

**ENTOMOLOGY**

**ENT**

**College of Agriculture and Natural Resources  
College of Natural Science**

**250. Pesticides, Their Alternatives and Environmental Quality**  
*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.*

Experiments in morphology, physiology, behavior of insects. Populations and classification of major groups.

**337. Forest and Shade Tree Entomology**

*Fall. 4(3-2) Three terms of natural science*

Provides an understanding of significance and nature of insect injury to forest and shade trees, based upon morphology, physiology, biology and taxonomy of insect and host. Analyzes biological, chemical, cultural and silvicultural approaches to insect control in order to equip student with competence to carry out survey and action program assignments.

**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 Cull 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 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.

**430. Economic Entomology**

*Fall. 3(2-3) ENT 301, ENT 302.*  
Recognition, life histories, behavior, ecology and integrated control of insects of economic importance.

**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.

**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**

*Fall of even-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**

*Winter 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. Insect Ecology**

*Fall of even-numbered years. 3(2-3) Approval of department.*  
Detailed consideration of the dynamics of insect populations. Review of those factors in the insect ecosystem which can be manipulated for the purpose of pest management. Role and use of models in insect ecology.

**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.

**Descriptions – Entomology  
of  
Courses**

**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 arthropods 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. 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. 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.

**263. Children, Youth and the Family**  
*(245.) Fall, Winter, Spring. 3(3-0) Sophomores; SOC 241 or FCS 145 or FCS 262A; or approval of instructor.*

A family systems perspective of middle childhood, adolescence, and youth development is presented, incorporating childhood through launching stages of family development. Interactions of parents, children and socio-cultural factors are analyzed.

**364A. Interacting with Young Children in Child Development Centers**  
*(364.) Fall, Winter, Spring. 3(3-0) FCS 262A, FCS 262B each with minimum grade of 2.0; FCS 364B 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 364A or concurrently, FCS 262A, FCS 262B each with a minimum grade of 2.0.*

Experience in interaction with children ages two to six years, individually and in small groups in a child development center.

**369A. Learning Activities for Early Childhood Programs**  
*Fall, Winter, Spring. 3(3-0) Majors: FCS 262A and FCS 262B, FCS 364A and FCS 364B each with a minimum grade of 2.0; FCS 369B concurrently. Others: approval of department.*

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 reenroll for a maximum of 16 credits. Seniors; 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, Spring. Summer of even-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. 3(3-0) Juniors. Credit may not be earned in both FCS 445 and PSY 290.*

Personal, interpersonal, societal meanings of human sexuality, utilizing outgoing small peer group interaction. Nonlecture, value clarification approach, integrating reflection on research findings, family, peer and cultural influences.

**446. Approaches to the Study of the Family**  
*Fall, Winter. Summer of odd-numbered years. 4(4-0) FCS 145 or FCS 263, FCS 444.*

The family is studied from several approaches. Case studies, films, literary materials, research studies and observations of living situations are included.

**461. Individual Child Study**  
*Fall, Winter. 3(2-2) Majors: FCS 364; others: FCS 262A, PSY 244 or ED 412.*

An in-depth analysis of development and behavior utilizing regular observation of a young child. Applications of theories of child growth and behavior.

**464A. Practicum in a Child Development Center**  
*Fall, Winter, Spring. Summer of odd-numbered years. 3 to 7 credits. FCS 262A, FCS 262B, FCS 364A, FCS 364B, FCS 369A, FCS 369B each with a minimum grade of 2.0 and approval of department.*

A directed practicum in planning, implementing and evaluating the learning environment, in a class of young children during an entire term.

**464B. Problems in Teaching in a Child Development Center**  
*Fall, Winter, Spring. Summer of odd-numbered years. 2(2-0) FCS 464A concurrently, HEC 301.*

Analysis of problems in teaching in an early childhood program. Application of child guidance techniques and principles.

**467. Administration of Child Development Centers**  
*Spring. 3(3-0) FCS 464A, FCS 464B or concurrently; or approval of department.*

Administrator's role in child development centers. Application of child care philosophy, management and communication skills to operation of early childhood education programs. Federal, state, and local regulations and support services.