

Departments of Instruction

Biology (Bio)

Dr. George B. Noland, *Chairman*

Any of the 300-400 courses listed may be taken for graduate credit under the usual conditions.

Bio 303. PHYSIOLOGY	FOUR CREDIT HOURS
Bio 304. HISTOLOGY	TWO CREDIT HOURS
Bio 309. MICROTECHNIQUE	FOUR CREDIT HOURS
Bio 312. GENERAL GENETICS	FOUR CREDIT HOURS
Bio 316. PLANT MORPHOLOGY	THREE CREDIT HOURS
Bio 320. EVOLUTION	THREE CREDIT HOURS
Bio 324. ENTOMOLOGY	THREE CREDIT HOURS
Bio 325. PARASITOLOGY	THREE CREDIT HOURS
Bio 330. PLANT PHYSIOLOGY	FOUR CREDIT HOURS
Bio 361. INVERTEBRATE ZOOLOGY	FOUR CREDIT HOURS
Bio 407. EMBRYOLOGY	FIVE CREDIT HOURS
Bio 410. RADIATION BIOLOGY	FOUR CREDIT HOURS
Bio 411. GENERAL BACTERIOLOGY	FIVE CREDIT HOURS
Bio 412. HUMAN GENETICS	TWO CREDIT HOURS
Bio 416. PATHOGENIC BACTERIOLOGY	THREE CREDIT HOURS
Bio 454. NEUROANATOMY	THREE CREDIT HOURS
Bio 501. SEMINAR	ONE CREDIT HOUR

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

Bio 503. ADVANCED GENETICS	THREE CREDIT HOURS
An analysis of the nature of the gene and gene action. The course will review recent advances in biochemical and physiological genetics, cytogenetics, population genetics and radiation genetics.	

Bio 504. BIO-LAB TECHNIQUES

THREE CREDIT HOURS

Designed to acquaint teachers with lecture demonstration skills and laboratory techniques applied to the biological sciences. The course will present methods of collecting, preserving, and preparing biological materials for classroom use.

Bio 505. PROTOZOOLOGY

THREE CREDIT HOURS

A study of the protozoa, their structure and physiology, their importance in experimental biology and their relation to other micro-organisms.

Bio 507. ENDOCRINOLOGY

THREE 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.

Bio 508. FIELD BIOLOGY

THREE CREDIT HOURS

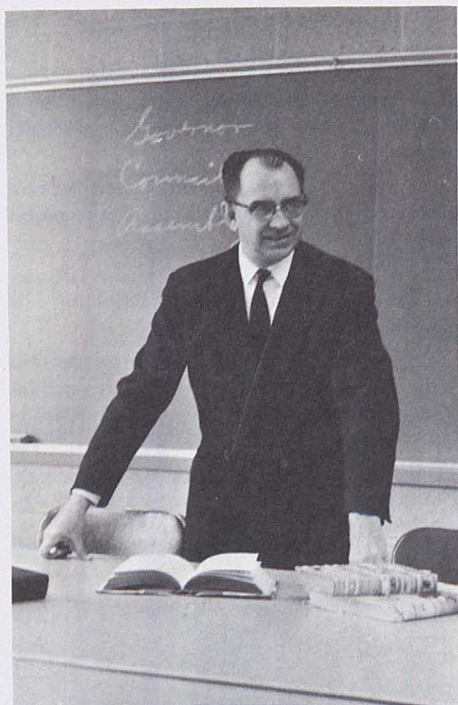
The course is designed to acquaint the student with the local flora and fauna. Field trips will be used to apply techniques in the observation and study of organisms in their natural environment.

Bio 510. 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.





Bio 511. CELLULAR PHYSIOLOGY

THREE CREDIT HOURS

The concepts of structure, physiology and bio-chemistry of cells and subcellular aggregations will be studied. Emphasis will be placed on the mechanisms of energy transfer, membrane phenomena and enzyme activity.

Bio 513. MYCOLOGY

THREE CREDIT HOURS

Biology of the fungi and slime molds. Lecture will deal with the taxonomy, morphology, cytology, physiology and genetics of the fungi. Laboratories will deal with morphological, growth and experimental studies.

Bio 515. BACTERIAL PHYSIOLOGY

FOUR 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.

Bio 520. PRINCIPLES OF BIOLOGY

THREE CREDIT HOURS

This course is specifically designed as an introduction to modern biology. This is a background course open only to graduate students registered in the Master Teacher Program.

Bio 590. PRO-SEMINAR OR PHL 505 INTER-DISCIPLINARY SEMINAR

THREE CREDIT HOURS

The relevance of science to all other knowledge; problems dealing with the interrelations of science, Philosophy, Education and Government.

Bio 599. THESIS

THREE-SIX CREDIT HOURS

Business (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 502. CONTROLLERSHIP** THREE CREDIT HOURS
 Analysis of the functions of controllership. Emphasis upon the integration of the related areas of accounting, organization, finance, and business decision-making. The role of the chief accounting executive in planning, recording, coordinating, and controlling the financial aspects of the enterprise.
- 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 510. BUSINESS INVESTIGATION AND ANALYSIS** THREE CREDIT HOURS
 Meaning of research and types of business research problems. Sources of organization, 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 with 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
 Planning, organization, integrating and measuring the marketing effort. The management of the marketing functions of business. The managerial problem in the distribution, supervision, and control of marketing. Extensive use of the case method and current materials.
- 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 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
 The purposes of this course are to study the development of a personal philosophy and a philosophy of business.
 *Required of all students.

MBA 580. 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 599. 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.

Chemistry (CHM)

Dr. Cletus Chudd, S.M., *Chairman*

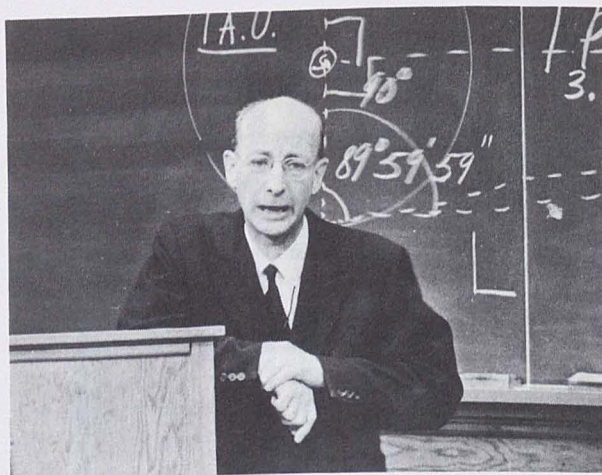
The courses marked with an asterisk are intended primarily for graduate students in Education. Prerequisite for enrolling in any of these courses for credit toward the M.S. in Education degree is standard teacher certification in the field of Physical Science or in Chemistry.

*CHM 412. INTERMEDIATE ORGANIC CHEMISTRY THREE CREDIT HOURS
 Prerequisite: One year of Basic Organic Chemistry.

*CHM 417. INORGANIC CHEMISTRY THREE CREDIT HOURS
 Prerequisite: Chm 215 Quantitative Analysis, or the equivalent.

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

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



CHM 503-504. ADVANCED INORGANIC CHEMISTRY

SIX CREDIT HOURS

Current views on atomic theory and atomic structure, chemical bonding, periodic properties of the elements, inorganic nomenclature, coordination compounds, acid-base systems, nuclear chemistry, properties and compounds of families of elements.

CHM 505-506. ADVANCED ORGANIC CHEMISTRY

SIX CREDIT HOURS

Molecular orbital and resonance theories, conformational analysis, stereo-chemistry, correlation of molecular structure with physical and chemical properties, reaction mechanisms, heterocyclic chemistry.

CHM 507-508. ADVANCED PHYSICAL CHEMISTRY

SIX CREDIT HOURS

Classical thermodynamics with emphasis on non-ideal systems and chemical reactions. Introductory quantum theory, chemical bonding and the structure of molecules. Chemical kinetics, empirical kinetics and reaction mechanism, absolute reaction rate theory.

CHM 510. PRO-SEMINAR

THREE CREDIT HOURS

The impact of Chemistry on present-day society; sociological, economical, and ethical factors. Phl 505 may be substituted for Chm 510.

CHM 511. BIOCHEMISTRY

THREE CREDIT HOURS

Review of structure of carbohydrates, lipids and proteins, followed by the metabolic path of each group. Energy metabolism, inorganic metabolism and enzyme systems will also be treated.

CHM 512. 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 oxygen cathode, fluorometer, high speed centrifuge, paper electrophoresis, and radioisotope scintillation tube with attached scaler.

CHM 514. ADVANCED ANALYTICAL CHEMISTRY

THREE CREDIT HOURS

Theoretical topics of analytical Chemistry, particularly as applied to electrical and optical methods of instrumental analysis.

CHM 520-521. RESEARCH

SIX CREDIT HOURS

Economics (Eco)

Charles W. Whalen, *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 (Edu)

Dr. Louis J. Faerber, S.M., *Dean*

- Edu 325. SOCIAL STUDIES IN THE ELEMENTARY SCHOOL THREE CREDIT HOURS
- Edu 431. VISUAL AND OTHER SENSORY AIDS IN EDUCATION TWO CREDIT HOURS
- Edu 448. PSYCHODYNAMICS OF BEHAVIOR THREE CREDIT HOURS
Prerequisites: This course replaces the previous prerequisites of Mental Hygiene and Abnormal Psychology for the Guidance and Counseling Program; students who have already completed this dual requirement on the undergraduate level should not take this course.
- Edu 451W. ADVANCED KINDERGARTEN-PRIMARY INSTRUCTION THREE CREDIT HOURS
Prerequisite: Edu 219 Kindergarten Instruction or equivalent.
- Edu 480. THE PSYCHOLOGY OF SLOW LEARNING CHILDREN TWO CREDIT HOURS
Enrollment limited to teachers with positions (or prospective positions) in special education.
- Edu 484. LANGUAGE ARTS FOR SLOW LEARNING CHILDREN TWO CREDIT HOURS
Prerequisite: Edu 480.
- Edu 485. SOCIAL STUDIES FOR SLOW LEARNING CHILDREN TWO CREDIT HOURS
Prerequisite: Edu 480.
- Edu 486. ARITHMETIC FOR SLOW LEARNING CHILDREN TWO CREDIT HOURS
Prerequisite: Edu 480.
- Edu 487. OCCUPATIONAL ORIENTATION AND JOB TRAINING TWO CREDIT HOURS
A course in special education for teachers of slow learning children. Prerequisite: Edu 480.
- Edu 500W. MATHEMATICS IN ELEMENTARY GRADES TWO CREDIT HOURS
A graduate workshop designed to produce college teachers and school supervisors of the Individualized Arithmetic Program. Demonstration of how the logical patterns of mathematical thought which are inherent in arithmetic can be readily acquired by pupils. Prerequisite: Completion of a Level One Workshop, one year's experience in teaching the Individualized Arithmetic Program, and the imminent prospect of teaching the Individualized Arithmetic Program to teachers.
- Edu 501. ADVANCED PSYCHOLOGY OF LEARNING THREE SEMESTER HOURS
Major theories of learning and current issues in the principal areas of the psychology of learning, e.g., transfer of training.
- Edu 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: Edu 419 Philosophy of Education, or equivalent where the student has already achieved a norm for evaluating the theories of modern education.
- Edu 503. RESEARCH METHODOLOGY AND STATISTICS THREE CREDIT HOURS
Comprehension of educational statistics and terminology of research. Major techniques and methods of research for intelligent consumption. Specific techniques and guides for efficiently locating research on a given problem, reading critically, and drawing logical inferences. Prerequisite: One of the other core courses, i.e., Edu 501 or Edu 502 or Edu 504.

EDU 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.

EDU 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.

EDU 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. Prerequisite: Admission to graduate standing in the School of Education.

EDU 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.

EDU 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.

EDU 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.

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

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

EDU 515. SCHOOL LAW TWO CREDIT HOURS
Problems in school administration which may give rise to court action. Ohio school law will be emphasized.

EDU 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.

EDU 518. SCHOOL AND THE SOCIAL ORDER THREE CREDIT HOURS
The relationship of 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.

EDU 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.

EDU 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.

EDU 523. OCCUPATIONAL INFORMATION AND COMMUNITY RESOURCES**TWO CREDIT HOURS**

Selection, utilization, and evaluation of educational and occupational information materials. Familiarization with standard labor market data and resources of the local community.

EDU 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.

EDU 530. PSYCHOLOGY OF INDIVIDUAL DIFFERENCES**TWO CREDIT HOURS**

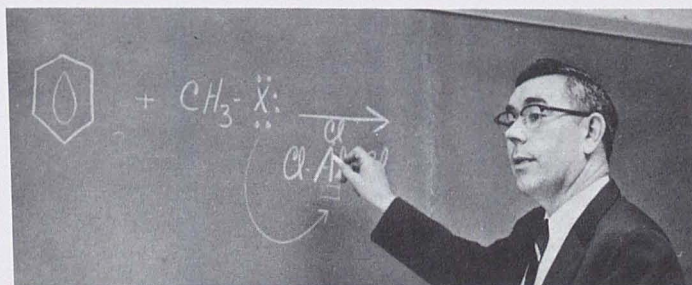
Nature, extent, and significance of variability; hereditary and cultural influences; theories of intelligence; trait organization; group differences.

EDU 533. PSYCHOMETRICS**THREE 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. Prerequisites: Edu 448, 503.

EDU 534. INTERPRETATION OF INDIVIDUAL TESTS**TWO CREDIT HOURS**

Intensive study of major theoretical problems concerning the use and interpretation of individual psychological tests. Particular attention is devoted toward interpretation of the Stanford-Binet, Wechsler Intelligence Scale for Children, the Bender Gestalt, and projective techniques. Emphasis is placed upon use of individual test results in the counseling program. Prerequisite: Edu 533.



EDU 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: Edu 522, Edu 533.

EDU 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.

EDU 543. PRINCIPLES AND TECHNIQUES OF COUNSELING THREE CREDIT HOURS
Basic theories, principles and techniques of counseling. A consideration of directive, non-directive and eclectic techniques as a function of the intelligence and grade-level of the child. Ethical considerations. Prerequisites: Edu 448, 503, 533.

EDU 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. Guidance Center facilities will be utilized as a training center. Prerequisites: Edu 533, 543. Recommended: Edu 523.

EDU 547. PSYCHOLOGY OF EXCEPTIONAL CHILDREN TWO CREDIT HOURS
Deals with the intellectual deviate, the socially and emotionally maladjusted. Concentration on educational guidance for the gifted and the mentally retarded. Prerequisites: Edu 448, Psy 306 or Edu 207.

EDU 550. READING PROBLEMS AND THE GUIDANCE PROGRAM TWO CREDIT HOURS
Understanding the nature of the problem. Practicum in diagnostic and remedial reading.

EDU 551, 552, 553, 554, 555, 556. CHILD STUDY PROJECT ONE CREDIT HOUR
One graduate credit per semester with a maximum of six credits in this series. These courses involve the direct study of children throughout the school year. Each participant gathers a wide body of information about a pupil, presents the accumulated data from time to time to the study group for underlying the child's behavior, learning, and development. Provides opportunity for teachers in service to earn credit for participation in their own local child study group. The study sessions meet 18 times a semester. (These projects must be registered for in sequence and they yield one semester hour per project per semester.)

EDU 558W. CHILD STUDY LEADERSHIP WORKSHOP TWO CREDIT HOURS
This workshop is designed to train teachers and school counselors for leadership roles in the Child Development Laboratory as conducted within approved school systems. It is in cooperation with the University of Maryland's sponsored Institute for Child Study.

Provides training to persons who plan to participate as group members or leaders in the Child Study Program sponsored by the Institute. The workshop will provide suitable experience in its own right for persons whose role in schools can be enhanced through deeper understanding of children and youth, e.g., area principals.

EDU 560. LIBRARY GUIDANCE FOR TEACHERS TWO CREDIT HOURS
Trains the teacher to make use of the available services and resources of the standard school library in behalf of a well-rounded education for pupils. Acquaints the class with library organization, reference material, indexes, and bibliography. Not designed for teacher-librarians.

EDU 561W. COMMUNITY RESOURCES IN ELEMENTARY TEACHING

This workshop aims to give elementary teachers background for their teaching (particularly in the social studies area) by taking them behind the scenes in local government, social agencies, key industrial plants, and historical sites. Dayton and the Miami Valley will be the laboratory.

EDU 562. SCHOOL PROVISIONS FOR INDIVIDUAL DIFFERENCES**THREE CREDIT HOURS**

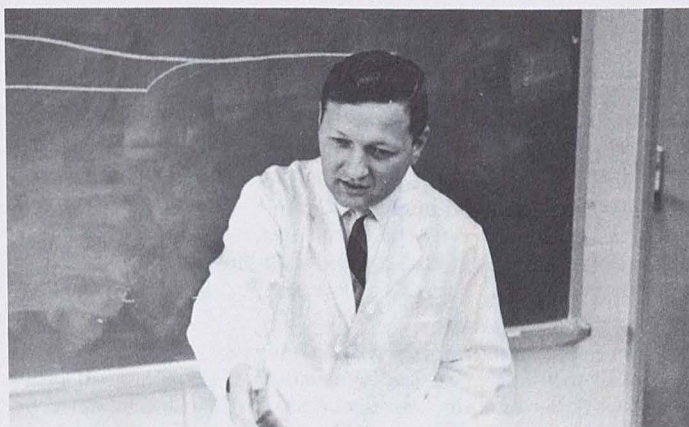
Studies the different traits and abilities of pupils and ways whereby teaching might be adjusted to these differences. Special attention focused on the slow learner, the gifted student, and the educationally retarded child.

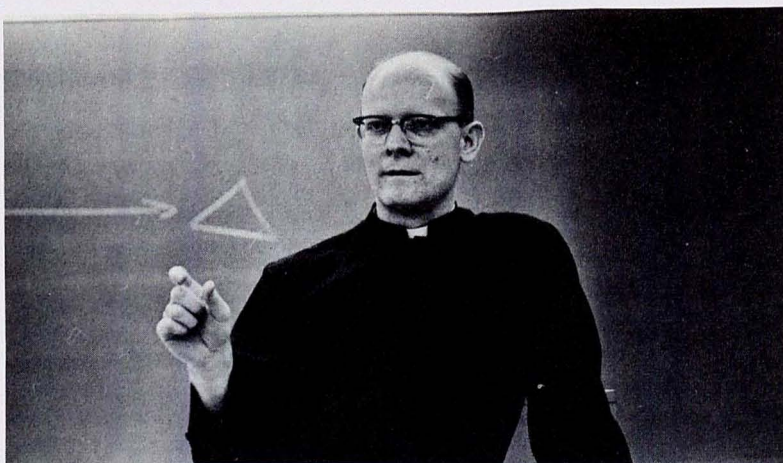
EDU 563. DIAGNOSIS AND REMEDIAL READING**THREE CREDIT HOURS**

A study of the major factors associated with reading difficulties, techniques that might be used to diagnose the nature and causes of pupil difficulty, and the methods by which remedial adjustments can be made. Demonstrations and directed observation of teaching. Prerequisite: Edu 303 Reading in the Elementary School or 320 Reading and Language Arts in Elementary School.

EDU 564. ADVANCED SCIENCE IN ELEMENTARY SCHOOL**THREE CREDIT HOURS**

This 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: Edu 460W Science in the Elementary School or another college course in physical science.





Edu 565. GROUP TECHNIQUES IN THE CLASSROOM

THREE CREDIT HOURS

A comprehensive study will be made of classroom grouping in both primary and intermediate areas of the elementary school. A practical approach is planned for the study of all phases of grouping; initial class appraisals, deciding individual needs, class grouping, manipulation of social differences, and planning for effective group instruction; homogeneous and heterogeneous grouping; also a unique plan of random grouping will be presented.

Edu 566W. THE EDUCATION OF GIFTED CHILDREN

TWO CREDIT HOURS

The workshop will deal with formal and informal methods of identifying giftedness, the potentials and problems of the gifted, assessment of special school programs, and positive provisions for the instructional program.

Edu 570W. CRITERIA FOR THE EVALUATION OF CATHOLIC ELEMENTARY SCHOOLS

THREE CREDIT HOURS

A workshop designed for Catholic school administrators selected by the Elementary School Department, National Catholic Educational Association, for eventual publication of an *Evaluative Criteria for Catholic Elementary Schools*.

Edu 571W. USE OF THE CRITERIA FOR EVALUATION OF

CATHOLIC ELEMENTARY SCHOOLS

THREE CREDIT HOURS

This workshop is designed to enable Catholic school administrators to engage in depth studies relative to the evaluative criteria formulated in Edu 570W. The Participants will engage likewise in discovering ways and means of implementing the criteria in their own schools or school systems.

Edu 590. FIELD PROJECT

THREE CREDIT HOURS

An on-the-job research project that investigates a problem that stems from an actual need for the purpose of effecting improvement of either one's own professional practice or of the school setting in which the investigator works. It is accompanied by a seminar session on the campus held once a week. Prerequisite: Admission as a candidate for a degree.

Chemical Engineering (CME)

Dr. Michael Bobal, *Chairman*

CME 501. ADVANCED THERMODYNAMICS

TWO CREDIT HOURS

Advanced topics of thermodynamics with applications. Prerequisite: Cme 303 or equivalent. (Open for enrollment of undergraduate students.)

CME 502. FLUID FLOW

TWO CREDIT HOURS

A study of compressible and incompressible flow with applications. Prerequisite: Cme 311 or equivalent. (Open for enrollment of undergraduate students.)

CME 503. ADVANCED UNIT OPERATIONS

TWO CREDIT HOURS

This course covers diffusional topics, including extraction and multi-component absorption. Prerequisite: Cme 312 or equivalent. (Open for enrollment of undergraduate students.)

CME 504. HEAT TRANSMISSION

TWO CREDIT HOURS

A study of the basic concepts of the flow of heat by conduction, convection and radiation. Prerequisite: Cme 311 or equivalent. (Open for enrollment of undergraduate students.)

Civil Engineering (CIE)

Seymour J. Ryckman, *Chairman*

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 504. LIMIT DESIGN IN STEEL

THREE CREDIT HOURS

A review of the physical properties of metal, the theory and application of limit design to simple and redundant members, trusses, and columns. A brief study of connection details. Corequisite: Cie 406. (Open for enrollment of undergraduate students.)

CIE 506. ULTIMATE DESIGN OF REINFORCED CONCRETE

THREE CREDIT HOURS

The theory and application of ultimate design in reinforced concrete as applied to the sections of beams, columns and members subject to both bending and direct stress. The latest report of the A.S.C.E.-A.C.I. Joint Committee is reviewed. Prerequisite: Cie 407. (Open for enrollment of undergraduate students.)

CIE 524. FOUNDATION DESIGN

THREE CREDIT HOURS

Analysis of earth pressure and stability of natural slopes. Study of frost action, permafrost. The design of spread foundations, pile foundations, caissons, cofferdams, anchored bulkheads, bridge piers and abutments. Prerequisite: Cie 409; Corequisite: Cie 407. (Open for enrollment of undergraduate students.)

CIE 542. HIGHWAY DESIGN I

THREE CREDIT HOURS

Design and construction of pavements, including concrete, asphalt, aggregate and soil cement surfaces. Designs of base courses. Maintenance. Prerequisite: Cie 405. (Open for enrollment of undergraduate students.)

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. (Open for enrollment of undergraduate students.)

Electrical Engineering (ELE)

Bro. Louis Rose, S.M., *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 341. (Open for enrollment of undergraduate students.)

ELE 503. ANALOG COMPUTERS

THREE CREDIT HOURS

The discussion and analysis of linear electrical computing elements in conjunction with electronic differential analysis. The utilization of electrical and electronic circuits for the performance of linear operation, for multiplication and division, and for function generation. Use of differential analyzers for solving linear integral-differential equations, simultaneous linear algebraic equations, and non-linear differential equations. Prerequisite: Ele 313, Math 342. (Open for enrollment of undergraduate students.)

ELE 504. DIGITAL COMPUTERS

THREE CREDIT HOURS

Digital computers and their design. Circuit components and binary numbers. Boolean algebra. The simplification of Boolean functions. Memory element input equations. The derivation of application equations. Digital computer memories. Input-output equipment. The arithmetic unit. Error-free computer operation. The control unit. Completing computer design. Prerequisite: Ele 313. (Open for enrollment of undergraduate students.)

ELE 511. ADVANCED THEORY AND DESIGN OF ROTATING MACHINERY I

THREE CREDIT HOURS

Basic principles and applied theory in practical design of induction machinery, commercial, aircraft and missile types. Prerequisite: Ele 403. (Open for enrollment of undergraduate students.)

ELE 512. ADVANCED THEORY AND DESIGN OF ROTATING MACHINERY II

THREE CREDIT HOURS

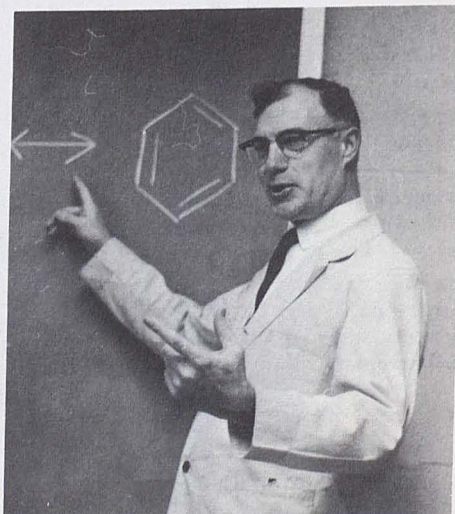
Detailed theory and design of direct current and synchronous machines. Permanent magnet and flux switch machines. Heat transfer phenomena; the general temperature field. Prerequisite: Ele 511. (Open for enrollment of undergraduate students.)



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. *Second Term, Odd Years*
- 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. *First Term, Even Years*
- 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. *First Term, Odd Years*
- EGR 504. MASS AND ENERGY TRANSPORT THREE CREDIT HOURS
 Basic concepts, principles and definitions, rate equations, thermodynamic principles, applications. *Second Term, Even Years*
- EGR 505. PROPERTIES OF MATERIALS THREE CREDIT HOURS
 Structure, properties, and behavior of materials. Conductivity, diffusivity, electro-chemistry, elasticity, plasticity, fracture, viscosity. *First Term, Odd Years*
- 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. *Second Term, Odd Years*
- EGR 512. RELIABILITY THREE CREDIT HOURS
 Application of statistical theory to the design of reliability systems in the broadest sense. Theory behind, and techniques to be used in designing testing methods and procedures for determining reliability of component parts and total systems. Environmental test design. Statistical analysis of, and inference from test results. Prerequisite: Mth 331. *First Term, Odd Years*
- EGR 513. SYSTEMS ANALYSIS, DESIGN & EVALUATION THREE CREDIT HOURS
 A total systems approach to problem solving. This course considers techniques which treat quite sophisticated and difficult problems. Proofs and the characteristic rigor of mathematics are avoided but the essential subtlety of the techniques remain. This course relates mathematical courses on the one hand and applied engineering courses on the other. Prerequisite: Egr 512. *Second Term, Odd Years*
- EGR 516. MODERN ELECTRON DEVICES THREE CREDIT HOURS
 Attention is directed toward late developments in electronic devices exclusive of transistors and conventional electron tubes. Some specific topics include low noise traveling wave tubes, parametric amplifying devices, and several devices from the area of quantum electronics. Stress is placed on basic physical principles and theory of operation. Prerequisites: Mth 421, Mth 422, Phy 505 or equivalent.
- 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. Prerequisites: Mth 421, Mth 422, Egr 504.

- 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. Prerequisites: Mth 421, Mth 422, Egr 502.
- 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 301. *Second Term, Even Years*
- EGR 520. ADVANCED STRUCTURAL ANALYSIS THREE CREDIT HOURS
Methods of moment-areas, slope-deflection, moment distribution, column analogy, and virtual work. Includes consideration of such problems as frames of variable cross section, plates and shells, and space frames. Prerequisites: Cie 407, Egm 304.
- EGR 521. THEORETICAL SOIL MECHANICS THREE CREDIT HOURS
General principles involved in the theories of soil mechanics. Discussion includes stress conditions for failure, active and passive pressure, plastic equilibrium in a semi-infinite mass, bearing capacity, semi-infinite elastic solids and subgrade reaction. Prerequisite: Cie 409.
- EGR 522. PHILOSOPHICAL FOUNDATIONS OF ENGINEERING THREE CREDIT HOURS
The place of engineering and the engineer in present day society. The philosophical bases for engineering enterprise and the meaning of engineering achievement. (May be replaced by Phl 505.)
- 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. *First Term, Odd Years*
- 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 ZERO 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

TWO CREDIT HOURS

A study of the experimental analysis of stress as an aid to design for strength and economy with emphasis on electrical strain gages. Also covered are photoelasticity, brittle coatings, photoelastic coatings, analogies, structural similitude. Prerequisite: Egm 304; Corequisite: Egm 501L.

EGM 501L. EXPERIMENTAL STRESS ANALYSIS LABORATORY

ONE CREDIT HOUR

Experiments and problems to acquaint the student with the basic techniques of the use of strain gages, photoelasticity, and brittle coatings in stress analysis. Corequisite: Egm 501.

English (ENG)

Dr. B. J. Bedard, *Chairman*

Any 400 upper level undergraduate course in English may yield graduate credit under the conditions described in the degree requirements. 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 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. English 516 is *not* 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

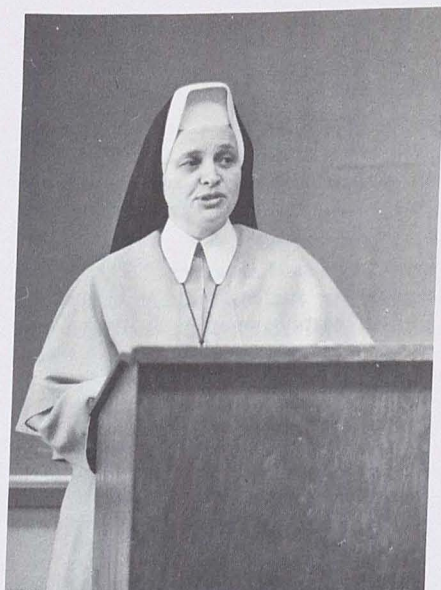
THREE CREDIT HOURS

An analysis of Shakespeare's development from *Hamlet* to *The Tempest*. The course includes the major tragedies, problem plays, and dramatic romances. English 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 572. TRANSCENDENTALISM IN NINETEENTH CENTURY AMERICAN LITERATURE THREE CREDIT HOURS
 A consideration of the writers of the Romantic Age in America.
- *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 590. TEACHING OF COLLEGE ENGLISH THREE CREDIT HOURS
Discussion, instruction, and practice in the methods of teaching composition and literature. Required of and open only to Assistants.

ENG 592. PHILOSOPHICAL AND CRITICAL FOUNDATIONS OF LITERATURE THREE CREDIT HOURS
An intensive treatment of the philosophical assumptions underlying the influential literary theories from antiquity to the present. Required of all degree applicants.

ENG 595. RESEARCH AND BIBLIOGRAPHY THREE CREDIT HOURS
An introduction to the methods and tools of literary scholarship.

ENG 599. THESIS THREE-SIX CREDIT HOURS

History (HST)

Dr. Wilfred J. Steiner, *Chairman*

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

HST 500. 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 as a historical science, with its own method and objectives. Some familiarity with historical method will be required in the composition of research papers.

HST 501. GREEK AND ROMAN CIVILIZATION THREE CREDIT HOURS
This course seeks to understand life in Ancient Greece and Rome. The method of inquiry is comparison and contrast: first between Athens and Sparta, the focal points of the Hellenic era, and then between the republican and imperial periods of Rome. In each case, Hellenic and Rome, the course probes economic, social, religious, and cultural forces. A general knowledge of Ancient History is presupposed.

HST 505. GREAT AFRICAN STATES THREE CREDIT HOURS
—An intensive study of highly developed civilizations of medieval and early modern Africa. Stress will be placed on the empires of Ghana, Mali, Songhay, Ethiopia and Zanj.

HST 506. MEDIEVAL CIVILIZATION THREE CREDIT HOURS
An interpretation of the culture of the Middle Ages, including Christian thought from St. Augustine to St. Thomas Aquinas, humanism and the classical revival, the rise of vernacular literature, the fine arts, education, and scientific development. A general knowledge of medieval history is presupposed.

HST 521. 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 522. VICTORIAN ENGLAND THREE CREDIT HOURS
 The study of Great Britain from the Congress of Vienna in 1815 to the end of World War I. The course examines domestic politics, imperial affairs, the Oxford and Evangelical Movements, the Industrial Revolution, the development of Socialism, and major intellectual and cultural currents.
- HST 528. SOVIET UNION SINCE 1917 THREE CREDIT HOURS
 A comprehensive analysis of Soviet Russia from the Revolution of 1917 to the present day. Concentration will be on the political, economic (including the impact of science and technology), and social aspects of the Soviet nation. Treatment will also be given to the full range of Soviet foreign relations and ideology.
- HST 531. THE CIVILIZATION OF THE FAR EAST THREE CREDIT HOURS
 The purpose of this course is to acquaint the student with the cultural, religious, social, and economic development of the Far East. A general knowledge of World History is presupposed.
- HST 540. INTERPRETATIONS IN WORLD HISTORY THREE CREDIT HOURS
 Specific topics will be chosen for investigation and interpretation as determined by the Instructor. The course will be designed to assist students in following recent trends in the interpretation of historical events. A general knowledge of World History is a prerequisite.
- HST 545. SEMINAR IN NON-AMERICAN HISTORY THREE CREDIT HOURS
 Discussions and reports. The topics will depend, in part, upon the interest of the members of the class.
- HST 550. THE PHILOSOPHY OF HISTORY THREE CREDIT HOURS
 The course in the Philosophy of History will be concerned primarily with the speculative historical writing—i.e., the study of the principal philosophers of history beginning with Greek antiquity and including St. Augustine, Hegel, Marx, Spengler, and Toynbee.
- HST 552. THE AMERICAN REVOLUTION 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 555. THE IMMIGRANT IN AMERICA THREE CREDIT HOURS
 A study of the various immigrant groups that combined to establish the distinctive features of American civilization. Attention will be focused on the contributions of the nationality groups in the development of our social, economic, political, cultural, and religious institutions. A general knowledge of American History is presupposed.
- HST 570. 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 580. HISTORY OF THE LABOR MOVEMENT IN THE U.S. THREE CREDIT HOURS
 After a brief survey of classic instances of early labor organization from the 1790's through the 1850's, a major attention is given to the conditions of labor in the post-Civil War United States and the movement toward national organization of labor. Thereafter, discussion turns to the economic, political, social, and intellectual emphases and programs of national labor organizations in the environment of late 19th century and 20th century United States.

HST 585. SCIENCE AND TECHNOLOGY IN AMERICAN HISTORY THREE CREDIT HOURS
A descriptive and interpretative study of the role of American scientists, inventors, and technologists in American history from the colonial era to the present time, with particular emphasis upon the Machine Age. A general knowledge of American History is a prerequisite.

HST 590. 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 595. SEMINAR IN AMERICAN HISTORY THREE CREDIT HOURS
Students will examine selected topics in American History. A research paper will be required of each student.

HST 599. THESIS THREE-SIX CREDIT HOURS

Mathematics (MTH)

Dr. Kenneth C. Schraut, *Chairman*

MTH 411. PROBABILITY AND STATISTICS I THREE CREDIT HOURS
Prerequisite: Mth 202 or 218

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 202 or 218

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

MTH 432. FOURIER SERIES AND BOUNDARY VALUE PROBLEMS THREE CREDIT HOURS
Prerequisite: Mth 422

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

MTH 465. MODERN OPERATIONAL MATHEMATICS THREE CREDIT HOURS
Prerequisite: Mth 202 or 218

MTH 471. TOPOLOGY THREE CREDIT HOURS
Prerequisite: Mth 422

The courses marked with an asterisk are intended primarily for graduate students in Education. Prerequisite for enrolling in any of these courses for graduate credit toward the M.S. in Education degree is standard teacher certification in Mathematics with at least 21 semester hours in Mathematics.

*MTH 501-502. FUNDAMENTAL CONCEPTS OF ALGEBRA SIX CREDIT HOURS
An introduction to the basic concepts of abstract algebra such as number postulates, groups, rings, fields, mappings, classes, and sets, as well as certain concepts taken from the classical theory of equations. An intensive study of the relation of these topics to the topics of high school algebra as proposed by the several curriculum revision groups.

***MTH 503-504. FUNDAMENTAL CONCEPTS OF GEOMETRY**

SIX CREDIT HOURS

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

***MTH 505-506. FUNDAMENTAL CONCEPTS OF PROBABILITY AND STATISTICS**

SIX CREDIT HOURS

Topics to be discussed include: the basic laws of probability, frequency distribution (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 the several curriculum revision groups.

***MTH 507. FUNDAMENTAL CONCEPTS OF ANALYSIS**

THREE CREDIT HOURS

This course will include the concepts of number, sequence, function, limit, continuity, derivative, integral, and infinite series, as well as their relation to the material in the high school curriculum.

***MTH 508. INTRODUCTION TO APPLIED ANALYSIS**

THREE CREDIT HOURS

A survey of the application of differential equations and infinite series to classical problems in physics, science, and engineering.



***MTH 510. THEORY AND PRACTICE OF COMPUTER PROGRAMMING** THREE CREDIT HOURS
A study of the universal compilers *agol* and *cobol*, followed by a survey of the computer solution of selected problems taken from science, technology, and business. Attention will be given to the analysis of errors.

MTH 521-522. REAL VARIABLES I THREE CREDIT HOURS EACH SEMESTER
Sets and relations, cardinal numbers, order types and ordinals, the real number system and metric spaces, functions and sequences of functions. Prerequisite: Mth 422.

MTH 525-526. COMPLEX VARIABLES THREE CREDIT HOURS EACH SEMESTER
Fundamental concepts, integral theorems, series and the expansion of analytic functions in series, singularities. Entire functions, meromorphic functions, analytic continuation, conformal representation. Prerequisite: Mth 521.

MTH 531-532. ADVANCED DIFFERENTIAL EQUATIONS THREE CREDIT HOURS EACH SEMESTER
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. PARTIAL DIFFERENTIAL EQUATIONS I THREE CREDIT HOURS
Classification of partial differential equations, reduction to cononical form. Existence theorems and the generalized Cauchy problem. Methods of Solution, orthogonal functions, Green's Theorem, and operational methods. Prerequisites: Mth 421, 461, and preferably Mth 465.

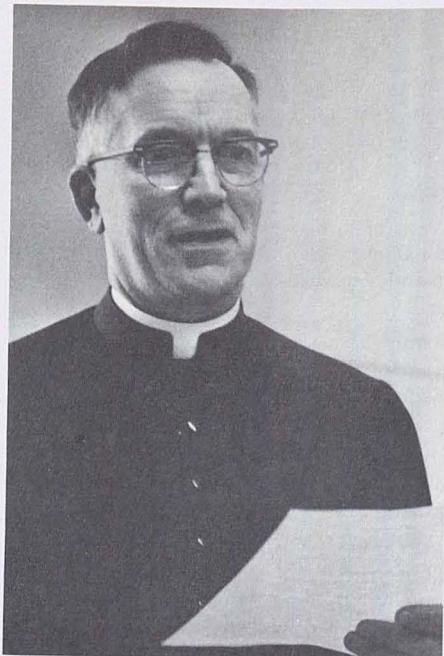
MTH 536. PARTIAL DIFFERENTIAL EQUATIONS II THREE CREDIT HOURS
The wave equation, Laplace's equation, some problems in the conduction of heat, motion of viscous fluids, the hodograph method. Numerical solutions and existence theorems related to these methods. Prerequisite: Mth 535.

MTH 541-542. OPERATIONAL METHODS THREE CREDIT HOURS EACH SEMESTER
The operational methods frequently used in applied mathematics are studied including the Laplace and other Fourier transformations. The concept of involution is used to develop the theory. The inversion integral and applications to ordinary and partial differential equations are discussed. Prerequisite: Mth 422, 461, and preferably 432 and 465.

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 theory 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 SEMESTER
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 SEMESTER
Harmonic analysis, data analysis, interpolation by orthogonal functions. Quadrature methods. Matrices and large scale linear systems. Concepts of convergent matrices, spectral radii, and spectral norms of matrices. Classical and modern iterative methods, including the successive overrelaxation method. Numerical solution of partial differential equations. Concepts of stability and convergence of numerical methods. Error analysis. Consideration will be given



to programming the methods studied for a high speed digital computer. Prerequisite: Consent of Instructor.

MTH 561. ABSTRACT ALGEBRA

THREE CREDIT HOURS

Semi-groups and groups, groups with operators, integral domains and fields, extensions of rings and fields, elementary factorization theory, modules and ideals. Prerequisite: Mth 361 or equivalent.

MTH 565-566. LINEAR ALGEBRA AND MATRICES

THREE CREDIT HOURS EACH SEMESTER

Vector spaces, linear transformations and matrices, determinants, equivalence relations, canonical forms, functions of vectors. Orthogonal and Unitary equivalence, structure of polynomial rings, equivalence of matrices over a ring similarity of matrices, linear inequalities. Prerequisite: Mth 361 or equivalent.

MTH 571-572. LINEAR TOPOLOGICAL SPACES

THREE CREDIT HOURS EACH SEMESTER

The study of various topologies within linear spaces, with emphasis on Branch and Hilbert Spaces. Review of Lebesgue integration. Orthogonal expansions. Projections. Linear transformations. 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 599. PHILOSOPHICAL FOUNDATIONS OF MATHEMATICS

THREE CREDIT HOURS

The philosophical character of mathematical concepts. Nature, foundation and method of mathematics. The historical inter-relation of Philosophy and Mathematics from the Greeks to the present day. May be replaced by Phl 505.

Philosophy (PHL)

Rev. Edmund L. Rhodes, S.M., *Chairman*

The courses below marked with an asterisk are intended primarily for graduate students in Education. Prerequisites for enrolling in any of these courses for credit in the M.S. in Education degree is the completion of the twelve semester hours of basic undergraduate sequence in Philosophy courses.

These courses are also open to graduate students for the M.A. degree in Philosophy under conditions stated in this Bulletin concerning the use of advanced undergraduate courses open to graduate students.

*PHL 408. HISTORY OF MODERN PHILOSOPHY THREE CREDIT HOURS

*PHL 410. HISTORY OF POLITICAL PHILOSOPHY THREE CREDIT HOURS

*PHL 430. PHILOSOPHY OF PLATO THREE CREDIT HOURS

*PHL 432. PHILOSOPHY OF ARISTOTLE THREE CREDIT HOURS

*PHL 434. ST. THOMAS AQUINAS THREE CREDIT HOURS

*PHL 450. PROBLEMS IN PHILOSOPHY THREE CREDIT HOURS

PHL 504. PHILOSOPHY OF ART THREE CREDIT HOURS

An analysis of the nature of art, beauty, and the aesthetic judgment in the light of the philosophical principles and distinctive conditions found in each: a discussion of the permanent and inward relationship of the values of truth, goodness and beauty.

PHL 505. INTER-DISCIPLINARY SEMINAR THREE CREDIT HOURS

Special emphasis to be given to the current interrelations of science, philosophy, the humanities, religion, education and government.

PHL 515. METHODS OF RESEARCH IN PHILOSOPHY SEMINAR THREE CREDIT HOURS

The seminar aims to acquaint students with the methods, materials and tools special to and necessary for philosophical research.

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 545. MODERN FRENCH PHILOSOPHY THREE CREDIT HOURS

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

PHL 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 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. THE HISTORY AND LITERATURE OF AMERICAN PHILOSOPHY

THREE CREDIT HOURS

A survey of the major trends and issues of American thought from the 18th century to the present, especially as reflected in the writings of Edwards, Jefferson, Emerson; Royce, Peirce, James, Dewey, and Santayana. The development of democratic traditions; transcendentalism; the significance of recent European importation.

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.

Physics (PHY)

Dr. Joseph Kepes, *Chairman*

Prerequisite for enrolling in any of these courses for graduate credit toward the M.S. in Education degree is the completion of undergraduate requirements for standard teacher certification in Physics or in Physical Science plus the completion of one year of college mathematics.

PHY 351. INTRODUCTION TO ASTRONOMY

THREE CREDIT HOURS

Prerequisites: Mth 202 Differential and Integral Calculus II, and Phy 206, 207, 208 General Physics.

PHY 420. INTRODUCTION TO SOLID STATE

THREE CREDIT HOURS

Prerequisite: Phy 311.

PHY 440. X-RAYS

THREE CREDIT HOURS

Prerequisites: Mth 218, Phy 206, 207, 208. Recommended previous course: Phy 311.

PHY 450. ADVANCED ASTRONOMY

THREE CREDIT HOURS

Prerequisite: Phy 351 Introduction to Astronomy.

PHY 500. MODERN PHYSICS I

THREE CREDIT HOURS

The object of the course is to familiarize high school science teachers with some of the current advances in physics. The great present day interest in atomic and nuclear physics stems both from the basic nature of the problems attacked and from the technical applications, which are world in importance. An understanding of the foundations of the subject, together with some of the chief results and trends, a necessity for high school teachers of science.

PHY 500L. MODERN PHYSICS LAB I

TWO CREDIT HOURS

A laboratory course intended to allow the student to perform experiments discussed in the lecture, to measure fundamental particles, charges, and constants, both modern and classical.

PHY 501. MODERN PHYSICS II

THREE CREDIT HOURS

A continuation of Phy 500. Modern Physics I.

PHY 501L. MODERN PHYSICS LAB II

TWO CREDIT HOURS

A continuation of Phy 500L. Modern Physics Lab I.

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

A study of Lagrange's Equations, Hamilton's Principle, conservative and non-conservative systems, central force problems, Principle of Least Action, canonical transformations, Hamilton-Jacobi Theory, oscillating systems, and other selected topics. Prerequisite: Phy 303-304 or equivalent.

PHY 513. ELECTROMAGNETIC THEORY

THREE CREDIT HOURS

Electrostatic Fields, Poisson's and Laplace's Equations, Green's Theorem, vector and scalar magnetic potential, Maxwell's Equations, electromagnetic waves, dipole radiation, retarded potentials, Lienard-Wiechert Formulation, interference and diffraction, plus other selected topics. Prerequisite: Phy 511.

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 516. PHILOSOPHICAL BASIS OF MODERN PHYSICS

THREE CREDIT HOURS

The implications of physical concepts are studied, nature, basis and method of Physics. The historical relationship between Philosophy and Physics from the time of the Greeks.

PHY 517. QUANTUM MECHANICS

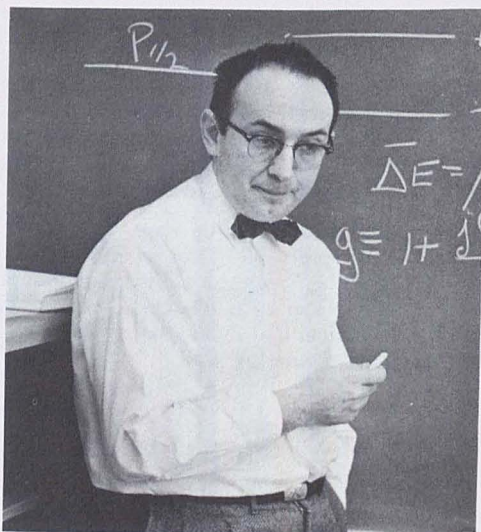
THREE CREDIT HOURS

The Schroedinger Wave Equation, matrix mechanics, operators, perturbation theory, approximation methods and scattering theory. Prerequisite: Phy 511.

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 or instructor.

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 adviser.

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 ONE TO THREE CREDIT HOURS
 Laboratory or library work in selected topics of physics. Topics include: Plasma Physics, Polymer Physics, Advanced Quantum Mechanics. Prerequisite: Approval of Graduate Adviser.

Psychology (Psy)

Dr. Anthony Debons, *Chairman*

PSY 307. PSYCHOLOGY OF EXCEPTIONAL CHILDREN THREE CREDIT HOURS

PSY 312. ABNORMAL PSYCHOLOGY THREE CREDIT HOURS
 Prerequisite: Psy 305 Mental Hygiene, or equivalent.

PSY 401. ADVANCED STATISTICS THREE CREDIT HOURS
 Prerequisite: Psy 302 Elementary Statistics, or Edu 503.

PSY 408. SOCIAL PSYCHOLOGY THREE CREDIT HOURS
 Prerequisites: Six hours of Psychology or Educational Psychology.

PSY 420. INDUSTRIAL PSYCHOLOGY THREE CREDIT HOURS
 Prerequisites: Psy 302 or Edu 503.

Theological Studies (ThL) Rev. Matthew F. Kohmescher, S.M., *Chairman*

Any of the 400 level undergraduate courses in Theology (except Thl 406, 407, and 408) may count for graduate credit under the usual conditions. Prerequisite for enrolling in any of the following courses for graduate credit toward the M.S. in Education degree is completion of the undergraduate sequence of Theology and Philosophy courses, namely twelve semester hours in Theology and twelve semester hours in Philosophy, or the equivalent.

ThL 500. PHILOSOPHY OF RELIGION THREE CREDIT HOURS
 A systematic interpretation of the essential bond that unites man to God in a real relation of the creature and the Creator; a Christian philosophic approach to this personal social relationship in the dimension of immanence and transcendence; and exposition of the sacred and eternal in the human and divine society effected by faith and love in the human being made to the image and likeness of God.

THL 501. HISTORY OF RELIGION

THREE CREDIT HOURS

The comparative role of Christianity and non-Christian religions in the molding of world civilization and, in particular, in the Western culture. Among all religions, the unique doctrinal, moral, and liturgical features of Christianity, with special investigation of their processive incarnational character.

THL 505. THEOLOGY OF THE INCARNATION

THREE CREDIT HOURS

An appreciative study of the Incarnation of the Word of God divinely revealed in Sacred Scriptures and Tradition as the pivotal truth of Christianity, together with its doctrinal developments and precisions necessitated by the key Christological controversies of the patristic, medieval, and contemporary eras, as well as its consequent influence on Christian life and practice during these same periods.

THL 520. ROLE OF THE MOTHER OF GOD IN THE INCARNATION

THREE CREDIT HOURS

The Divine Maternity, principle of Mary's excellence; the spiritual maternity: the meaning of the doctrine, pronouncements of the Magisterium, the evidence from Scripture, the voice of Tradition, the theological explanation; relation to other privileges, special questions of the 19th and 20th century authors. The Universal Mediation of Mary.

THL 521. PRIVILEGES OF THE BLESSED VIRGIN

THREE CREDIT HOURS

The Immaculate conception: defined doctrine, proof from Sacred Scripture, argument from Tradition, proof from theological reason, alleged debt of sin in Mary, immunity from concupiscence, consequences, greatness of the privilege; the Assumption: (1) Our Lady's Death, adversaries, proof of the thesis, question of Mary's death after Munificentissimus Deus; (2) The Assumption itself: Catholic dogma, errors, proofs from the Magisterium, Scripture, Tradition, Liturgy, Connection with other truths.

THL 522. HISTORY OF MARIOLOGY

THREE CREDIT HOURS

An historical treatment of the principal ideas in the Mariological treatise in order to see the development of dogma and theological doctrine from the time of the Fathers of the Church to the present era. Special emphasis will be given to the doctrines of the spiritual maternity and the coredemption.

THL 540. THE CHURCH OF CHRIST

THREE CREDIT HOURS

Institution and Organization of the Church of Christ. Functions and characteristics of the Church. The hierarchy and the Roman Pontiff. The Church as the Mystical Body of Christ.

THL 541. CHURCH AND STATE

THREE CREDIT HOURS

A definition of the problem in terms of institutions; its historical perspectives with emphasis on its contemporary significance. A presentation of the basic elements involved in any solution of the problem.

THL 542. THE CATHOLIC CHURCH IN AMERICA

THREE CREDIT HOURS

An intensive study of the history, structure and regional diversity of the Church in our pluralistic society and a consideration of the widening impact of the Church on the national community in areas vital both to the United States and the supernatural mission of the Mystical Body in our country.

THL 543. MISSIOLOGY: THE MISSIONARY MOVEMENT IN THE CHURCH

THREE CREDIT HOURS

An intensive study of the nature of the Church's mission and its implementation throughout the course of history, with special emphasis on the latest developments, particularly on the increasingly vital role that the laity are to play in the missionary conquests of the Church.

THL 544. THEOLOGICAL PERSPECTIVES OF THE APOSTOLATE

THREE CREDIT HOURS

A dynamic study of Christian social morality in the light of the mission of the Church; the mystery of the Church; the role of Christ the King; apostolic life in Christ; apostolic purifications and temptations; the exigencies of the missionary spirit.

THL 545. CANON LAW FOR THE LAITY

THREE CREDIT HOURS

A consideration of those points in the official law of the Church which are of great practical importance in the life of the layman.

THL 590. SEMINAR WITH MONOGRAPH

THREE CREDIT HOURS

THL 599. THESIS

SIX CREDIT HOURS

