940. Studies in Shakespeare
Winter of odd-numbered years. 3(3-0) To receive credit, both ENG 940 and ENG 941 must be completed satisfactorily.

941. Studies in Shakespeare
Spring of odd-numbered years. 3(3-0) To receive credit, both ENG 940 and ENG 941 must be completed satisfactorily.

970. Graduate Reading Course
Fall, Winter, Spring, Summer. 1 to 5 credits. Approval of department.
Supervised reading course in English and American literature for Ph.D. candidates.

975. The Reading Process and the Concept of Literacy
Spring. 3(3-0) Approval of department.
The contributions of language and literary studies to our understanding of the reading process and our definitions of literacy.

980. Studies in English Language
Fall, Winter, Spring. 3(3-0)
The English language from the viewpoint of historical problems, literary analysis and pedagogical implications.

981. Seminar: Earlier English Literature
Fall, Winter, Spring. 3(3-0)
Special problems in English literature, beginnings to 1660.

982. Seminar: Later English Literature
Fall, Winter, Spring. 3(3-0)
Special problems in English literature, 1660-1900.

983. Seminar: American Literature
Fall, Winter, Spring. 3(3-0)
Special problems in American literature, beginnings to 1900.

984. Seminar: Twentieth Century Literature
Fall, Winter, Spring. 3(3-0)
Special problems in English and American literature, 1900 to the present.

985. Seminar: Special Studies in Literary Form and Theory
Fall, Winter, Spring. 3(3-0)
Forms, genres, and movements.

986. Seminar: American Literature and Culture
Fall, Winter, Spring. 3(3-0)
American literature in a cultural context, drawing upon popular and fine arts, the history of ideas, the history of social movements.

987. Seminar: Special Topics in Comparative Literature
Spring. 3(3-0) Advanced graduates. Interdepartmental with the departments of Romance and Classical Languages and German and Russian and administered by the Department of Romance and Classical Languages.

998. Advanced Writing for Doctoral Candidates
Fall, Winter, Spring, Summer. 3(3-0) Admission to a doctoral program or approval of instructor.
Training for writing dissertations and publishing in the sciences, humanitites, and other fields. Includes a detailed analysis of each student's style, methods of organizing, practice in editing, and individual conferences.

999. Doctoral Dissertation Research
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

ENTOMOLOGY ENT

College of Agriculture and Natural Resources
College of Natural Science

250. Pesticides, Their Alternatives and Environmental Quality (N)
Winter. 3(4-0)
Impact of agricultural pesticides on man and his environment. Emphasizes the effect of chemicals on food production and combating diseases and ecological imbalance. Presents pesticide alternatives for the future.

301. General Entomology
Fall, Spring. 3(3-0) B S 211 and B S 212 recommended.
Biological relationships of insects. Insect behavior, ecology, and classification. Metamorphosis and development of insects.

302. General Entomology Laboratory
Fall, Spring. 2(0-6) ENT 301 or concurrently.
Insect diversity with emphasis on morphology, development, classification, identification, bionomics, and evolution. Stresses reproductive strategies and general adaptability as relates to the overall ecological success of insects.

303. Entomological Techniques
Spring. 2(0-6) ENT 301 or approval of department; ENT 302 recommended but not required.
Field entomology, including collecting and rearing techniques and methods of specimen preparation and preservation. Practical experience in insect identification and bionomics. Collection required.

337. Forest and Shade Tree Entomology
Fall. 4(3-2) Three terms of natural science.
Ecological relationships of insect/tree interactions. Taxonomy of insects and recognition of insect injury. Biological, chemical, silvicultural and intergrated control methods. Insect collection required (see instructor during prior spring term).

401. Problems
Fall, Winter, Spring, Summer. 1 to 6 credits. May reenroll for a maximum of 12 credits. Approval of department.
Advanced individual work on a field or laboratory research problem or a study of published literature on a selected topic.

404. Field Entomology
Summer. 6 credits. One year of zoological science or teaching major in general science or approval of department. Given at W. K. Kellogg Biological Station.
Basic field survey in entomology. Emphasis on the biology, collection and identification of insects common to the Gull Lake Biological Station area.

410. Apiculture and Pollination
Spring. 3(2-2)
Biology of the honey bee and some of the wild bees. Relationships between bees and flowering plants. Value of bees in crop pollination. Introduction to management with visits to the University apiary.

411. Seminar
Fall, Winter, Spring. 1(1-0) Majors or approval of department.
Reports by students, faculty, and representatives of the profession, with emphasis on current problems not covered in regular college subjects.

415. Insect Behavior
Winter of even-numbered years. 3(3-0) ENT 301, ENT 302; ZOL 413 recommended.
Mechanisms and adaptive significance of communication, orientation, food and habitat selection and behavioral rhymicity in insects.

418. Systematic Entomology
Winter. 4(1-9) ENT 301, ENT 302.
General taxonomic course to acquaint the student with the various groups of insects.

420. Aquatic Insects
Spring. 4(3-3) ENT 301, ENT 302.
Biology, ecology and systematics of aquatic insects. Insect collection required.

421. Stream Ecology
Fall, Summer--given at W. K. Kellogg Biological Station. 3(3-0) ENT 420 or approval of department. Interdepartmental with the Department of Fisheries and Wildlife.
An in-depth examination of stream ecosystems--physical, chemical and biological aspects. Field work will be centered on local streams. Laboratory exercises will involve manipulations necessary for the determination of population energy budgets, with special emphasis on aquatic insects. Field trips required.

425. Agricultural Entomology
Fall. 4(3-2) One year of biological or agricultural sciences.
Natural processes of insect populations and associated techniques that are important to agriculture.

438. Taxonomy of Immature Insects
Spring of even-numbered years. 4(1-9) ENT 418.
Identification of immature insects with particular emphasis on the Holometabola.

440. External Morphology of Insects
Fall. 4(2-6) ENT 301, ENT 302, or approval of department.
Morphological concepts of external skeletal parts of insects. Emphasis on evolutionary development of structures from the Apterygota through the Pterygota.

441. Internal Morphology

Winter. 4(2-6) ENT 440 or approval of department.

Morphology of the internal structure of insects. Emphasis on the evolutionary development of organs and organ systems of various representative insects.

444. Insect Ecology

Fall of odd-numbered years. 3(3-0) One course in introductory entomology.

Unique characteristics and principles of insect ecology. Trophic relationships, populations, climate, co-existence, competition, behavior, communities and distributions.

450. Insect Physiology

Spring. 5(3-4) ENT 441; 1 biochemistry or physiology course; 1 year of chemistry including 1 term of organic.

General and comparative physiology of insects, treating molecular, tissue and organ function. Laboratory exercises emphasizing mastery of sound experimental procedures.

455. Toxicology of Insecticides

Winter of odd-numbered years. 4(4-0) 1 term organic chemistry.

Properties of insecticides. Mode of action, metabolism and movement in animals. Safety and potential hazards to man and wildlife. Fates of insecticides in the environment.

460. Medical Entomology

Spring. 4(3-3) ENT 301, ENT 302, or approval of department.

Distribution and biology of important arthropod vectors of diseases to man, disease symptoms, life cycle of the infectious agent, reservoirs, urticating arthropods, anaphylactic reactions, myiasis, and prophylactic measures.

470. Nematode Diseases of Economic Plants

Winter. 4(3-3) B S 212 or BOT 205. Interdepartmental with the Department of Botany and Plant Pathology.

Major nematode diseases of economically important plants, with emphasis on diagnostic symptoms, nematode biology and principles of control.

480. Insects in Relation to Plant Diseases

Fall of even-numbered years. 3(2-2) ENT 302. Interdepartmental with the Department of Botany and Plant Pathology.

Relationships of insects, mites and nematodes to important plant diseases incited by bacteria, fungi, viruses and toxins. Mode of transmission and means of control. Transmission techniques and important plant-pathogen-insect relationships.

490. Topics in Entomology

Fall, Winter, Spring, Summer. Variable credit. Majors or approval of department.

Advanced work in medical entomology, acarology, advanced forest entomology, soil arthropods, behavior and biological control.

808. Advanced Taxonomy

Fall, Winter. 4(0-12) May reenroll for a maximum of 24 credits. ENT 418, ENT 440.

Classification in depth of a single order of insects, including comparative morphology of the group and survey of recent and classical literature.

812. Graduate Seminar Topics

Fall, Winter, Spring. 1(1-0) May reenroll if different topic is taken. Graduate students and approval of department.

Graduate level seminars on current research and philosophy. Student participation required.

815. Biological Control

Spring of even-numbered years. 3(2-3) Approval of department.

Properties of entomophagous species; relationships to population ecology and systematics; foreign exploration, colonization, manipulation, and evaluation; interactions with pesticides, analysis of successful programs, and future trends. Collection for taxonomic lab to be made the summer before.

820. Applied Insect Ecology

Winter of odd-numbered years. 3(2-3) Approval of department.

Ecological factors in an insect's ecosystem that can be manipulated for the purpose of pest management. Critical evaluation of current and classical literature presented by students in both oral and written reports.

821. Advanced Stream Ecology

Summer. 3 credits. ENT 421 or approval of instructor. Given at W. K. Kellogg Biological Station. Interdepartmental with the Department of Fisheries and Wildlife.

Stream ecosystem energy budget models with emphasis on individual projects involving both laboratory and field experiments. Particular use will be made of artificial streams and locally abundant species of aquatic insects.

838. Principles of Taxonomy

Spring of odd-numbered years. 3(3-0) Twenty credits in zoology and/or entomology, or approval of department.

Methods and principles of systematic zoology and entomology, including a historical survey of the pre-Linnaean and post-Linnaean systems of classification. International rules of zoological nomenclature and their emendations.

840. Insect Toxicology

Winter of odd-numbered years. 5(3-6) ENT 301, ENT 302; organic chemistry.

Chemical and physical properties of insecticides, relationship of chemical structure to mode of action, and physiological basis of toxicological action.

871. Biology of Nematodes

Spring. 4(2-6) ENT 470 or approval of department. Interdepartmental with the Department of Botany and Plant Pathology.

Ontogeny, taxonomy, morphology, pathology and ecology of nematodes, with special reference to plant-parasitic and phytopathogenic species.

881. Biology of the Arthropoda

Winter. 5(3-6) ZOL 481 or approval of department. Interdepartmental with and administered by the Department of Zoology.

Ecology, life cycles, morphology, taxonomy, and distribution of anthropods other than insects.

890. Problems

Fall, Winter, Spring, Summer. 1 to 6 credits. May reenroll for a maximum of 12 credits. Majors or approval of department.

Advanced individual work in: apiculture, aquatic insects, insect biochemistry, biosystematics, economic insects, insect ecology, forest insects, morphology, nematology, insect physiology, plant disease transmission, insect toxicology, araneida, acarina, medical entomology, chemistry of insecticides, insect biology, extension entomology, systems.

899. Master's Thesis Research

Fall, Winter, Spring, Summer. Variable credit. Approval of department.

940. Analytical Techniques for Biological Compounds I

Fall. 4(2-6) Organic chemistry, approval of department.

Application, extraction, cleanup and purification techniques employed in analysis of biologically active compounds. Stresses use of radioisotopes, and column, paper, thin-layer, and molecular sieve chromatography.

941. Analytical Techniques for Biological Compounds II

Winter. 4(2-6) ENT 940.

Analytical techniques used for identification and quantification of biologically active compounds. Emphasis on spectroscopy and gas-liquid chromatography.

999. Doctoral Dissertation Research

Fall, Winter, Spring, Summer. Variable credit. Approval of department.

FAMILY AND CHILD SCIENCES FCS

College of Human Ecology

145. The Individual, Marriage and the Family

Fall, Winter, Spring. 4(4-0) Students may not receive credit in both FCS 145 and S W 228.

Individual as young adult. Alternative living patterns. Marriage as social institution. Courtship and marriage patterns. Adjustments in marriage. Attitudes and roles in family living. Crises situations. Family planning.

255. Family and Individual Development: Life Cycle

Winter, Spring. 3(3-0) Three terms of natural science; sophomores.

Overview of family development. Predictable individual developmental changes over the life span. Cognitive, moral, physical, psychological and social aspects. Interface between individual and family development.

262A. Child Growth and Development: Conception through Early Childhood

Fall, Winter, Spring. Summer of odd-numbered years. 3(3-0) Sophomores, PSY 160 or PSY 170 or ED 200; FCS 262B concurrently.

Physical, cognitive, social, and emotional aspects of human growth and development from conception through early childhood.

262B. Child Growth and Development Laboratory

Fall, Winter, Spring. Summer of odd-numbered years. 1(0-3) FCS 262A concurrently or approval of department.

Observation of human development in infants and young children.