarized in contemporary behavioristic trends on the one hand, and contemporary personalistic, existential, and phenomenological trends on the other. A reintegration of the main contributions of these trends enabling the student to develop a competent outlook of psychology as a human science. Prerequisite: Psy 536, permission of instructor.

**Psy 541. COMPUTER APPLICATIONS TO BEHAVIORAL SCIENCE****THREE CREDIT HOURS**

A survey is made of several psychological studies in which the use of the computer was critical to the experimental design. Prerequisite: Psy 501, permission of instructor.

**Psy 552. CLINICAL PSYCHOLOGY****THREE CREDIT HOURS**

An integrated approach to the subject matter of clinical psychology through clinical inquiry (research) and clinical service (practice). Emphasis will be placed upon recent trends in Community Psychology. Prerequisites: Psy 313, permission of instructor.

**Psy 565. PSYCHOPHYSIOLOGY****THREE CREDIT HOURS**

The neurophysiological analysis of attention, sensation, perception, emotion, motivation, and learning. Electrophysiological methods are studied as techniques in the study of the nervous system and behavior. Prerequisite: Permission of instructor.

**Psy 566. CLERKSHIP****THREE CREDIT HOURS**

To train the student to develop sensitivity in clinical interviewing, behavior observation, test interpretation and psychotherapeutically oriented activities under supervision. Prerequisite: Psy 516, 519. Requires 20 hours per week supervised work in a clinical setting.

**Psy 567. THEORIES OF PERSONALITY****THREE CREDIT HOURS**

In-depth critical analysis of contemporary personality theories. Re-integration of their main assumptions and research findings into a unified and comprehensive view of the human person. Prerequisite: Permission of instructor.

- PSY 568. THEORIES OF PSYCHOTHERAPY** **THREE CREDIT HOURS**  
 In-depth critical analysis of contemporary theories of psychotherapy. Re-integration of their main contribution into a more functional and more diversified approach to the practice of psychotherapy. Prerequisite: Psy 552, 567, permission of instructor.
- PSY 570. THE PRACTICE OF PROFESSIONAL PSYCHOLOGY** **THREE CREDIT HOURS**  
 A treatment of selected issues relevant to the practice of professional psychology. Psychology as a science and profession; value orientation; legal status of practicing psychologist; ethical issues and practices; interprofessional relations; and practical problems of everyday functioning in professional psychology. Prerequisite: Psy 552, permission of instructor.
- PSY 571. INDIVIDUAL PSYCHOTHERAPY: THEORY AND PRACTICE** **THREE CREDIT HOURS**  
 A didactic and experiential treatment of the more personalistic approaches to individual psychotherapy (e.g., Adlerian, Rogerian). Theoretical, experimental, and ethical issues covered, but stress is placed on the development of skill in the therapeutic process per se. Prerequisite: Psy 567, 568.
- PSY 579. PRACTICUM IN INTERVIEWING AND COUNSELING** **TWO CREDIT HOURS**  
 This course is designed to give the graduate student experience in counseling undergraduate students under supervision. This course would follow courses in theory in the counseling area. Prerequisite: Permission of instructor.
- PSY 585. EXPERIMENTAL SOCIAL PSYCHOLOGY** **THREE CREDIT HOURS**  
 Develop an understanding and working knowledge of scientific method in general and social psychology methods in specific. Demonstrate an ability to plan, conduct, and report on investigations in social psychology. Stress is placed on applying design methods to concepts and issues relevant to social psychology. Prerequisite: Psy 302, 308, 408.
- PSY 592. SEMINAR IN STATISTICS** **THREE CREDIT HOURS**  
 To give the student a working knowledge of specialized statistical techniques such as analysis of variance, nonparametric statistics, correlational methods, etc. The specific statistical technique covered in the course may be different from one offering to the next depending upon the interests and desires of the graduate students and the judgments of the departmental faculty. Prerequisite: Psy 501.
- PSY 593. MATHEMATICAL PSYCHOLOGY I** **THREE CREDIT HOURS**  
 To familiarize the students with the role of mathematics as a discursive, normative, and descriptive tool in psychology. Prerequisite: Psy 501.
- PSY 594. MATHEMATICAL PSYCHOLOGY II** **THREE CREDIT HOURS**  
 Continuation of Psy 593 with emphasis upon computer applications. Prerequisite: Psy 593.
- PSY 596. EXPERIMENTAL RESEARCH** **ONE-TWELVE CREDIT HOURS**  
 Individual graduate students explore particular research areas. Under guidance of the instructor, research projects are formulated and conducted. Project reports are required. May be repeated. Prerequisite: Permission of advisor.
- PSY 597. READINGS** **ONE-THREE CREDIT HOURS**  
 Intended to stimulate graduate students for establishing competence in areas of research and investigation. May be repeated. Permission of Instructor.

**PSY 599. THESIS**

**THREE CREDIT HOURS**

Under guidance of Advisor, student develops problem, constructs apparatus, collects data and provides interpretation of the data for staff assessment.

**Theological Studies (THL)**

**Rev. Matthew F. Kohmescher, S.M., *Chairman***

Any of the 400 level undergraduate courses in Theological Studies may count for graduate credit under the usual conditions.

**THL 501. BIBLICAL HEBREW**

**THREE CREDIT HOURS**

An introduction to the morphology and syntax of biblical hebrew designed to facilitate the handling of basic tools and the reading of simple prose texts.

**THL 502. BIBLICAL GREEK**

**THREE CREDIT HOURS**

An introduction to Koine (NT) Greek. Vocabulary, Grammar, and Syntax. Selective readings of New Testament texts.

**THL 510. CHRISTIAN DOCTRINE IN THE EARLY CHURCH**

**THREE CREDIT HOURS**

An analysis of the development of doctrine from the sub-apostolic age to the beginning of the Middle Ages. Areas covered include: The Apostolic Fathers. The Apologists. Gnosticism. Irenaeus. Marcion. Tertullian. The Schools of Antioch, Alexandria, and Cappadocia. John of Damascus.

**THL 511. CHRISTOLOGICAL CONTROVERSIES SURROUNDING CHALCEDON**

**THREE CREDIT HOURS**

A critical, in-depth study of the great Christological controversies leading to the formulation of the Definition of Chalcedon in 451 A.D. and subsequent to this Definition.

**THL 513. THE DOCTRINE OF THE TRINITY**

**THREE CREDIT HOURS**

An examination of some of the classical interpretations of the Trinity from the early church to modern times. The problems involved in the relation of the Trinity to the Doctrine of God, Christology and the work of the Holy Spirit.

**THL 514. JEWISH THOUGHT IN THE EARLY CHRISTIAN ERA**

**THREE CREDIT HOURS**

An analysis of the influence of Jewish thought in the early Christian period with particular reference to Philo of Alexandria and Hellenistic Judaism.

**THL 515. FATHERS OF THE CHURCH**

**THREE CREDIT HOURS**

An analysis of the life and thought of individual Fathers of the Church. May be taken more than once. 1. Augustine, 2. Origen.

**THL 519. SCHOLASTICISM**

**THREE CREDIT HOURS**

The course proposes to treat the origins and development of the theological methodology known as scholasticism, as well as the great themes and synthesis associated with the major scholastics of the Thirteenth Century, Thomas of Aquinas and Bonaventure.

**THL 522. MEDIEVAL THEOLOGIAN**

**THREE CREDIT HOURS**

A critical study of the life and thought of individual medieval theologians. May be taken more than once. 1. Thomas Aquinas.

**THL 525. THEOLOGY OF TRENT**

**THREE CREDIT HOURS**

A critical and historical study of the teachings of the Council of Trent.

- THL 526. THE THEOLOGY OF REFORMERS** THREE CREDIT HOURS  
 Historical, critical and comparative studies of the theologies of Martin Luther, John Calvin, Huldreich Zwingli, and the Radical Reformers. Primary sources will be carefully and critically examined.
- THL 528. THE REFORMATION AND AMERICAN THOUGHT** THREE CREDIT HOURS  
 An analysis, historical and critical, of the impact of the Continental and English Reformation on the formation and development of American Theological thought. Reactions, criticisms, and secessions.
- THL 542. OLD TESTAMENT BACKGROUNDS** THREE CREDIT HOURS  
 An introduction to Ancient Near Eastern Studies, a survey of the literature and the relationship to the Old Testament. May be taken more than once. 1. Mythology, 2. Historiography.
- THL 543. FORM CRITICISM** THREE CREDIT HOURS  
 An investigation of the origin, development, and methodology of Form Criticism. Special attention will be given to both the theoretical understanding and practical application of this method of biblical criticism.
- THL 544. OLD TESTAMENT EXEGESIS** THREE CREDIT HOURS  
 A critical and exegetical study of selected writings of the Old Testament. May be taken more than once. 1. Hexateuch, 2. Historical Books, 3. Prophets, 4. Psalms, 5. Wisdom Literature.
- THL 547. OLD TESTAMENT THEOLOGY** THREE CREDIT HOURS  
 An examination of the discipline of Old Testament Theology. Special consideration will be given to the relationship of history and theology.
- THL 551. NEW TESTAMENT BACKGROUNDS** THREE CREDIT HOURS  
 A thorough study of selected individual points, e.g. Gnosticism, Qumran, etc., which are needed for an understanding of the New Testament. May be taken more than once. 1. Qumran, 2. Gnosticism.
- THL 552. THE QUESTION OF THE HISTORICAL JESUS** THREE CREDIT HOURS  
 This course addresses itself to two large problem areas of New Testament interpretation, the complex of issues surrounding the question of the historical Jesus and the new hermeneutic, studying them in their historical perspective, present state of development and possible future directions.
- THL 554. NEW TESTAMENT EXEGESIS** THREE CREDIT HOURS  
 A critical and exegetical study of selected writings of the New Testament. May be taken more than once. 1. Synoptics, 2. Luke-Acts, 3. John, 4. Pauline Corpus.
- THL 557. NEW TESTAMENT THEOLOGY** THREE CREDIT HOURS  
 A thorough study of one theme in the theology of the New Testament. May be taken more than once.
- THL 560. THEOLOGICAL MOVEMENTS** THREE CREDIT HOURS  
 A study of selected movements in theology in the 19th and 20th centuries. May be taken more than once. 1. Liberalism and Modernism, 2. Process Philosophy and Theology.

- THL 561. MODERN THEOLOGIANS THREE CREDIT HOURS  
An in-depth study of the life and work of selected modern theologians. May be taken more than once.
- THL 562. FAITH AND REASON THREE CREDIT HOURS  
An historical and critical treatment of selected problems inherent in the theological process. May be taken more than once.
- THL 564. THE CHRISTIAN DOCTRINE OF GOD THREE CREDIT HOURS  
This course will concentrate primarily on the recent discussion about God, examining the major options in contemporary theology, including the theologies of the "death of God."
- THL 565. CHRISTOLOGY THREE CREDIT HOURS  
An examination of the problems faced by contemporary theologians in discussing Jesus and his significance for Christian faith, and many of the solutions offered to these problems.
- THL 566. ECCLESIOLOGY THREE CREDIT HOURS  
An in-depth study of selected teachings on the nature, structure, mission of the Church and her relationship to other Christian churches, to world religions and to the world.
- THL 567. SACRAMENTAL THEOLOGY THREE CREDIT HOURS  
A detailed study of the principle of sacramentality and of the individual sacraments accenting the historical developments of each and the contemporary renewal.
- THL 568. MARY & CHRIST THREE CREDIT HOURS  
A study of the role of the Mother of God in the Incarnation with special treatment of the Divine Maternity and its relation to the Spiritual Maternity and to the other functions of Mary.
- THL 569. MARIAN QUESTION TODAY THREE CREDIT HOURS  
A detailed treatment of the present situation in the light of chapter 8 of the Constitution on the Church with special emphasis on ecumenical considerations.
- THL 570. LITURGY THREE CREDIT HOURS  
A study of the theological perspective on the history and the future of the liturgy.
- THL 572. APPROACHES TO MORALITY THREE CREDIT HOURS  
An attempt to establish the foundations of Christian morality, consisting of an historical survey of approaches and developments from the New Testament period to the present.
- THL 573. EVOLUTION AND ETHICS THREE CREDIT HOURS  
The contemporary theology of Christian existence as a whole, stressing the conscious unity of existence; the implications of evolution for theology and ethics.
- THL 574. THEOLOGY OF HOPE THREE CREDIT HOURS  
A study of the development and implications of the new theology of hope.
- THL 581. THEOLOGY OF REVELATION THREE CREDIT HOURS  
An in-depth study of God's self-disclosure to His people as found in Scripture, Tradition, and the living experience of the Church immersed in history.

- THL 582. CATECHESIS OF REVELATION** **THREE CREDIT HOURS**  
 An examination of the implications of the historical view of life for contemporary catechesis. A comparison and critique of various approaches to the interpretation of history's impact upon the understanding of man and the meaning of life. (Presupposes a course in the theology of revelation.)
- THL 583. RELIGIOUS PSYCHOLOGY** **THREE CREDIT HOURS**  
 A study of the human response to God in the light of contemporary psychology. The implications for catechesis in the various stages of human development, in the process of conversion and commitment, and in the crises of faith.
- THL 584. CONTEMPORARY CATECHETICAL PROCESSES** **THREE CREDIT HOURS**  
 A study of the role of structure in catechesis in the light of those used by effective centers of catechesis, especially in the U.S.A. An approach to the understanding and evaluation of life experiences and intuitional insights as to content and method in the relationship established by structure.
- THL 590. SELECTED QUESTIONS** **THREE CREDIT HOURS**  
 A study of specific questions and developments in biblical, historical, and systematic theology. May be taken more than once.
- THL 592. CONTEMPORARY ISSUES** **ONE-SIX CREDIT HOURS**  
 A graduate workshop-seminar investigating and analyzing a specific area of theology and interdisciplinary scholarship concerning contemporary issues.
- THL 593. DIRECTED STUDY** **THREE CREDIT HOURS**  
 A directed study in depth of a particular theologian, problem, or historical period. May be taken more than once.
- THL 599. THESIS** **SIX CREDIT HOURS**