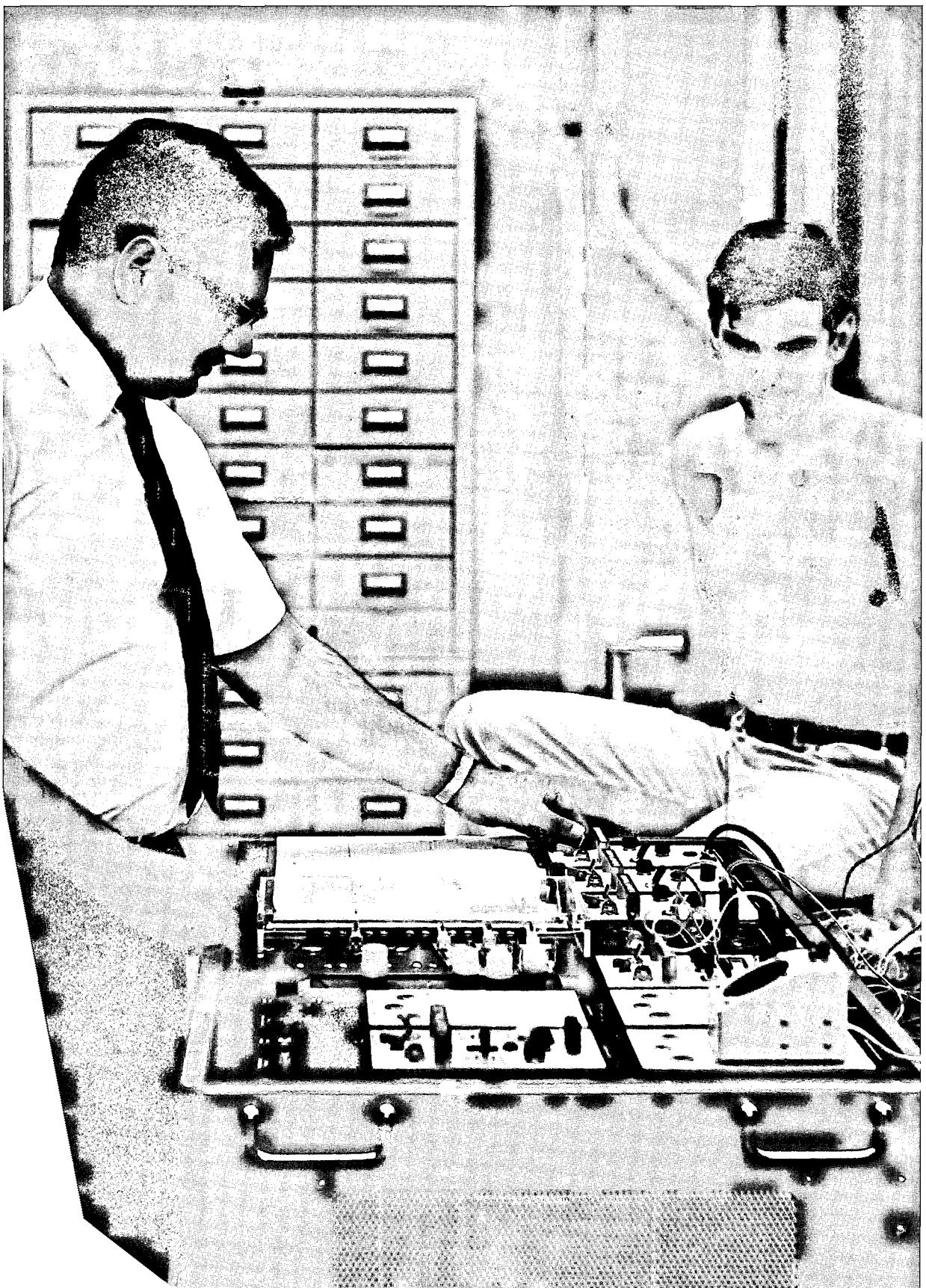


VIII Department of Instruction

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 phylogenic 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. ACCOUNTING SYSTEMS THREE CREDIT HOURS
Latest concepts, methods, and advanced developments in accounting 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.

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.

MBA 510. BUSINESS INVESTIGATION AND ANALYSIS THREE CREDIT HOURS
Meaning of research and types of business research problems; sources of information, interpretation and application of research to special projects; use of modern machine methods in research procedure.

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.

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.

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.

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.

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 crystalline state, diffraction of X-rays by crystals, methods of crystal structure analysis.

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. CHEMICAL SPECTROSCOPY THREE CREDIT HOURS
An introduction to the treatment of molecular rotations and vibrations, including some applications of group theory, as well as applications of infrared spectroscopy, nuclear magnetic resonance, and ultraviolet spectroscopy as aids in determining molecular structure.

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 TOPICS IN BIOCHEMISTRY THREE CREDIT HOURS
Topics discussed are the chemistry and metabolism of amino acids, polypepetides, proteins, purines, pyrimidines, and nucleic acids; kinetics of enzyme reactions.

CHM 552. SPECIAL TECHNIQUES IN BIOCHEMISTRY THREE CREDIT HOURS
This course comprises the study of cellular respiration, enzyme kinetics, chemical and physical methods of biochemical analysis, and the use of radioisotopes in metabolism by means of special equipment such as the Warburg microrespirometer, recording spectrophotometer, recording ozygen cathode, fluorometer, high speed centrifuge, paper electrophoresis, and radioisotope scintillation tube with attached scaler.

CHM 553. TOPICS IN BIOCHEMISTRY THREE CREDIT HOURS
Topics discussed are the chemistry and metabolism of carbohydrates, fats and steroids. Inorganic metabolism. Biochemical energetics.

CHM 560-561. RESEARCH THREE CREDIT HOURS EACH TERM

The following courses are offered by the Department of Chemistry in cooperation with the School of Education for students pursuing the M.S. in Education degree.

*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 or 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, theatric 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 ELEMENTARY GRADES 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. Considers basic statistical concepts and their application in the analysis of education data.

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 507W. THE PRINCIPALSHIP OF THE CATHOLIC ELEMENTARY SCHOOL TWO CREDIT HOURS
This workshop seeks to apply the principles of administration to the Catholic Elementary School. Particular attention is placed upon human relationships, in-service education of the professional staff, securing community participation in school policy formation, pupil personnel problems, curriculum development, and managerial responsibilities of the principal.

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 Cooperative Office Education Program of the Department of Education, State of Ohio, is included. This workshop fulfills a requirement for COE 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, nondirective and eclectic techniques as a function of the intelligence and grade-level of the child; ethical considerations. Prerequisites: EdC 522; recommended, EdC 531.

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 553. INTERNSHIP IN COLLEGE PERSONNEL SERVICE 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. (Restricted to participants in the cooperative teaching centers.)

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 GUIDANCE 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
In special cases and with permission of the Dean, students may register for this course in lieu of EdF 592, Graduate Seminar.

EDF 592. GRADUATE SEMINAR THREE CREDIT HOURS
Provides students with general guidance in conducting their Research Projects and in preparing for the oral comprehensive examination. Emphasis is on the integration of the total graduate program. Should be taken after the student has completed all, or most, of his course work.

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 Southwestern 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. INDIVIDUAL STUDIES IN GUIDANCE AND COUNSELING THREE CREDIT HOURS
Graduate students following Plan B are required to complete an individual study in Guidance designed to further their competence in the field. The design of each Study is elaborated by the student with his advisor and approved by the department chairman.

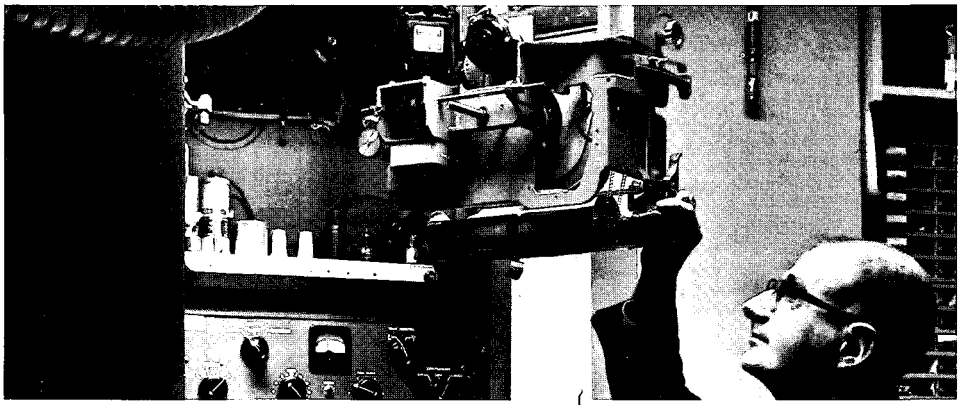
Chemical Engineering (CME)

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.

*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.

*Open for enrollment of undergraduate students.

*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. ADVANCED CIRCUIT ANALYSIS — THREE CREDIT HOURS
Poles and zeros of polynomial functions and networks; numerical procedures; Chebyshev and Taylor approximations to brick wall functions; elementary and modern synthesis; low pass and band pass amplifiers; feedback amplifiers and stability. Prerequisites: Ele 413, Mth 219. (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 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 — 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 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 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 (EGR)

EGR 501. 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.

EGR 502. MECHANICS OF FLUIDS THREE CREDIT HOURS
Fluid properties; important differential equations in fluid flow, laminar and turbulent flow, boundary layer flow; introduction to compressible flow.

EGR 503. THERMODYNAMICS THREE CREDIT HOURS
Thermodynamic concepts; the laws of thermodynamics; kinetic theory of gases; introduction to the Maxwell-Boltzmann statistics and their applications.

EGR 504. MASS AND ENERGY TRANSPORT THREE CREDIT HOURS
Basic concepts, principles and definitions, rate equations, thermodynamic principles, applications.

EGR 505. PROPERTIES OF MATERIALS THREE CREDIT HOURS
Structure, properties, and behavior of materials. Conductivity, diffusivity, electrochemistry, elasticity, plasticity, fracture, viscosity.

EGR 506. SOLID STATE DEVICES THREE CREDIT HOURS
Introduction to the theory of solid state devices; electron emission devices, semi-conductor devices, dielectric devices, and magnetic devices. Mathematical technique beyond differential equations will be developed as needed.

EGR 517. TRANSPORT PROPERTIES THREE CREDIT HOURS
Momentum, energy and mass transport including viscosity and mechanism of momentum transport, thermal conductivity and mechanism of energy transport, diffusivity and the mechanisms of mass transport. Prerequisite: Cme 581 or Mth 403.

EGR 518. COMPRESSIBLE FLOW THREE CREDIT HOURS
One-dimensional compressible flow, two- and three-dimensional subsonic flow, two-dimensional supersonic flow, mixed flow, and flow of real gases with viscosity and heat conductivity. Prerequisite: Egr 502 or Mth 403.

EGR 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.

EGR 525. AUTOMATIC CONTROL THEORY THREE CREDIT HOURS
System representation, steady state and transient analysis of feedback control systems, modes of control, Laplace transform, root-locus method, analog computers and frequency-response methods.

EGR 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.

EGR 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.

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.

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 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 Labesque 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 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 transhipment 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, probablistic 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. PHYSICAL METALLURGY I (Structure) THREE CREDIT HOURS
The electronic, atomic, submicroscopic, microscopic and macroscopic structures of crystalline solids are presented. Specific topics include bonding, electron theory of metals, crystallography, atomic arrangements, imperfections in crystals, dislocations, phase diagrams, phase transformations, and diffusion. Prerequisite: Mth 219.

MEE 502. PHYSICAL METALLURGY II (Mechanical Properties) 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 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.

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

*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.

*MEE 515. STATISTICAL THERMODYNAMICS THREE CREDIT HOURS
Microscopic thermodynamics; Kinetic theory; Virial theorem of Clausius; transport phenomena; Gibbs, Botzmann, 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.

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

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 absorbtivity of gases. Introduction to radiative exchange in gases. Prerequisite: Mth 403.

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 compressible flow. Prerequisite: Mee 418; Corequisite: Mth 403.

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; Corequisite: 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 533. STRUCTURAL ANALYSIS I THREE CREDIT HOURS
Basic principles of stress and strain, introduction to Theory of Elasticity, Theory of Beams, and Elastic Instability. Prerequisites: Egm 303, Mth 219.

*MEE 534. STRUCTURAL ANALYSIS II THREE CREDIT HOURS
The torsion problem; circular and rectangular plates, stability of plates; membrane theory of shells; discussion of viscous and plastic behavior of materials. Prerequisite: Egm 304.

*MEE 535. MECHANICAL VIBRATIONS THREE CREDIT HOURS
Multi-degree of freedom systems, Lagrange's equatings, transient vibrations, vibrations of continuous systems. Matrix and numerical methods. Introduction to finite element method. Introduction to nonlinear virbations. Prerequisite: Mee 416.

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

*MEE 536. AUTOMATIC PROCESS CONTROL 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.

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 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 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.

*Open for undergraduate enrollment with the consent of the Department Chairman.

Dr. B. J. Bedard, *Chairman*
Dr. M. H. Means, *Assistant Chairman*

English (ENG)

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 511. MIDDLE ENGLISH THREE CREDIT HOURS
A study of the developments in the English language from 1066 to 1500 with an ancillary treatment of representative literary specimens.

*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 treament 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, S.M., *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 neoclassical 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 — TWO 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 — TWO CREDIT HOURS

*Hst 630. Studies in African and Mid-East History — TWO CREDIT HOURS

*Hst 640. Studies in Asian History — TWO 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 History U.S. Before 1877 — TWO CREDIT HOURS

*Hst 670. Studies in History U.S. After 1877 — TWO CREDIT HOURS

*Hst 680. Studies in Latin American History — TWO 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. Anthony Debons, *Chairman*

ISc 501. Introduction to Information Science — THREE 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*

The following courses may be taken by individuals outside the Mathematics Program for completion of requirements for their Master's degree.

MTH 403. APPLIED ANALYSES I THREE CREDIT HOURS
Prerequisite: Mth 218 or 228.

MTH 404. APPLIED ANALYSES II THREE CREDIT HOURS
Prerequisite: Mth 403.

MTH 411. PROBABILITY AND STATISTICS I — THREE CREDIT HOURS
Prerequisite: Mth 218 or 228.

MTH 412. PROBABILITY AND STATISTICS II — THREE CREDIT HOURS
Prerequisite: Mth 411.

MTH 413. PROBABILITY AND STATISTICS III — THREE CREDIT HOURS
Prerequisite: Mth 412.

MTH 421. ADVANCED CALCULUS I — THREE CREDIT HOURS
Prerequisite: Mth 218 or 228.

MTH 422. ADVANCED CALCULUS II — THREE CREDIT HOURS
Prerequisite: Mth 421.

MTH 461. INTRODUCTION TO THE THEORY OF FUNCTIONS OF A COMPLEX VARIABLE
Prerequisite: Mth 422. — THREE CREDIT HOURS

MTH 471. TOPOLOGY — THREE CREDIT HOURS
Prerequisite: Mth 422.

NOTE: Only Mth 411, 412 and 413 may be applied to the Master's degree in Mathematics. The description of all these courses may be found in the undergraduate catalog.

Master of Science in Education degree with a concentration in Mathematics

Students following the Master High School Teacher Program in the School of Education who desire a concentration in mathematics should take the courses listed below. Normally, these courses, which satisfy all the recommendations of the M.A.A. and N.C.T.M. for teacher training in high school mathematics, are taught only in the Summer Session as part of an N.S.F. Institute program. For a more detailed description of the Master High School Teacher program leading to the Master of Science in Education degree, see pages 56 and 59 of this catalog.

MTH 501-502. FUNDAMENTAL CONCEPTS OF ALGEBRA
THREE CREDIT HOURS EACH TERM

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 equations. An intensive study of the relation of these topics to the topics of high school algebra as proposed by several curriculum revision groups.

MTH 503-504. FUNDAMENTAL CONCEPTS OF GEOMETRY
THREE CREDIT HOURS EACH TERM

A study of the axioms and concepts upon which various geometries are built. A comparison is made between Euclidian, metric and projective geometries and to a lesser extent consideration is given to non-Euclidian geometries. A comparison is also made between synthetic and analytic methods of proof with some consideration given to vector notation. An intensive study of the relation of these topics to the topics of high school geometry as proposed by several curriculum revision groups.

MTH 505-506. FUNDAMENTAL CONCEPTS OF PROBABILITY AND STATISTICS
THREE CREDIT HOURS EACH TERM

Topics to be discussed include: the basic laws of probability, frequency distributions (Binomial, Poisson, Normal, etc.), sampling estimation of parameters, sampling distributions, confidence intervals, tests of hypotheses, regression, and analysis of variance. An intensive study of the relation of these topics to the topics of high school probability and statistics as proposed by several curriculum revision groups.

MTH 507-508. FUNDAMENTAL CONCEPTS OF ANALYSIS
THREE CREDIT HOURS EACH TERM

This course will include the concepts of number, sequence, function of a single real variable and function of several real variables, limit, continuity, total derivative and partial derivative, single integral and multiple integral, infinite series, and applications to geometry, as well as their relation to the material in the high school curriculum.

The Master's degree in Mathematics

See page 36 of this catalog for a description of the requirements for this degree.

MTH 511-512. STATISTICAL INFERENCE THREE CREDIT HOURS EACH TERM

Distribution theory including conditional distributions, order statistics, sufficient statistics, the Rao-Blackwell theorem, point and interval estimation, maximum likelihood estimation, hypothesis testing, likelihood ratio tests, Chebyshev's inequality, central limit theorem.

MTH 521-522. REAL VARIABLES THREE CREDIT HOURS EACH TERM

A brief discussion of some of the elementary notions of set theory, functions, cardinality, order types and ordinals; the topology of the real line, continuity, the Stone-Weierstrass theorem, Lebesgue measure, measurable functions, Lebesgue integration; differentiation and integration, absolute continuity; the classical Banach spaces, product measures and Fubini's theorem; extensions of the Lebesgue integral.

MTH 523-524. MEASURE THEORY AND INTEGRATION THREE CREDIT HOURS EACH TERM

Abstract measure theory; extensions and completions of measures; integration; general set functions; signed measures; Jordan-Hahn decompositions: the Radon-Nikodym theorem and applications; integration over locally compact spaces; regularity; the Riesz-Markoff theorem; integration over locally compact groups. Prerequisites: Mth 521-522 and Mth 471 or 571.

MTH 525-526. COMPLEX VARIABLES THREE CREDIT HOURS EACH TERM

Fundamental concepts, integral theorems, series and the expansion of analytic functions in series, singularities, entire functions; meromorphic functions; analytic continuation; conformal representation. Prerequisite: Mth 422.

MTH 531-532. ADVANCED DIFFERENTIAL EQUATIONS THREE CREDIT HOURS EACH TERM

Existence theorems and numerical methods; linear equations and systems; singularities; asymptotic behavior and stability; self adjoint differential systems and boundary value problems. Prerequisite: Mth 521.

MTH 535-536. PARTIAL DIFFERENTIAL EQUATIONS THREE CREDIT HOURS EACH TERM
Classification of partial differential equations, reduction to canonical form; existence theorems and the generalized Cauchy problem; methods of solution, orthogonal functions, Green's Theorem, and operational methods; the wave equation, Laplace's equation, some problems in the conduction of heat, motion of viscous fluids, the hodograph methods; numerical solutions and existence theorems related to these methods. Prerequisites: Mth 421 and 461.

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 422 and 461.

MTH 551-552. METHODS OF MATHEMATICAL PHYSICS THREE CREDIT HOURS EACH TERM
Linear transformations and matrix theory; the series expansion of functions; linear integral equations; the calculus of variations; linear and non-linear oscillators; eigenvalue problems; partial differential equations and potential theory; functional transformations; special functions. Prerequisite: Consent of instructor.

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 561-562. MODERN ALGEBRA THREE CREDIT HOURS EACH TERM
Semi-groups, rings, integral domains and fields; extensions of rings and fields, elementary factorization theory, groups with operators; modules and ideals; finite and infinite field extensions; fields with valuations, real fields and Galois Theory.

MTH 565-566. LINEAR ALGEBRA THREE CREDIT HOURS EACH TERM
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. Prerequisite: Mth 361 or equivalent.

MTH 571-572. TOPOLOGY THREE CREDIT HOURS EACH TERM
An axiomatic treatment of the concept of a topological space; various operators on a set which define a topology; bases and subbases; connectedness, compactness; continuity, homeomorphisms, separation properties and countability axioms; regular and normed spaces, filters, function and quotient spaces; metrizability, paracompactness. Uniform spaces.

MTH 573-574. NORMED LINEAR SPACES THREE CREDIT HOURS EACH TERM
The study of various topologies within linear spaces, with emphasis on Banach and Hilbert Spaces; review of Lebesgue integration; orthogonal expansions; projections, linear transformation, Banach algebras and spectral theory.

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 581-582. MATHEMATICAL LOGIC THREE CREDIT HOURS EACH TERM
Propositional calculus, quantification theory, characterization problem for theories, theory of models, recursive functions, undecidability and completeness, arithmetical and analytical hierarchies, formalization of arithmetic. Prerequisite: Mth 481 or equivalent.

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 Chairman.

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 Decartes, 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 Bonhoffer, 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 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 520. ADVANCED SOLID STATE PHYSICS THREE CREDIT HOURS
Crystal structure, thermal properties of solids; insulators; band theory of solids; semiconductors; luminescence. Prerequisite: Phy 517 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 517 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*

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, *Acting Chairman*

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: None.

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 FOUR CREDIT HOURS
Focuses on individual asssesment 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 FOUR 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 515, Psy 560.

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 advisor.

PSY 530. 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 advisor.

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. THEORIES OF 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 advisor.

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: 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 the advisor.

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 advisor.

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 15-20 hours per week supervised experience 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: Permission of Instructor.

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 advisor.

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-SIX 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.

PSY 599. THESIS THREE CREDIT HOURS
Under guidance of major 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 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, 451, A.D. Arius, Athanasius, Apollinaris, Cyril of Alexandria, the Cappadocian Fathers, Diodore, Theodore of Mopsuestia, Nestorius, Leo, and Eutyches.

THL 512. POST CHALCEDONIAN CHRISTOLOGIES THREE CREDIT HOURS
The development of the theological interpretation of the Chalcedonian Christological formula in the Monophysite controversy and in the Monothelite controversy, and its classical exposition in John of Damascus.

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 THEOLOGIANS 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 527. THE REFORMATION IN ENGLAND THREE CREDIT HOURS
Historical and critical study of Anglicanism, Puritanism, and the Free Churches in England. The Episcopacy and Presbyterianism in Scotland. 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 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. METHODOLOGY 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. May be taken more than once. 1. Ecclesiology of Vatican II, 2. Ecclesiology of Yves Congar.

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 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 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.