

999. Doctoral Dissertation Research
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 36 credits in all enrollments for this course.
R: Open only to doctoral students in English.

ENTOMOLOGY

ENT

Department of Entomology College of Agriculture and Natural Resources College of Natural Science

205. Pests, Society and Environment
Fall, Spring. 3(3-0) Interdepartmental with Botany and Plant Pathology.
Nature of pests and their impact on society. Principles of integrated pest management in relation to environmental quality and sustainable development.

222. New Horizons in Biotechnology
Fall. 2(2-0) Interdepartmental with Crop and Soil Sciences. Administered by Crop and Soil Sciences. Perspectives on biotechnology for safer food production, environmental quality, and improved human health. Impacts of biotechnology on the national economy. Political and ethical ramifications of applied biotechnology.

319. Introduction to Earth System Science
Fall. 3(3-0) Interdepartmental with Botany and Plant Pathology, Geological Sciences, Zoology, and Sociology.
P: Completion of one course in biological or physical science.
Systems approach to Earth as an integration of geochemical, geophysical, biological and social components. Global dynamics at a variety of spatio-temporal scales. Sustainability of the Earth system.

362. Management of Turfgrass Pests
Fall. 4(3-2) Interdepartmental with Crop and Soil Sciences, and Botany and Plant Pathology. Administered by Crop and Soil Sciences.
P: CSS 232.
Chemical, biological, and cultural methods of managing weeds, diseases, and insect pests of turfgrass. Environmental considerations in pest management.

401. Directed Studies
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 8 credits in all enrollments for this course.
R: Approval of department.
Individual field or laboratory research, or review of published literature, on a topic of interest.

404. Insects: Success in Biodiversity
Fall, Summer of even-numbered years. 4(3-4)
P: BS 110 or BOT 105, BOT 106.
Biological adaptations of insects to the environment. Evolution, behavior, ecology, metamorphosis, classification, importance to humans, and pest management.

407. Diseases and Insects of Forest and Shade Trees
Spring. 4(3-3) Interdepartmental with Botany and Plant Pathology. Administered by Botany and Plant Pathology.
P: BOT 105 or BS 110 or LBS 144; BOT 218 or FOR 204 or HRT 211. R: Completion of Tier I writing requirement. Not open to students with credit in BOT 405.
Diseases, insects, and environmental problems affecting trees in forests, parks, suburbs, and nurseries. Methods of control.

410. Apiculture and Pollination
Fall. 2(1-2)
Biology of bees and their relationship to flowers, pollination and crop production.

419. Advanced Earth System Science
Spring. 3(2-2) Interdepartmental with Botany and Plant Pathology, Geological Sciences, Zoology, and Sociology.
P: ENT 319
Systems science theory applied to analysis of the biological, geological, physical, and social causes and consequences of global changes. Issues of sustaining the Earth system.

420. Stream and Aquatic Insect Ecology
Fall. 4(3-3) Interdepartmental with Fisheries and Wildlife, and Zoology. Administered by Fisheries and Wildlife.
P: BS 110, CEM 141.
Biological and environmental factors determining structure and function of stream and aquatic insect communities. Aquatic insect systematics.

442. Concepts of Biological Information Systems
Spring. 3(3-0) Interdepartmental with Resource Development.
R: Open only to seniors and graduate students.
Systems approach to managing biological information using computer technology.

460. Medical and Veterinary Entomology
Spring of even-numbered years. 3(2-3)
P: BS 110. R: not open to freshmen and sophomores
Insects and other organisms related to human and animal health. Ectoparasites, ecology of vector-borne diseases, epidemiology, and management of arthropod vectors.

470. General Nematology (W)
Spring of odd-numbered years. 3(2-3)
P: BS 110 or BS 111, BS 111L. R: Completion of Tier I writing requirement.
Biology of nematodes with special reference to the influence of phytoparasitic, entomopathogenic, animal parasitic, microbiotrophic and marine species on human ecology.

477. Pest Management I: Pesticides in Management Systems
Fall. 3(3-0) Interdepartmental with Horticulture, Crop and Soil Sciences, and Fisheries and Wildlife.
P: CEM 143; BOT 405 or CSS 402, ENT 404 or ENT 470 or FW 328.
Chemistry, efficient use, and environmental fate of pesticides. Legal and social aspects of pesticide use.

478. Pest Management II: Biological Components of Management Systems (W)
Spring of odd-numbered years. 3(2-3) Interdepartmental with Horticulture, Crop and Soil Sciences, Fisheries and Wildlife, and Forestry.
P: ENT 404 or ENT 470 or BOT 405 or CSS 402 or FW 328. R: Completion of Tier I writing requirement.
Principles of host plant resistance and biological control and their relationship to the design of agroecosystems. Classification of insect biological control agents.

485. Tropical Biology
Spring. 3(3-0) Interdepartmental with Zoology, and Botany and Plant Pathology. Administered by Zoology.
P: ZOL 250. R: Open only to juniors and seniors.
Tropical biota emphasizing evolutionary and ecological principles compared across tropical ecosystems.

485L. Field Tropical Biology
Spring, Summer. 2 credits. Interdepartmental with Zoology, and Botany and Plant Pathology. Administered by Zoology.
P: ZOL 485 or concurrently. R: Open only to juniors and seniors. Approval of department.
Intensive field experience to study tropical ecosystems. Individual project required. Given at various sites in Costa Rica by the Organization for Tropical Studies.

805. Integrated Pest Management Systems
Fall. 3(2-2)
Biological, ecological and sociological factors which can be exploited for integrated pest management. Design and management of environmental systems for pest prevention and non-chemical control.

812. Graduate Seminar
Fall, Spring. 1(1-0) A student may earn a maximum of 10 credits in all enrollments for this course. Current research topics. Student presentation required.

815. Insect Behavior
Fall of odd-numbered years. 3(2-3)
P: ENT 404.
Fundamentals of insect behavior with emphasis on mechanisms. Quantitative methods.

818. Systematics, Morphology, Biology: Adults
Spring of even-numbered years. 3(1-7)
P: ENT 404.
Classification, identification, morphology, biology and evolutionary relationships of adult insects. Specimens provided.

838. Systematics, Morphology, Biology: Immatures
Fall of even-numbered years. 3(1-7)
P: ENT 404.
Classification, identification, morphology, biology and evolutionary relationships of immature insects. Emphasis on terrestrial holometabola. Collection required.

844. Insect Ecology and Evolution
Spring of odd-numbered years. 3(3-0)
P: ENT 404.
Unique characteristics and principles of insect ecology and evolution including trophic relationships, community structure, speciation and coevolution.

845. Ecology and Evolution: the Interface
Fall. 3 credits. Interdepartmental with Zoology, and Botany and Plant Pathology. Administered by Zoology.
P: BOT 849
Conceptual and methodological issues common to both ecology and evolutionary biology.

850. Insect Physiology
Spring of odd-numbered years. 4(3-2)
P: ENT 404.
System by system description of insect form and function. Examples of how physiological systems are coordinated for complex biological functions.

851. Molecular Entomology
Fall of odd-numbered years. 3(3-0) Interdepartmental with Genetics.
Analysis of molecular processes unique to insects, and their potentials for genetic engineering.

870. Plant Nematology
Spring of even-numbered years. 3(2-3) Interdepartmental with Botany and Plant Pathology.
P: BOT 405.
Biology, host parasite relationships and management of selected nematode diseases of economic plants.

890. Independent Study
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 8 credits in all enrollments for this course.
R: Open only to graduate students.
Individual study on a field or laboratory research topic or review of published literature on a topic of interest.

**Descriptions —Entomology
of
Courses**

899. Master's Thesis Research
Fall, Spring, Summer. 1 to 12 credits. A student may earn a maximum of 24 credits in all enrollments for this course.
R: Open only to masters students in Entomology.

940. Analytical Techniques for Bioactive Compounds: Separation
Spring of odd-numbered years. 4(2-6)
Extraction and chromatographic separations of compounds from environmental matrices.

941. Analytical Techniques for Bioactive Compounds: Confirmation
Spring of even-numbered years. 4(2-6)
Instrumental confirmation of compounds from environmental matrices.

999. Doctoral Dissertation Research
Fall, Spring, Summer. 1 to 12 credits. A student may earn a maximum of 99 credits in all enrollments for this course.
R: Open only to Ph.D. students in Entomology.

**ENVIRONMENTAL
ENGINEERING ENE**

**Department of Civil and
Environmental Engineering
College of Engineering**

800. Environmental Engineering Seminar
Fall, Spring. 1(1-0)
R: Open only to Environmental Engineering majors.
Current research in environmental engineering.

801. Dynamics of Environmental Systems
Spring. 3(3-0)
Principles of mass balance, reaction kinetics, mass transfer, reactor theory in environmental engineering.

802. Physicochemical Processes in Environmental Engineering
Fall. 3(3-0)
P: ENE 801.
Physical and chemical principles of air and water pollution control and environmental contaminants in water, air and soils.

804. Biological Processes in Environmental Engineering
Fall. 3(3-0)
P: ENE 801 or concurrently.
Engineering of microbial processes used in wastewater treatment, in-situ bioreclamation, and solid waste stabilization.

806. Laboratory Feasibility Studies for Environmental Remediation
Spring. 3(2-4)
P: ENE 802, ENE 804 R: Open only to graduate students in Environmental Engineering, Environmental Engineering-Environmental Toxicology, and Environmental Engineering-Urban Studies. Not open to students with credit in ENE 803 or ENE 805.
Analysis and characterization of contaminants in soil or water. Conceptual and preliminary design of treatment systems. Use of treatability studies to evaluate treatment options. Oral presentations and preparation of consulting reports with design recommendations.

807. Environmental Analytical Chemistry
Fall. 3(3-0)
R: Open only to Environmental Engineering majors.
Techniques for measurement and analysis in environmental engineering. Sample preparation. Quality assurance.

808. Environmental Analytical Chemistry Laboratory
Spring. 1 credit.
P: ENE 807. R: Open only to Environmental Engineering majors.
Laboratory work in environmental analytical chemistry.

880. Independent Study in Environmental Engineering
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course.
R: Open only to Environmental Engineering majors.
Solution of environmental engineering problems not related to student's thesis.

890. Selected Topics in Environmental Engineering
Fall, Spring, Summer. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course.
R: Open only to Environmental Engineering majors.
Selected topics in new or developing areas of environmental engineering.

899. Master's Thesis Research
Fall, Spring, Summer. 1 to 8 credits. A student may earn a maximum of 24 credits in all enrollments for this course.

999. Doctoral Dissertation Research
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 72 credits in all enrollments for this course.

**FAMILY AND CHILD
ECOLOGY FCE**

**Department of Family and Child
Ecology
College of Human Ecology**

145. The Individual, Marriage and the Family
Fall, Spring. 3(3-0)
R: Open only to freshmen and sophomores.
Development of the young adult in the human ecological context. Issues of sexuality, gener, parenting, work and family interface, communication and resource use. Diversity in relationships and families.

211. Child Growth and Development: Conception Through Early Childhood
Fall, Spring. 3(3-0)
R: Not open to freshmen.
Physical, cognitive, social, emotional and ecological aspects of human growth and development from conception through early childhood.

211L. Child Growth and Development Laboratory
Fall, Spring. 1 credit.
C: FCE 211 concurrently. R: Not open to freshmen.
Observation and recording the behavior and development of young children.

212. Children, Youth and Family
Fall, Spring. 3(3-0)
P: FCE 145, SOC 100 or FCE 211. R: Not open to freshmen.
An ecosystems perspective on development during childhood and adolescence emphasizing family and community contexts.

225. Ecology of Lifespan Human Development in the Family
Fall, Spring. 3(3-0)
Human development across the lifespan with an ecological perspective. Relationships between human resource professionals and family systems.

238. Personal Finance
Fall, Spring, Summer. 3(3-0)
Strategies, techniques and resources useful in the management of personal finance.

270. Introduction to Family Community Services
Fall, Spring. 4(3-2)
Family community services from an ecological perspective. Professional orientation and factors influencing the field. Participation in community agency required.

280. Community as Context for Individual and Family Development
Fall, Spring. 3(2-2)
Families' and individuals' fit within a community over their life span from an ecological perspective. Analysis of change. Influence of context on development and its implications for family community services. Community observations required.

320. Interaction Processes with Children in Groups
Fall, Spring. 3(3-0)
P: FCE 211, FCE 211L. R: Open only to juniors and seniors in the Department of Family and Child Ecology.
Principles of verbal and non-verbal interaction in relation to children's behavior in groups. Focus on young children in early childhood programs.

320L. Interaction with Children-Laboratory
Fall, Spring. 1 credit.
P: FCE 211, FCE 211L; FCE 320 or concurrently. R: Open only to juniors and seniors in the Department of Family and Child Ecology.
Practice applying principles of interaction to individuals and small groups in early childhood programs.

321. Curriculum for Early Childhood Programs
Fall, Spring. 3(3-0)
P: FCE 320, FCE 320L. R: Open only to juniors and seniors in the Department of Family and Child Ecology. Completion of Tier I writing requirement.
Child development principles and accreditation standards for designing curricula for early childhood programs. Planning and evaluating learning activities and programs.

321L. Curriculum for Early Childhood Programs: Laboratory
Fall, Spring. 1 credit.
P: FCE 320, FCE 320L, FCE 321 or concurrently. R: Open only to juniors and seniors in the Department of Family and Child Ecology.
Supervised practice in providing learning activities for individual children and small groups. Planning, implementing and evaluating activities.

345. Principles of Family Studies
Fall, Spring. 3(3-0)
P: FCE 225 R: Not open to freshmen.
Historical, social, cultural and economic perspectives on contemporary families. Approaches to studying families. Role of communication, resources and decision making in family systems.

346. Helping Skills in Family Community Services
Fall, Summer. 3(2-2)
P: FCE 270, FCE 280.
Foundational skill development necessary for the delivery of services to diverse families, including communicating, interviewing, problem solving, and assessment. Application of skills in a field experience.