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, ZOO 413 recommended. Mechanisms and adaptive significance of communication, orientation, food and habitat selection and behavioral rhythmicity 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 438. 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
Fall. 5(3-4) ENT 301, ENT 302; 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) ENT 301, ENT 302. 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.
FAMILY AND CHILD ECOLOGY - Descriptions of Courses

812. Graduate Seminar Topics
Fall, Winter, Spring. 1(1-0) May re-enroll if different topic is taken. Graduates and approval of department.
Graduate seminar 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.

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.

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. 3(3-0) ZOL 481 or approval of department. Interdepartmental with and administered by the Department of Zoology.
Ecology, life cycles, morphology, taxonomy, and distribution of arthropods other than insects.

890. Problems
Fall, Winter, Spring, Summer. 1 to 6 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.
Appropriate cleanup and purification techniques employed in analysis of biologically active compounds. Stress use of radioisotopes and columns, paper, thin-layer, and molecular steer 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.

364A. Interacting with Young Children in Child Development Centers
(364.) Fall, Winter, Spring. 3(3-0)
FCS 262A, FCS 262B each with a minimum grade of 2.0; FCS 364A concurrently.
Application of principles of human growth and development to personal interaction with children ages three to six individually and in small groups in schools of early childhood.

364B. Interacting with Young Children - Laboratory
Fall, Winter, Spring. 1(0-3) FCS 264A concurrently, FCS 264A, FCS 264B each with a minimum grade of 2.0.
Experience in interaction with children ages two to six years, individually and in groups in a child development center.

369A. Learning Activities for Early Childhood Programs
Fall, Winter, Spring. 3(3-0)
Planning, learning activities and teaching strategies for children ages 3 to 6 in early childhood education programs.

369B. Learning Activities for Early Childhood Programs - Laboratory
Fall, Winter, Spring. 1(0-3) FCS 369A concurrently and approval of department.
Experience in planning and carrying out learning activities with young children in an early childhood program.

400H. Honors Work
Fall, Winter, Spring. Summer.
Variable credit. May re-enroll for a maximum of 16 credits. Senior: approval of department.

442. Minority Families in America
(401.) Winter. 3(3-0) Juniors.
Historical, structural, functional components of minority family systems in white America. Centers on a particular minority family system each term. Life styles, pressures, adaptations, viability and continuity of minority family subculture.

444. Interpersonal Relationships in the Family
Fall. Winter, Spring. Summer of odd-numbered years. 3(3-0) FCS 145 or FCS 263 or approval of department.
Relationships between and among family members as they are affected by other systems, and by physical, cultural, social-psychological forces within the family eco-system. Contemporary family life issues.

445. Human Sexuality in the Family
(365.) Fall, Winter, Spring. 3(3-0)
Juniors. Credit may not be earned in both FCS 445 and PSY 280.
Personal, interpersonal, societal meanings of human sexuality, utilizing ongoing small peer group interaction. Nonlecture, value clarification approach, integrating reflection on research findings, family, peer and cultural influences.