

# Entomology

## Undergraduate Study

An undergraduate degree in Insect Science will no longer be offered.

### Minor - Insect Science

The department offers a minor in Insect Science that may be earned by completing ENT 370 Insect Biology and 12 credits in courses selected from an approved list supplied by the department.

### Minor - Emerging Global Diseases

Entomology administers the Emerging Global Diseases minor (see <http://www.ent.iastate.edu/egd>). Core courses address the biology of emerging disease agents (e.g., protozoa, fungi, microbes, and viruses), the clinical manifestations and epidemiology of emerging diseases, and the impact of those diseases on human interactions and socioeconomics. One course must be taken from each of three core areas:

Pathogens and Disease		3
MICRO 310	Medical Microbiology	
BIOL 353	Introductory Parasitology	
& MICRO 353	and Introductory Parasitology	
Sociology and Economics		
SOC 411	Social Change in Developing Countries	
SOC 345	Population and Society	
FS HN 342	World Food Issues: Past and Present	
Arthropod-borne Diseases		
ENT 374	Insects and Our Health	
ENT 574	Medical Entomology	

The remainder of the credits (for a total of 15) may be selected from any of the above-listed courses not selected, and from other appropriate courses as approved by Emerging Global Diseases program advisers.

## Graduate Study

The department offers work for the master of science and doctor of philosophy degrees with a major in entomology. Studies at the Ecosystem, Organismal, and Subcellular levels occur in the following areas: aquatic entomology, biological control, chemical ecology, ecology, host plant resistance, insecticide toxicology, medical/veterinary entomology, pathology, pest management, physiology, population genetics, or systematics.

Graduates have a broad understanding of entomology and related disciplines, and an in-depth command of their area of concentration. They are able to communicate effectively with scientific colleagues and the general public in both formal and informal settings. Graduates are able to address complex problems facing entomology or toxicology professionals, taking into account related ethical, social, legal, economic, and environmental issues. They are skilled in research methods, data analyses, and interpretation of results. They also are skilled in working effectively with their colleagues, and writing concise and persuasive grant proposals. They have an understanding of and can critically evaluate current entomological literature.

Prerequisite to the entomology major and to minor graduate work in the department is completion of at least two years of zoological courses, for part of which credit in other closely allied biological sciences may be substituted. Specific course requirements for advanced degrees depend partly upon previous training and experience in the major field of specialization.

Any student receiving the M.S. in entomology shall have at least one course in insect physiology, one course in insect systematics, two courses of ENT 590 Special Topics (selected from topics A through D, F through I, M and N, inclusive), and at least 1 credit of ENT 600 Seminar.

Any student receiving the Ph.D. in entomology shall have at least one course in insect physiology, one course in insect systematics, four additional courses of ENT 590 Special Topics (selected from topics A through D and F through I, M through N inclusive), and at least 1 credit of ENT 600 Seminar. At least one 590 must be taken from each of these subgroups: Population (C, D, N); Organismal (A, B, F, M); and Suborganismal (G, H, I).

In addition, Ph.D. students majoring either in Entomology or Toxicology shall have two semesters of teaching experience, taken as ENT 590K Special Topics: Teaching Experience. both semesters or ENT 590K Special Topics: Teaching Experience. one semester and ENT 590L Special Topics: Extension Internship. the other semester.

A student can receive a Ph.D. minor in Entomology by taking 3 Entomology courses (500 level and above) for a total of 9 credits to be determined by the student's POS committee and approved by the Entomology Director of Graduate Education.

An option for an emphasis in molecular Entomology is available. Any student receiving the M.S. in entomology with an emphasis in molecular entomology is required to take:

ENT 555	Insect Physiology	4
ENT 590G	Special Topics: Molecular Entomology.	1-3
Plus one other course of 590 selected from topics A-D, F, H, I, M, N		
Plus one additional course in molecular entomology		
ENT 600	Seminar	1
BBMB 404	Biochemistry I	3
BBMB 542A	DNA Techniques.	1
And one course from the following:		
ENT 576	Systematic Entomology	
ENT 525	Aquatic Insects	
ENT 568	Advanced Systematics	

Any student receiving the Ph.D. in entomology with an emphasis in molecular entomology is required to take:

ENT 555	Insect Physiology	4
ENT 590G	Special Topics: Molecular Entomology.	1-3
Plus three other courses of 590 selected from topics A-D, F, H, I, M, N		
One additional course in molecular entomology		
ENT 600	Seminar	1
BBMB 542A	DNA Techniques.	1
Plus two other workshops selected from:		
BBMB 542B	Introduction to Molecular Biology Techniques: Protein	
BBMB 542C	Cell Techniques. Includes immunophenotyping, ELISA, flow cytometry, microscopic techniques, and image analysis. (F.S.)	
BBMB 542D	Plant Transformation. Includes Agrobacterium and particle gun-mediated transformation of tobacco, Arabidopsis, and maize, and analysis of transformants. (S.)	
BBMB 542E	Introduction to Molecular Biology Techniques: Proteomics	
An additional course with a molecular component		
Plus one from each of the following:		
Systematics		
ENT 576	Systematic Entomology	3
ENT 525	Aquatic Insects	
ENT 568	Advanced Systematics	
Biochemistry		
BBMB 404	Biochemistry I	3
BBMB 405	Biochemistry II	
BBMB 501	Comprehensive Biochemistry I	

Entomology participates in the interdepartmental majors in ecology and evolutionary biology; genetics; Microbiology; and molecular, cellular and developmental biology; and in the interdepartmental major and minor in toxicology (see Index).

The Federal Corn Insects and Crop Genetics Research Unit and the North Central Plant Introduction Station are available for advanced study in certain phases of entomological research.

More information about the department, such as current research, faculty resumes, physical facilities, and graduate students can be viewed on the department's website at [www.ent.iastate.edu](http://www.ent.iastate.edu). Curriculum assessment for the department can be viewed here: <http://www.ent.iastate.edu/assessment>.

**Courses primarily for undergraduates:**

**ENT 201. Introduction to Insects.**

(1-0) Cr. 1. F.S.SS.

5 weeks. Classroom section spring only. World Wide Web section of course offered summer and fall semesters. Biological and ecological aspects of insects.

**ENT 211. Insects and Society.**(2-0) Cr. 2. F.S. *Prereq: ENT 201*

11 weeks. Classroom section spring only. World Wide Web section offered fall semester. Holscher. The importance of insects in human well-being. Insect-human interactions. Primarily for nonscience and nonagriculture majors.

**ENT 283. Pesticide Application Certification.**

(Cross-listed with AGRON, FOR, HORT). (2-0) Cr. 2. S.

Holscher. Core background and specialty topics in agricultural, and horticultural pesticide applicator certification. Students can select certification categories and have the opportunity to obtain pesticide applicator certification at the completion of the course. Commercial pesticide applicator certification is emphasized.

**ENT 370. Insect Biology.**(2-3) Cr. 3. F. *Prereq: BIOL 101 or BIOL 211*

Jurenka. Structure, physiology, evolution, behavior, life histories, and recognition of insects. Collection required. Nonmajor graduate credit.

**ENT 371I. Introduction to Insect Ecology.**

(Cross-listed with IA LL). (3-3) Cr. 4. Alt. SS., offered 2013.

Field and laboratory study of insects, their diversity, life history; emphasis on ecology and behavior.

**ENT 372. Livestock Entomology.**

(2-0) Cr. 2. Alt. S., offered 2013.

Classroom and off-campus videotape sections. 12 weeks. Holscher. Recognition, biology, behavior, economic importance, and management of insects and other arthropods affecting livestock and poultry production. Nonmajor graduate credit.

**ENT 374. Insects and Our Health.**(Cross-listed with MICRO). (3-0) Cr. 3. S. *Prereq: 3 credits in biological sciences*

Bartholomay. Identification, biology, and significance of insects and arthropods that affect the health of humans and animals, particularly those that are vectors of disease. Nonmajor graduate credit.

Meets International Perspectives Requirement.

**ENT 374L. Insects and Our Health Laboratory.**(Cross-listed with MICRO). (0-3) Cr. 1. Alt. S., offered 2014. *Prereq: Credit or enrollment in ENT 374*

Bartholomay. Laboratory and field techniques for studying medical or public health entomology, including: collection, identification and maintenance of medically significant arthropods and experimental design and execution related to the biology of arthropods or arthropod-pathogen interactions.

**ENT 375. Plant Protection Using Natural Enemies.**(Dual-listed with ENT 575). (3-0) Cr. 3. Alt. S., offered 2013. *Prereq: ENT 370 or ENT 376*

Bonning, Harris. Overview of the biology, ecology, and classification of insect pathogens, predators, and parasitoids. Discussion of the use of these organisms in plant protection, including an emphasis on genetic alteration of natural enemies. Nonmajor graduate credit.

**ENT 376. Fundamentals of Entomology and Pest Management.**(2-3) Cr. 3. S. *Prereq: BIOL 101 or BIOL 211*

O'Neal. Introduction to entomology and insect-pest management, including life processes, ecology, economics, tactics of population suppression, and ecological backlash. Nonmajor graduate credit. Credit for either Ent 376 or Ent 386, but not both, may be applied toward graduation.

**ENT 386. Management of Insect Pests.**(2-0) Cr. 2. Alt. S., offered 2014. *Prereq: BIOL 101 or BIOL 211*

Introduction to insects and their lifestyles. Theory and application of pest-management practices. Examples drawn primarily from field crops. Nonmajor graduate credit. Credit for either Ent 376 or Ent 386, but not both, may be applied for graduation.

**ENT 410. Insect-Virus Interactions: a Molecular Perspective.**(Dual-listed with ENT 510). (Cross-listed with MICRO). (3-0) Cr. 3. Alt. F., offered 2013. *Prereq: Permission of an instructor.*

Bonning, Bartholomay. Overview of insect-virus interactions including insect immunity to viruses, genetic enhancement of viral insecticides, transgenic mosquitoes, disruption of virus transmission, and the role of insect and virus genomics in combating viral disease of both human and agricultural importance.

**ENT 425. Aquatic Insects.**(Dual-listed with ENT 525). (Cross-listed with A ECL). (2-3) Cr. 3. Alt. S., offered 2013. *Prereq: BIOL 312 or equivalent*

Courtney. Morphology, ecology, diversity, and significance of aquatic insects, with emphasis on the collection, curation and identification of taxa in local streams and lakes.

**ENT 452. Integrated Management of Diseases and Insect Pests of Turfgrasses.**(Dual-listed with ENT 552). (Cross-listed with PL P, HORT). (3-0) Cr. 3. Alt. S., offered 2014. *Prereq: HORT 351*

Gleason, D. Lewis. Identification and biology of important diseases and insect pests of turfgrasses. Development of integrated pest management programs in various turfgrass environments.

**ENT 466. Ecosystem Service Management.**(Dual-listed with ENT 566). (2-3) Cr. 3. Alt. F., offered 2014. *Prereq: permission of instructor*

Lecture and discussion of land use and conservation techniques for improving ecosystem services including: pollination of crops, biological control of pests, prevention of erosion and water quality improvement.

**ENT 471. Insect Ecology.**(Dual-listed with ENT 571). (2-3) Cr. 3. Alt. F., offered 2014. *Prereq: 9 credits biological sciences*

O'Neal. The contribution of insects to ecosystem function is staggering. This course will focus on insect population ecology, predator-prey interaction and chemical ecology. The role of insects in nutrient cycling, pollination and pest management will be discussed with case studies used to highlight the applied nature of insect ecology and its relationship to agriculture.

**ENT 478. Medical Protozoology.**(Dual-listed with ENT 578). (Cross-listed with V PTH, MICRO). (2-1) Cr. 3. F. *Prereq: MICRO 302 or BIOL 314, or equivalent*

Medically important protozoa: their ecology and biology and the diseases they cause in humans and animals. Emphasis is on the protozoa, with some consideration of parasitic nematodes. Topics include: infection and immunity, computational biology/bioinformatics, unique/special subcellular systems (pathways and organelles), vector-parasite-host interactions, disease prevention/treatment strategies, developmental biology. Nonmajor graduate credit.

**ENT 490. Independent Study.**Cr. 1-3. Repeatable, maximum of 6 credits. *Prereq: 15 credits in biological sciences, junior or senior classification*

A maximum of 6 credits of ENT 490 may be used toward graduation.

**ENT 490E. Independent Study: Research or work experience..**Cr. 1-3. Repeatable, maximum of 6 credits. *Prereq: 15 credits in biological sciences, junior or senior classification*

A maximum of 6 credits of ENT 490 may be used toward graduation.

**ENT 490U. Independent Study: Laboratory teaching experience.**Cr. 1-3. Repeatable, maximum of 6 credits. *Prereq: 15 credits in biological sciences, junior or senior classification. For students registering to be undergraduate laboratory assistants.*

A maximum of 6 credits of ENT 490 may be used toward graduation.

**Courses primarily for graduate students, open to qualified undergraduates:****ENT 510. Insect-Virus Interactions: a Molecular Perspective.**(Dual-listed with ENT 410). (Cross-listed with MICRO). (3-0) Cr. 3. Alt. F., offered 2013. *Prereq: Permission of an instructor*

Bonning, Bartholomay. Overview of insect-virus interactions including insect immunity to viruses, genetic enhancement of viral insecticides, transgenic mosquitoes, disruption of virus transmission, and the role of insect and virus genomics in combating viral disease of both human and agricultural importance.

**ENT 511. Integrated Management of Tropical Crops.**(Cross-listed with PL P, HORT). (3-0) Cr. 3. Alt. S., offered 2013. *Prereq: PL P 408 or PL P 416 or ENT 370 or ENT 376 or HORT 221*

Gleason, Lewis. Applications of Integrated Crop Management principles (including plant pathology, entomology, and horticulture) to tropical cropping systems. Familiarization with a variety of tropical agroecosystems and Costa Rican culture is followed by 10-day tour of Costa Rican agriculture during spring break, then writeup of individual projects.

Meets International Perspectives Requirement.

**ENT 525. Aquatic Insects.**

(Dual-listed with ENT 425). (Cross-listed with A ECL). (2-3) Cr. 3. Alt. S., offered 2013. *Prereq: BIOL 312 or equivalent*  
Courtney. Morphology, ecology, diversity and significance of aquatic insects, with emphasis on the collection, curation and identification of taxa in local streams and lakes.

**ENT 530. Ecologically Based Pest Management Strategies.**

(Cross-listed with AGRON, SUSAG, PL P). (3-0) Cr. 3. Alt. F., offered 2014.  
Durable, least-toxic strategies for managing weeds, pathogens, and insect pests, with emphasis on underlying ecological processes.

**ENT 550. Pesticides in the Environment.**

(Cross-listed with TOX). (2-0) Cr. 2. S. *Prereq: 9 credits of biological sciences*  
Coats. Fate and significance of pesticides in soil, water, plants, animals, and the atmosphere.

**ENT 552. Integrated Management of Diseases and Insect Pests of Turfgrasses.**

(Dual-listed with ENT 452). (Cross-listed with PL P, HORT). (3-0) Cr. 3. Alt. S., offered 2014. *Prereq: HORT 351*  
Gleason, D. Lewis. Identification and biology of important diseases and insect pests of turfgrasses. Development of integrated pest management programs in various turfgrass environments.

**ENT 555. Insect Physiology.**

(3-3) Cr. 4. S. *Prereq: ENT 370*  
Jurenka. Life processes of the insects, including reviews of current problems in insect physiology.

**ENT 566. Ecosystem Service Management.**

(Dual-listed with ENT 466). (2-3) Cr. 3. Alt. F., offered 2014. *Prereq: permission of instructor*

Lecture and discussion of land use and conservation techniques for improving ecosystem services including: pollination of crops, biological control of pests, prevention of erosion and water quality improvement.

**ENT 568. Advanced Systematics.**

(Cross-listed with EE0B). (2-3) Cr. 3. Alt. S., offered 2013. *Prereq: Permission of instructor*

Principles and practice of systematic biology; taxonomy, nomenclature and classification of plants and animals; sources and interpretation of systematic data; speciation; fundamentals of phylogenetic systematics.

**ENT 570. Plant-Insect Interaction.**

(2-0) Cr. 2. Alt. F., offered 2013. *Prereq: ENT 370 or ENT 376*  
Gassmann. Physiological, behavioral, ecological, and evolutionary factors that govern interactions between insects and plants, applications of this knowledge to agriculture, and important results from the study of natural systems. Additional topics covered during the semester include: tritrophic interactions, biological control of plants by insects, and pollination biology. Student-led discussions and draws on both the primary and secondary literature.

**ENT 571. Insect Ecology.**

(Dual-listed with ENT 471). (2-3) Cr. 3. Alt. F., offered 2014. *Prereq: 9 credits biological sciences*

O'Neal. The contribution of insects to ecosystem function is staggering. This course will focus on insect population ecology, predator-prey interaction and chemical ecology. The role of insects in nutrient cycling, pollination and pest management will be discussed with case studies used to highlight the applied nature of insect ecology and its relationship to agriculture.

**ENT 574. Medical Entomology.**

(3-3) Cr. 4. Alt. S., offered 2014. *Prereq: 9 credits in biological sciences*  
Bartholomay. Identification, biology, and significance of insects and other arthropods that attack people and animals, particularly those that are vectors of disease.

**ENT 575. Plant Protection Using Natural Enemies.**

(Dual-listed with ENT 375). (3-0) Cr. 3. Alt. S., offered 2013. *Prereq: ENT 370 or ENT 376*

Bonning, Harris. Overview of the biology, ecology, and classification of insect pathogens, predators, and parasitoids. Discussion of the use of these organisms in plant protection, including an emphasis on genetic alteration of natural enemies.

**ENT 576. Systematic Entomology.**

(3-6) Cr. 5. Alt. F., offered 2014. *Prereq: ENT 370*  
Courtney. Classification, distribution, and natural history of insects, including fundamentals of phylogenetic systematics, biogeography, taxonomic procedures, and insect collection and curation.

**ENT 578. Medical Protozoology.**

(Dual-listed with ENT 478). (Cross-listed with V PTH, MICRO). (2-1) Cr. 3. F. *Prereq: MICRO 302 or BIOL 314, or equivalent*  
Medically important protozoa: their ecology and biology and the diseases they cause in humans and animals. Emphasis is on the protozoa, with some consideration of parasitic nematodes. Topics include: infection and immunity, computational biology/bioinformatics, unique/special subcellular systems (pathways and organelles), vector-parasite-host interactions, disease prevention/treatment strategies, developmental biology. Nonmajor graduate credit.

**ENT 590. Special Topics.**

Cr. 1-3. Repeatable. *Prereq: 15 credits in biological sciences.*

**ENT 590A. Special Topics: Biological Control and Pathology..**

Cr. 1-3. Repeatable.

**ENT 590B. Special Topics: Chemical Ecology and Behavior..**

Cr. 1-3. Repeatable.

**ENT 590C. Special Topics: Ecology and Pest Management..**

Cr. 1-3. Repeatable.

**ENT 590D. Special Topics: Evolution and Systematics..**

Cr. 1-3. Repeatable.

**ENT 590E. Special Topics: Special Research Topics..**

Cr. 1-3. Repeatable.

**ENT 590F. Special Topics: Medical and Veterinary Entomology..**

Cr. 1-3. Repeatable.

**ENT 590G. Special Topics: Molecular Entomology..**

Cr. 1-3. Repeatable. Alt. F., offered 2012. *Prereq: 15 credits in biological sciences.*

**ENT 590H. Special Topics: Physiology and Biochemistry..**

Cr. 1-3. Repeatable.

**ENT 590I. Special Topics: Toxicology.**

Cr. 1-3. Repeatable.

**ENT 590K. Special Topics: Teaching Experience..**

Cr. 1-3. Repeatable.

**ENT 590L. Special Topics: Extension Internship..**

Cr. 1-3. Repeatable.

**ENT 590M. Special Topics: Immature Insects..**

Cr. 1-3. Repeatable.

**ENT 590N. Special Topics: Population Genetics..**

Cr. 1-3. Repeatable.

**Courses for graduate students:****ENT 600. Seminar.**

Cr. 1. F.S.SS.  
Presentation of research results.

**ENT 675. Insecticide Toxicology.**

(Cross-listed with TOX). (2-3) Cr. 3. Alt. F., offered 2013. *Prereq: ENT 555 or TOX 501*

Coats. Principles of insecticide toxicology; classification, mode of action, metabolism, and environmental effects of insecticides.

**ENT 699. Research.**

Cr. arr. Repeatable.