

# ENTOMOLOGY AND PLANT PATHOLOGY

The mission for the Department of Entomology and Plant Pathology is to discover, develop and disseminate science-based knowledge concerning arthropods and plant pathogens. Entomology is the science and study of insects and related arthropods. Plant Pathology is the science and study of bacteria, viruses, fungi, and nematodes that cause diseases in plants. A strong academic background in the physical and biological sciences is essential for success in both disciplines. Research and education programs range from basic studies of cellular, physiological, and genetic aspects to broad ecological and population studies and focus on the development of practical pest management strategies.

The undergraduate program in entomology leads to the BS in Entomology and offers students opportunities to explore the diversity of nature through the study of arthropods and their interactions with plants, animals, and human culture. Specialized course work in entomology includes insect identification, biology, ecology, physiology, biochemistry, population dynamics, medical and veterinary entomology, and insect pest management.

Plant pathology as a discipline encompasses the science required to understand the causes of plant diseases as well as prevention and controlling diseases. Undergraduate level courses are available in Plant Pathology and are valuable additions to programs in entomology, horticulture, agronomy, ecology, and botany. Specialized course work in plant pathology includes pathogen identification, genetics, host pathogen physiology, biotechnology, molecular genetics, and disease management.

There are many, and diverse, career opportunities for graduates of these programs, including positions involved with pest management in crops and livestock production, stored products such as grains and processed foods and protecting structural systems such as houses from termites and agricultural biotechnology. Undergraduate options in entomology include insect biology and ecology, bioforensics, and pre-medical/pre-veterinary sciences. Undergraduates of the entomology program are prepared to enter graduate programs in several disciplines, including entomology and plant pathology and have been successful in seeking and receiving professional degrees in medical and veterinary science programs. Others gain employment with private industry, research laboratories or county, state, or federal agencies. Some develop their own businesses as consultants and/or entrepreneurs.

## Minor in Entomology

This minor is designed to provide students with a basic understanding of insect biology, ecology, and classification. Students are also instructed on applications of Entomology related to ecosystem function, conservation, and agricultural impacts. Directed electives in this major also allow students to explore aspects of insect behavior, aquatic entomology, specific applications of entomology in horticulture, forestry, agronomy, structural, urban, and stored product scenarios. Requirements of the minor include 15 hours of core courses.

## Minor in Pest Management

This minor is designed to introduce students to pests including insects, plant pathogens and weeds that damage, reduce the quality, or increase production costs of agricultural crops or livestock, turf or ornamental plants, and trees. Integrated management methods for these pests are presented including cultural, biological, and chemical control strategies.

The minor is intended for students majoring in horticulture, plant and soil science, natural resource ecology and management, animal science, environmental science, entomology, or other majors in biological sciences. Requirements of the minor include 18 hours with 9-12 hours from core courses.

## Courses

### ENTO 2001 Introduction to Entomological Research

**Description:** Familiarize entomology majors with the department, faculty, and other students. Experience a broad overview of the field of entomology and how a degree in entomology can prepare you for many different opportunities and career paths.

**Credit hours:** 1

**Contact hours:** Lecture: 1 Contact: 1

**Levels:** Undergraduate

**Schedule types:** Lecture

**Department/School:** Entomology & Plant Pathology

### ENTO 2003 Insects and Society (N)

**Description:** Influence of insects and related arthropods on human society. Current issues involving insects, society and the environment. View of insects in folklore and mythology. Basic biology and behavior of insects and use of insects as model systems for biological studies. A course for both majors and non-majors.

**Credit hours:** 3

**Contact hours:** Lecture: 3 Contact: 3

**Levels:** Undergraduate

**Schedule types:** Lecture

**Department/School:** Entomology & Plant Pathology

**General Education and other Course Attributes:** Natural Sciences

### ENTO 2223 Insects in Global Public Health (N)

**Description:** Biology of diseases carried by arthropods, including their historical and societal impacts focusing on the intersection of arthropod and human biology.

**Credit hours:** 3

**Contact hours:** Lecture: 3 Contact: 3

**Levels:** Undergraduate

**Schedule types:** Lecture

**Department/School:** Entomology & Plant Pathology

**General Education and other Course Attributes:** Natural Sciences

### ENTO 2993 Introduction to Entomology (LN)

**Description:** Basic biology and classification of insects and closely related animals. Overview of the ecological roles of insects in both natural and managed ecosystems. Previously offered as ENTO 2992 and ENTO 2023.

**Credit hours:** 3

**Contact hours:** Lecture: 2 Lab: 2 Contact: 4

**Levels:** Undergraduate

**Schedule types:** Lab, Lecture, Combined lecture and lab

**Department/School:** Entomology & Plant Pathology

**General Education and other Course Attributes:** Scientific Investigation, Natural Sciences

**ENTO 3001 Research Skills in Entomology**

**Description:** Introduction to research opportunities in field and laboratory entomology. Focus on literature review, hypothesis formation, and development of a grant proposal.

**Credit hours:** 1

**Contact hours:** Lecture: 1 Contact: 1

**Levels:** Undergraduate

**Schedule types:** Lecture

**Department/School:** Entomology & Plant Pathology

**ENTO 3003 Livestock Entomology**

**Description:** Economic importance, biology and control of pests affecting domestic animals. Biology of diseases carried by arthropods, including their impacts focusing on the intersection of arthropod and animal biology. Previously offered as ENTO 2091.

**Credit hours:** 3

**Contact hours:** Lecture: 3 Contact: 3

**Levels:** Undergraduate

**Schedule types:** Lecture

**Department/School:** Entomology & Plant Pathology

**ENTO 3044 Insect Morphology and Physiology**

**Prerequisites:** ENTO 2993 Introduction to Entomology.

**Description:** Morphology and function of insects and their organ systems and use of selected techniques for the study of insect physiology. May not be used for degree credit with ENTO 5044.

**Credit hours:** 4

**Contact hours:** Lecture: 3 Lab: 3 Contact: 6

**Levels:** Undergraduate

**Schedule types:** Lab, Lecture, Combined lecture and lab

**Department/School:** Entomology & Plant Pathology

**ENTO 3421 Horticultural Insects**

**Prerequisites:** ENTO 2993 or concurrent enrollment.

**Description:** Identification, biology and control of pests attacking horticultural crops. Emphasis on pests injurious to vegetables, fruits, pecans, greenhouse plants, turf and ornamental trees and shrubs.

**Credit hours:** 1

**Contact hours:** Lab: 2 Contact: 2

**Levels:** Undergraduate

**Schedule types:** Lab

**Department/School:** Entomology & Plant Pathology

**ENTO 3461 Insects in Forest Ecosystems**

**Prerequisites:** ENTO 2993 or concurrent enrollment.

**Description:** Identification and seasonal life history of insect pests and beneficial insects on shade trees in urban settings, in commercial forests, and in forest products.

**Credit hours:** 1

**Contact hours:** Lab: 2 Contact: 2

**Levels:** Undergraduate

**Schedule types:** Lab

**Department/School:** Entomology & Plant Pathology

**ENTO 3501 Entomology for Educators**

**Description:** Hands-on laboratory course designed to provide high school science teachers, FFA or 4H leaders with all of the resources and background information needed to use insects as a model to teach scientific concepts. Curriculum and resources are provided at the level of 7-12th grade and may be adapted to other levels as needed.

**Credit hours:** 1

**Contact hours:** Lab: 2 Contact: 2

**Levels:** Undergraduate

**Schedule types:** Lab

**Department/School:** Entomology & Plant Pathology

**ENTO 4223 Ecological Methodology**

**Prerequisites:** One course in either ecology or general biology.

**Description:** Use of insects and other invertebrates for describing and evaluating interactions of individuals and populations with their environments. Coverage of behavioral and physiological ecology on consequences to individuals; population and community ecology considered in dynamics of groups of organisms in ecosystems. May not be used for Degree Credit with ENTO 5223.

**Credit hours:** 3

**Contact hours:** Lecture: 2 Lab: 2 Contact: 4

**Levels:** Undergraduate

**Schedule types:** Lab, Lecture, Combined lecture and lab

**Department/School:** Entomology & Plant Pathology

**ENTO 4400 Special Topics**

**Prerequisites:** Consent of instructor.

**Description:** Special topics in plant pathology, entomology or related fields. Same course as PLP 4400. Offered for variable credit, 1-3 credit hours, maximum of 3 credit hours.

**Credit hours:** 1-3

**Contact hours:** Contact: 1-3 Other: 1-3

**Levels:** Undergraduate

**Schedule types:** Independent Study

**Department/School:** Entomology & Plant Pathology

**ENTO 4464 Insect Biology and Classification**

**Prerequisites:** ENTO 2993 or equivalent or consent of instructor.

**Description:** Insect phylogeny, taxonomy, behavior, morphology and physiology in the context of ecosystem function. Major roles of insects in shaping ecosystem diversity, as indicators of environmental integrity, and as vectors of plant and animal pathogens and parasites.

**Credit hours:** 4

**Contact hours:** Lecture: 2 Lab: 4 Contact: 6

**Levels:** Undergraduate

**Schedule types:** Lab, Lecture, Combined lecture and lab

**Department/School:** Entomology & Plant Pathology

**ENTO 4484 Aquatic Entomology**

**Prerequisites:** ENTO 2993 or instructor permission.

**Description:** Biology, taxonomy and ecology of insects and other invertebrates, inhabiting freshwater environments. Identification and biology of individual taxa. Roles of insects in aquatic ecology, as a forage base. May not be used for degree credit with ENTO 5484 or ZOOL 5484. Same course as ZOOL 4484. Previously offered as ENTO 4483.

**Credit hours:** 4

**Contact hours:** Lecture: 3 Lab: 2 Contact: 5

**Levels:** Undergraduate

**Schedule types:** Lab, Lecture, Combined lecture and lab

**Department/School:** Entomology & Plant Pathology

**ENTO 4513 Biological Control**

**Prerequisites:** ENTO 2993 or equivalent or consent of instructor.

**Description:** The ecological principles and applied practices of biological control of insects and weeds. Principles include the scientific basis of biological control; natural enemies and their biology; biological control methods; and biological control in invasive species and pest management programs. May not be used for degree credit with ENTO 5513.

**Credit hours:** 3

**Contact hours:** Lecture: 2 Lab: 2 Contact: 4

**Levels:** Undergraduate

**Schedule types:** Lab, Lecture, Combined lecture and lab

**Department/School:** Entomology & Plant Pathology

**ENTO 4573 Introduction to Forensic Entomology**

**Description:** The role of arthropods in decomposition, the use of forensic entomology in criminal and civil investigations and the increasing importance of forensic science on society; material includes content that some students may find disturbing. May not be used for degree credit with ENTO 5573.

**Credit hours:** 3

**Contact hours:** Lecture: 3 Contact: 3

**Levels:** Undergraduate

**Schedule types:** Lecture

**Department/School:** Entomology & Plant Pathology

**ENTO 4733 Insect Behavior and Chemical Ecology**

**Prerequisites:** ENTO 2993 and CHEM 3015 or equivalent.

**Description:** Behavioral biology of insects. Ecological interactions among organisms mediated by naturally produced chemicals. An interface of ecology, behavior, physiology and chemistry with examples from animals, plants and microorganisms. Origin, function, significance and utilization of semiochemicals such as pheromones and allelochemicals. No credit for students with credit in ENTO 5733.

**Credit hours:** 3

**Contact hours:** Lecture: 3 Contact: 3

**Levels:** Undergraduate

**Schedule types:** Lecture

**Department/School:** Entomology & Plant Pathology

**ENTO 4800 Entomology Practicum**

**Prerequisites:** Consent of instructor.

**Description:** Supervised research or extension experience with faculty in the Entomology/Plant Pathology Dept. or with approved governmental agencies or private employers. Written report required at close of practicum. Offered for variable credit, 1-4 credit hours, maximum of 4 credit hours.

**Credit hours:** 1-4

**Contact hours:** Contact: 1-4 Other: 1-4

**Levels:** Undergraduate

**Schedule types:** Independent Study

**Department/School:** Entomology & Plant Pathology

**ENTO 4854 Medical and Veterinary Entomology**

**Prerequisites:** ENTO 2993 or consent of instructor.

**Description:** Biology and control of arthropod vectors of disease and the diseases carried by arthropods. Course includes emphasis on scientific writing skills. No credit for students with credit in ENTO 5854.

**Credit hours:** 4

**Contact hours:** Lecture: 3 Lab: 4 Contact: 7

**Levels:** Undergraduate

**Schedule types:** Lab, Lecture, Combined lecture and lab

**Department/School:** Entomology & Plant Pathology

**ENTO 5003 Insect Biochemistry**

**Prerequisites:** BIOC 3653 or equivalent or consent of instructor.

**Description:** Biochemical processes in insects and closely related arthropods with emphasis on pathways unique to this group. Biochemical aspects of arthropod-microbe and arthropod-host interactions.

**Credit hours:** 3

**Contact hours:** Lecture: 3 Contact: 3

**Levels:** Graduate

**Schedule types:** Lecture

**Department/School:** Entomology & Plant Pathology

**ENTO 5523 Integrated Management of Insect Pests and Pathogens**

**Prerequisites:** ENTO 2993 and PLP 3344.

**Description:** Modern theory and practices for management of insect pests and pathogens in plant production systems, emphasizing an ecologically-based, integrated approach. Basic concepts of pest management, decision-making, cost/benefit analysis and risk/benefit analytics. Previously offered as ENTO 5524.

**Credit hours:** 3

**Contact hours:** Lecture: 2 Lab: 2 Contact: 4

**Levels:** Graduate

**Schedule types:** Lab, Lecture, Combined lecture and lab

**Department/School:** Entomol & Plant Path

**ENTO 5573 Introduction to Forensic Entomology**

**Description:** The role of arthropods in decomposition, the use of forensic entomology in criminal and civil investigations and the increasing importance of forensic science on society; material includes content that some students may find disturbing. May not be used for degree credit with ENTO 4573.

**Credit hours:** 3

**Contact hours:** Lecture: 3 Contact: 3

**Levels:** Graduate

**Schedule types:** Lecture

**Department/School:** Entomology & Plant Pathology

**ENTO 5613 Host Plant Resistance**

**Prerequisites:** ENTO 2993 and PLP 3343 or equivalent and a general genetics course; or consent of instructor.

**Description:** Interactions of plants and the herbivorous insects and pathogenic micro-organisms that attack them. Development and deployment of multiple-pest resistant cultivars in crop management systems. Same course as PLP 5613. Previously offered as ENTO 5612.

**Credit hours:** 3

**Contact hours:** Lecture: 2 Lab: 2 Contact: 4

**Levels:** Graduate

**Schedule types:** Lab, Lecture, Combined lecture and lab

**Department/School:** Entomology & Plant Pathology

**ENTO 5733 Insect Behavior and Chemical Ecology**

**Prerequisites:** ENTO 2993 and CHEM 3015 or equivalent.

**Description:** Behavioral biology of insects. Ecological interactions among organisms mediated by naturally produced chemicals. An interface of ecology, behavior, physiology and chemistry with examples from animals, plants and microorganisms. Origin, function, significance and utilization of semiochemicals such as pheromones and allelochemicals. No credit for students with credit in ENTO 4733.

**Credit hours:** 3

**Contact hours:** Lecture: 3 Contact: 3

**Levels:** Graduate

**Schedule types:** Lecture

**Department/School:** Entomology & Plant Pathology

**PLP 3343 Principles of Plant Pathology****Prerequisites:** PBIO 1404 or MICR 2123 or HORT 1113 or PLNT 2013.**Description:** Introduction to basic principles and concepts of plant pathology, including the nature, cause and control of biotic and environmentally induced plant diseases, with emphasis on principles and methods of disease management. Offered in combination with PLP 5343. No credit for both PLP 3343 and PLP 5343. Previously offered as PLP 3344.**Credit hours:** 3**Contact hours:** Lecture: 2 Lab: 2 Contact: 4**Levels:** Undergraduate**Schedule types:** Lab, Lecture, Combined lecture and lab**Department/School:** Entomology & Plant Pathology**PLP 3553 Fungi: Myths and More****Prerequisites:** BIOL 1114 or (BIOL 1113 and BIOL 1111) or equivalent.**Description:** Fungal biology covering environmental roles and impacts on the health and nutrition of plants, animals and humans. Ethnomycological and industrial uses of fungi in foods, medicines, and intoxicants, and associated folklore and myths. Microscopy, microbiological methods, mushroom cultivation, and identification of microfungi and wild mushrooms. Same course as BOT 3553 or PBIO 3553.**Credit hours:** 3**Contact hours:** Lecture: 2 Lab: 2 Contact: 4**Levels:** Undergraduate**Schedule types:** Lab, Lecture, Combined lecture and lab**Department/School:** Entomology & Plant Pathology**PLP 4400 Special Topics****Prerequisites:** Consent of instructor.**Description:** Special topics in Plant Pathology, Entomology or related fields. Same course as ENTO 4400. Offered for variable credit, 1-3 credit hours, maximum of 3 credit hours.**Credit hours:** 1-3**Contact hours:** Contact: 1-3 Other: 1-3**Levels:** Undergraduate**Schedule types:** Independent Study**Department/School:** Entomology & Plant Pathology**PLP 4923 Applications of Biotechnology in Pest Management****Prerequisites:** BIOL 1114 or (BIOL 1113 and BIOL 1111) and CHEM 1215 or equivalent.**Description:** Applications of biotechnology in controlling arthropod pests of plants and animals, plant pathogens, and weeds. Introduction to underlying technology, products being developed and deployed, their effectiveness and associated problems or concerns resulting from their use. Same course as ENTO 4923 and PLNT 4923. Previously offered as PLP 4922. May not be used for Degree Credit with PLP 5923.**Credit hours:** 3**Contact hours:** Lecture: 3 Contact: 3**Levels:** Undergraduate**Schedule types:** Lecture**Department/School:** Entomology & Plant Pathology**PLP 5003 Plant Nematology****Prerequisites:** PLP 3343 or concurrent enrollment.**Description:** General morphology, taxonomy and bionomics of nonparasitic and plant parasitic nematodes. Plant parasitic nematode assay techniques, subfamily identification, symptomatology, pathogenicity and control. Previously offered as PLP 5004.**Credit hours:** 3**Contact hours:** Lecture: 2 Lab: 2 Contact: 4**Levels:** Graduate**Schedule types:** Lab, Lecture, Combined lecture and lab**Department/School:** Entomology & Plant Pathology**PLP 5613 Host Plant Resistance****Prerequisites:** ENTO 3343 and ENTO 2993 or equivalent and a general genetics course; or consent of instructor.**Description:** Interactions of plants and the herbivorous insects and pathogenic micro-organisms that attack them. Development and deployment of multiple-pest resistant cultivars in crop management systems. Same course as ENTO 5613.**Credit hours:** 3**Contact hours:** Lecture: 2 Lab: 2 Contact: 4**Levels:** Graduate**Schedule types:** Lab, Lecture, Combined lecture and lab**Department/School:** Entomology & Plant Pathology**PLP 5860 Colloquium****Prerequisites:** PLP 3343.**Description:** Concepts and principles of plant pathology through discussions of pertinent literature. Offered for fixed credit, 2 credits, maximum of 2 credit hours.**Credit hours:** 2**Contact hours:** Contact: 3 Other: 3**Levels:** Graduate**Schedule types:** Independent Study**Department/School:** Entomology & Plant Pathology**PLP 6303 Soilborne Diseases of Plants****Prerequisites:** PLP 3343.**Description:** Soilborne diseases, their reception and importance, the pathogens involved, rhizoplane and rhizosphere influences, inoculum potential, specialization of pathogens, suppressive soil effects, and disease management. Lecture and discussion sessions will emphasize in-depth understanding of problems and complexities associated with studies of soilborne pathogens.**Credit hours:** 3**Contact hours:** Lecture: 2 Lab: 2 Contact: 4**Levels:** Graduate**Schedule types:** Lab, Lecture, Combined lecture and lab**Department/School:** Entomology & Plant Pathology

## Undergraduate Programs

- Entomology: Bio-Forensics, BSAG (<http://catalog.okstate.edu/ferguson-college-agriculture/entomology-plant-pathology/bio-forensics-bsag/>)
- Entomology: Insect Biology and Ecology, BSAG (<http://catalog.okstate.edu/ferguson-college-agriculture/entomology-plant-pathology/insect-biology-ecology-bsag/>)
- Entomology: Pre-Veterinary and Pre-Medical, BSAG (<http://catalog.okstate.edu/ferguson-college-agriculture/entomology-plant-pathology/pre-veterinary-pre-medical-bsag/>)

## Graduate Programs

### Advanced Degree Programs

The Department of Entomology and Plant Pathology offers programs of study that lead to the MS of Entomology and Plant Pathology, the PhD in Entomology, or the PhD in Plant Pathology. These programs offer students opportunities to specialize in a wide range of basic or applied research fields. To qualify for graduate study in entomology and/or plant pathology an applicant should obtain a solid background in the basic sciences, especially biology, chemistry, mathematics, English, and communications skills. All requirements of the Graduate College must be satisfied for entry to the graduate programs. In addition, applicants for graduate programs should take the Graduate Record Examination and submit their scores. Students applying to the graduate program must be accepted into a research program by a major professor. The applicant must secure appropriate financial support in the form of a scholarship, fellowship, or graduate assistantship to be negotiated with the major professor and department and be approved by the departmental screening committee and department head before being admitted to the Department. Each graduate student is under the direction of the major professor as advisor and a selected faculty advisory committee. The program of study is adapted to the individual's needs within departmental and Graduate College guidelines. Graduate students are required to meet with their advisory committees every six months for program reports. Each student will follow a program of study and research approved by the student's committee and must submit an approved thesis or dissertation and present a public defense. Students supported as half-time research assistants are expected to be active participants in the research projects of their major professors. Additional information regarding the graduate programs in Entomology and Plant Pathology may be obtained from the department's website at: <https://agriculture.okstate.edu/departments-programs/entomol-plant-path/>.

## Minors

- Entomology (ENTO), Minor (<http://catalog.okstate.edu/ferguson-college-agriculture/entomology-plant-pathology/entomology-minor/>)
- Pest Management (PEST), Minor (<http://catalog.okstate.edu/ferguson-college-agriculture/entomology-plant-pathology/pest-management-minor/>)

## Faculty

Justin Talley, PhD—Professor and Head; Interim Director, Institute of Biosecurity and Microbial Forensics

**Regents Professors:** Kristopher L. Giles, PhD; Haobo Jiang, PhD

**Regents Professor Emerita:** Jacqueline Fletcher, PhD

**Endowed Professor Structural and Urban Entomology:** Bradford M. Kard, PhD

**Professors:** Kitty Cardwell, PhD; Francisco Ochoa Corona, PhD; Li Maria Ma, PhD; George Opit, PhD; Wyatt Hoback, PhD; Nathan Walker, PhD

**Professors Emeriti:** Robert W. Barker, PhD; Carol Bender, PhD; Richard C. Berberet, PhD; Jim T. Criswell, PhD; Kenneth Conway, PhD; John P. Damicone, PhD; Jonathon Edelson, PhD; Robert M. Hunger, PhD; Phillip G. Mulder, Jr, PhD; Tom Royer, PhD; John R. Sauer, PhD; Astri Wayadande, PhD; Russell E. Wright, PhD; Ali Zarrabi, PhD

**Adjunct Professors:** Charles Abramson, PhD; Akhtar Ali, PhD; Norman C. Elliott, PhD; John Foster, PhD; Carla Garzon, PhD; Brian McCornack, PhD; Hassan A. Melouk, PhD; J.P. Michaud, PhD; Richard Nelson, PhD; Eric Rebek, PhD; Hal Reed, PhD; Kiran Mysore, PhD; Carolyn Young, PhD

**Associate Professors:** Stephen Marek, PhD; Bruce Noden, PhD

**Adjunct Associate Professors:** Carmen Greenwood, PhD; Jen White, PhD

**Assistant Professors:** Meriem Aoun, PhD; Andres Espindola Camacho, PhD; Maira Duffeck, PhD; Mustafa Jibrin, PhD; Ashleigh Faris, PhD; Jonathan Cammack, PhD

**Adjunct Assistant Professors:** Francisco Flores, PhD; Deborah Jaworski, PhD; Michael Reiskind, PhD; Kay Scheets, PhD; Michael Cavallaro, PhD

**Associate Extension Specialist & Pesticide Coordinator:** Kevin Shelton, MS

**Associate Extension Specialists:** Steven Kelly Seuhs, MS; Andrine Shufran, PhD

**Assistant Extension Specialist—Integrated Pest Management Specialist for Cotton:** Maxwell Smith, MS

**Director, Associate Extension Specialist-Plant Disease Diagnostics:** Jen Olson, MS

**Director, Oklahoma Agricultural Leadership Program and Associate Extension Specialist (Stored Products):** Edmond Bonjour, MS