880. Plant Virology  
Fall of odd-numbered years. 3(2-0) 405 or approval of department.  
External and internal symptomatology, transmission, interactions, purifications, assay and serology of plant viruses.

881. Pathogenesis and Disease Resistance  
Winter of odd-numbered years. 4(3-2) 405 and 415, or approval of department.  
Lectures, readings, and discussions on mechanisms of pathogenicity and infectivity; physiology and biochemistry of disease development; tumorogenesis; metabolic consequences of infection; nature of disease resistance; and parasitism.

883. Plant Disease Control  
Fall of even-numbered years. 3(3-0) 406.  
Principals and methods in controlling plant diseases. Considerable emphasis is placed on the chemistry of fungicides, and their role in controlling plant diseases. Other factors affecting disease epidemiology are covered.

885. Plant Diseases in the Field  
Spring. 4 credits. 405 and approval of department.  
Diagnosis, distribution and sequential developments of plant diseases in the field.

890. Selected Topics in Plant Pathology  
Fall, Winter, Spring. 2 to 5 credits. Approval of department.  
Topics will be selected from the following areas: parasitism, plant viruses, ecology, genetics, nematology, fungicidal action, and soil microbiology.

899. Research  
Fall, Winter, Spring, Summer. Variable credit. Approval of department.  
Research for thesis at the master's degree level in one of the following fields: anatomy, cytology, ecology, genetics, lichenology, morphology, mycology, palaeobotany, pathology, physiology, and taxonomy.

918. Advanced Genetics  
Winter of odd-numbered years. 3(3-0) Approval of department.  
Role of the gene in differentiation and development, with special emphasis upon the genetic mechanisms responsible for the control of phenogenesis.

920. Advanced Plant Taxonomy  
Spring of even-numbered years. 4(4-0) 894, ZOL 441.  
Consideration of the recent scientific developments affecting plant classification.

921. Systematic Zoology  
Fall, Winter, Spring, Summer. 3(3-1) 894.  
Topics in zoological classification emphasizing non-vegetative characteristics of species, higher taxa, and major groups of animals.

922. Morphology of Higher Plants  
Spring of even-numbered years. 4(3-1) 921.  
Structural and functional morphology of flowering plants, with special emphasis on the adaptations for reproduction and dispersal of seeds and spores.

923. Botany of the Midwest  
Fall, Winter, Spring, Summer. 4(3-1) 922.  
Botanical and environmental adaptation of the Midwest flora as related to plant ecology and distribution.

924. Biology of the Midwest  
Fall, Winter, Spring, Summer. 4(3-1) 923.  
Historical and current distribution of the flora of the Midwest, its adaptations, and the forces which have determined its character.

925. Biology of Watersheds  
Fall, Winter, Spring, Summer. 4(3-1) 924.  
Water as a factor in the distribution and adaptation of plants, with special emphasis on midwestern watersheds.

926. Advanced Biology of Watersheds  
Fall, Winter, Spring, Summer. 4(3-1) 925.  
Advanced studies in the biology of watersheds, with emphasis on plant and animal adaptations.

927. Animal Ecology  
Fall, Winter, Spring, Summer. 4(3-1) 926.  
Problems of population dynamics, community structure, and environmental modification as they relate to the structure and function of animal populations.

931. Ecological Principles in Conservation  
Spring. 4 credits. 927.  
Application of ecological principles to the protection and management of natural resources.

932. Field Zoology  
Summer. 4 credits. 931.  
Field study of the distribution and ecology of plants and animals in the midwestern United States.

933. Field Botany  
Summer. 4 credits. 932.  
Field study of the distribution and ecology of plants in the midwestern United States.

934. Conservation of Natural Resources  
Summer. 4 credits. 933.  
Practices of conservation, with emphasis on land use, water use, and wildlife management.

935. Conservation and Ecology  
Summer. 4 credits. 934.  
Advanced studies in the principles and practices of conservation, with emphasis on the ecological aspects of resource management.

936. Conservation Biology  
Summer. 4 credits. 935.  
Modern methods and theories in the study of biological conservation, with emphasis on the interrelationships between biology and resource management.

937. Advanced Field Zoology  
Summer. 4 credits. 936.  
Advanced study of the distribution and ecology of plants and animals in the midwestern United States, with emphasis on advanced research techniques.

938. Advanced Field Botany  
Summer. 4 credits. 937.  
Advanced study of the distribution and ecology of plants in the midwestern United States, with emphasis on advanced research techniques.

939. Advanced Conservation and Ecology  
Summer. 4 credits. 938.  
Advanced studies in the principles and practices of conservation, with emphasis on the ecological aspects of resource management, and advanced research techniques.

940. Honors Work  
Fall, Winter, Spring, Summer. 1 to 13 credits. Approval of department.  
Independent and informal study in law, office administration or business communications.
416. Secretarial Administration III: Seminar
Winter, Spring. 4(4-0) Seniors or approval of department.
Analysis of the role of the executive secretary.

440. Law and Society
Fall, Winter, Spring, Summer. 3(3-0)
Seniors or approval of department.
Legal reasoning and legal institutions. Court systems and court procedures. Relationships of citizens and businessmen to governmental agencies. Torts, crimes.

441. Law of Contracts and Business Organizations
Fall, Winter, Spring, Summer. 5(5-0)
Law of contracts, including the concept of freedom of contract and its importance as the focal point of business transactions. Study of the legal framework within which formal business organizations must operate.

443. Property, Sales, Negotiable Instruments
Spring. 4(4-0) 441.
Law of real and personal property, including bailments, leaseholds, security transactions, sales, and negotiable instruments. Case study method used.

445. Real Estate Law
Winter. 3(3-0) 441.
Law of real and personal property, including fixtures, easements, land descriptions, titles, deeds, recording requirements, brokers, land contracts, escrows, closing of sale, abstracts, mortgages, mechanics liens, co-ownership, decedent and distribution, administration of estates, zoning, taxes, landlord and tenant. Combined text and case approach.

446. Interstate and International Business Law
Spring. 3(3-0) 341, 440 or 441.
Laws of contracts, sales, negotiable instruments, agency, business associations in the interstate and international sphere. Maritime contracts. International commercial arbitration. Area directed studies.

447. Hotel Law
Fall, Winter. 4(4-0) 440.
Negotiable instruments, warranties, property, torts, civil rights, agency, partnerships, corporations as applied to hotel and restaurant management.

488. Field Studies
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 8 credits. Business majors and approval of department. Planned program of observation and work in selected business firms. Analysis and reports.

456. Business Risks and Insurance
(‘AFA 486.) Winter, 5(5-0) 350 or Seniors in business administration.
Business insurance as it relates to business risks and decision making. Emphasis on business exposures, coverages and problems of the risk manager.

457. Management of Insurance Enterprise
(‘AFA 487.) Spring. 5(5-0) 350 or approval of department.
Organizational requirements and functional operations of insurance enterprise with emphasis on methods of underwriting, reserves, financial statements and investment requirements, loss adjustment, underwriting, and marketing. Statutory limitations on management freedom.

484. The Legal Environment of Business
Winter, Summer. 4(4-0)
Critical examination of the environment in which business operates. Analysis of the component elements of the legal environment of business and the structural framework in which law functions.

485. Legal Environment of International Business
Spring, Summer. 4(4-0)
Commercial and financial transactions in international business. Foreign agencies, branches, subsidiaries. Aspects of labor relations, anti-trust, taxation, and transportation as related to foreign operations. Litigation and arbitration in the international business community.

781. Seminar: Office Administration
Winter, Summer. 3 credits. May re-enroll for a maximum of 6 credits. Approval of department.
Problems, practices, and policies involved in office administration. Methods of establishing, analyzing, standardizing, and controlling administrative systems and procedures in the office.

787. Seminar in Business Law
Fall, Spring. 4(4-0) May re-enroll for a maximum of 8 credits. 448 or approval of department.
Public policy with regard to contracts, anti-trust, security transactions, labor relations of the firm, viewed from the legislative, judicial, and executive vantage points.

884. Insurance Companies as Financial Institutions
(‘AFA 884.) Winter. 4(4-0)
Analysis of insurance company investment behavior in the capital market. Emphasis on liquidity requirements, interest rates, legal and organizational requirements affecting investment decisions. Micro and macro aspects are investigated.

885. Seminar in Insurance Problems
(‘AFA 885.) Spring. 4(4-0)
Analysis of insurance problems affecting the public interest. Special emphasis on problems due to changing economic and social conditions. Insurance regulatory, financial, marketing and social problems are evaluated.

886. Special Problems
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

CHEMICAL ENGINEERING

CHE College of Engineering

300. Material and Energy Balances
(‘AFA 300.) Fall, 3(3-0) One year general chemistry, MTH 214.
Chemical engineering calculations. Material and energy balances in physical and chemical non-flow and flow systems. Behavior of ideal and real gas systems. Flows of reaction. Applications to chemical engineering systems.

311. Thermodynamics for Chemical Engineering
(‘AFA 311.) Winter. 3(3-0) 361.

321. Transfer Processes and Separations I
Winter. 3(3-0) 300, MTH 215.
Thermodynamics of fluid flow. Frictional effects for laminar and turbulent motion of compressible and incompressible fluids. Dimensional analysis and similarity. Treatment of fluid flow as a momentum transfer process.

323. Transfer Processes and Separations II
Spring. 3(3-0) 312.

334. Transfer Processes and Separations III
Spring. 3(3-0) 311, 313 or concurrently.
Mass transfer in continuous contacting systems. Mass transfer in single pass systems, transport analogies, interphase transfer and contact of immiscible phases.

361. Chemical Thermodynamics
Fall, Spring. 3(4-0). One year general chemistry; one year general physics; MTH 213. Interdepartmental and jointly administered with the Chemical Engineering Department.

381. Chemical Engineering Analysis
Fall, Spring. 3(3-0) Students may not receive credit in both 381 and MTH 341. MTH 215. Interdepartmental with the Mathematics Department.
Formulation of ordinary and partial differential equations describing chemical systems. Boundary value problems, numerical methods, matrices, and applications, to chemical engineering systems.

401. Applied Process Analysis
Spring. 3(3-0) CEM 130 or 141; MTH 113; or approval of department. Students may not earn credit in both 401 and 300.
Techniques of process analysis applied to natural environmental, and physical systems. Material and energy balances; diffusion; heat conduction and viscous flow. For majors in natural sciences and non-chemical engineering.

415. Transfer Processes and Separations IV
Fall. 3(3-0) 314.
Mass transfer in stage processes. Countercurrent processes, fractionation, contacting efficiency, and simultaneous momentum, heat and mass transfer.

423. Chemical Engineering Laboratory
(‘AFA 423.) Winter, 3(3-6) 415.
Assigned laboratory problems, requiring team effort. Experimental work, involving momentum, heat and mass transfer, separation processes, such as distillation, filtration, and drying; reactor kinetics; automatic process control.

424. Transport Phenomena and Physical Properties Laboratory
Spring. 3(3-6) 313 or concurrently.
Experiments involving the transport processes and measurement of physical, chemical and thermodynamic properties of various materials. Comparison of theoretical and experimental results.