ENTOMOLOGY (ENT)

ENT 202N: Insect Connections: Insects, Globalization and Sustainability
3 Credits

An introduction to the diversity of insects and the ways in which they interact with humans and impact our world. ENT 202N is a Science course that will use an interdisciplinary approach to look at the biology and the interplay between nature and society. Major themes of the course will be illustrated by focusing on the world of Insects and the relationships between society and Insects. Emphasis will be placed on critical analysis of both the costs and the benefits of human activities that impact natural systems. Course Learning Goals: 1. Discuss, describe, and give examples of relevant ecological and evolutionary processes and/or phenomena. 2. Apply content knowledge and understanding in novel contexts and situations. 3. Recognize the implications of the two-way dynamic between human activities and insects and how these dynamics differ in different parts of the world. 4. Make predictions associated with likely impacts of human activities on natural systems, ecosystem services, and insect and human populations. 5. Conduct research of relevant literature and utilize empirical evidence to support claims made in a popular press news story about insects. 6. Discuss, describe, and give examples of the two-way relationship between social issues and scientific discovery. 7. Communicate scientific knowledge to a diverse audience.

Bachelor of Arts: Natural Sciences
General Education: Natural Sciences (GN)
General Education: Social and Behavioral Sciences (GS)
General Education - Integrative: Interdomain
GenEd Learning Objective: Global Learning
GenEd Learning Objective: Integrative Thinking
GenEd Learning Objective: Soc Resp and Ethic Reason

ENT 216N: Plagues Through the Ages
3 Credits

This interdomain, general education course examines the major plagues of human history from both a scientific and societal lens. The course will be co-taught by instructors with biology and political science backgrounds who will help the students to integrate across those disciplines. Each week during a single lecture, students will learn the etiology, mode of transmission and treatment/control measures of a different disease. In parallel, students will also read popular press articles on how these diseases had particular cultural, economic or political impacts. These readings, in conjunction with guide questions, will prepare students for a weekly discussion during the second lecture run by both instructors. During the course, students will develop their ability to think critically about diseases and society and demonstrate this skill by designing a novel response to an emerging pathogen in a particular cultural context. This course will develop student communication skills, both oral and written.

General Education: Humanities (GH)
General Education: Natural Sciences (GN)
General Education - Integrative: Interdomain
GenEd Learning Objective: Effective Communication
GenEd Learning Objective: Crit and Analytical Think
GenEd Learning Objective: Integrative Thinking

ENT 222N: Honey Bees and Humans
3 Credits

Among more than 1,000,000 known insect species, honey bees are truly unique. No other insect has been harnessed so effectively to benefit humankind: honey bees provide critical pollination services for agricultural crops, and the wax and honey they produce are valuable commodities. Furthermore, their fascinating social life-style has intrigued individuals from hobby beekeepers to scientists studying complex questions about the evolution of sociality. More recently, documented declines in populations of honey bees and wild bees have stimulated interest in many communities, including policymakers, in improving health outcomes for bees. This course will provide students with a strong understanding of (1) honey bee behavior (particularly their complex and sophisticated social systems), biology, and health, (2) the important contributions honey bees and their pollination services make to maintaining natural ecosystems and increasing productivity of many of our key agricultural crops; and (3) the global history of human interactions with honey bees, including how people from many cultures have managed bees to provide honey, wax, and pollination services (4) the social and political context of addressing bee health issues. The course material will be presented in a series of interactive lectures, videos, and discussions, and also include a field trip to the Pollinator Gardens at the Arboretum at Penn State, a field trip to one of the Penn State apiaries, tracking individual honey bees in an observation hive, and dissections of samples in a laboratory exercise.

General Education: Natural Sciences (GN)
General Education: Social and Behavioral Sciences (GS)
General Education - Integrative: Interdomain
GenEd Learning Objective: Crit and Analytical Think
GenEd Learning Objective: Integrative Thinking
GenEd Learning Objective: Soc Resp and Ethic Reason

ENT 222N: Honey Bees and Humans
3 Credits

Among more than 1,000,000 known insect species, honey bees are truly unique. No other insect has been harnessed so effectively to benefit humankind: honey bees provide critical pollination services for agricultural crops, and the wax and honey they produce are valuable commodities. Furthermore, their fascinating social life-style has intrigued individuals from hobby beekeepers to scientists studying complex questions about the evolution of sociality. More recently, documented declines in populations of honey bees and wild bees have stimulated interest in many communities, including policymakers, in improving health outcomes for bees. This course will provide students with a strong understanding of (1) honey bee behavior (particularly their complex and sophisticated social systems), biology, and health, (2) the important contributions honey bees and their pollination services make to maintaining natural ecosystems and increasing productivity of many of our key agricultural crops; and (3) the global history of human interactions with honey bees, including how people from many cultures have managed bees to provide honey, wax, and pollination services (4) the social and political context of addressing bee health issues. The course material will be presented in a series of interactive lectures, videos, and discussions, and also include a field trip to the Pollinator Gardens at the Arboretum at Penn State, a field trip to one of the Penn
State apiaries, tracking individual honey bees in an observation hive, and dissections of samples in a laboratory exercise.

General Education: Natural Sciences (GN)
General Education: Social and Behavioral Sciences (GS)
GenEd Learning Objective: Critical and Analytical Thinking
GenEd Learning Objective: Integrative Thinking
GenEd Learning Objective: Social Responsibility and Ethical Reasoning

ENT 296: Independent Studies
1-18 Credits/Maximum of 18
Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.

ENT 297: Special Topics
1-9 Credits/Maximum of 9
Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.

ENT 313: Introduction to Entomology
2 Credits/Maximum of 2
This course is an introduction to entomology addressing issues of insect diversity, morphology and physiology, and identification of the most common groups of adult and immature insects. This course will highlight the beneficial and detrimental roles insects in human society along with responsible methods of pest management. Other topics such as insects as vectors of disease and the ecological and agricultural impact of exotic insect species introduction and climate change will be discussed.

Prerequisite: AGECO 144; AGECCO 121; ANSC 100; ANSC 300; ANTH 21; ANTH 216N; ANTH 218; ANTH 260; ANTH 271; 3 credits of BIOL; BISC 1; BISC 2; BISC 3; 3 credits of CHEM; ENT 202; ENT 216N; ENT 222; ERM 210; FOR 201; FRNSC 100; HORT 101; HORT 150N;

ENT 314: Management of Insect Pests of Ornamentals
1 Credits
Diagnosis and management of insect pests on shrubs and trees in the landscape or production nursery.

Prerequisite: ENT 313

ENT 316: Field Crops Entomology
1 Credits
Laboratory-based approach to identification and management of insect pests of agronomic crops.

Prerequisite: ENT 313

ENT 317: Turfgrass Insect Pest Management
3 Credits
This course will introduce students to a thorough understanding of insects and their relatives, IPM, and control strategies. The course will provide the students the opportunity to review EPA registered turfgrass insecticides and respective Material Safety Data Sheets, the effects of turfgrass insecticides on nontarget organisms, and the Food Quality Protection Act and how this legislation has altered public perception of insecticides. Students will be provided with a fundamental understanding of the ecology, ethology, life history and development of IPM plans for the key surface and subsurface pests of cool- and warm-season turfgrass. Students will be introduced to a wide array of commercial, educational and government web sites to strengthen their understanding of turfgrass entomology. Students also will be encouraged to develop a web-based notebook which they can utilize upon completion of the course. Students will be invited to share their experiences with pest problems and methods they deployed to manage turfgrass insect species in the turfgrass environment. Students will be evaluated by the use of class assignments, quizzes, two hour exams and a final exam, refereed journal reading assignment, and an IPM class project.

Concurrent: TURF 235

ENT 397: Special Topics
1-9 Credits/Maximum of 9
Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.

ENT 402W: Biology of Animal Parasites
3 Credits/Maximum of 3
An introduction to animal parasitology. Emphasis placed on host/parasite interactions, parasites of zoonotic importance, control programs and taxonomy. VB SC 402W Biology of Animal Parasites (3) This course provides students an opportunity to obtain an introduction to the field of animal parasitology. Material presented emphasizes life cycle patterns of animal parasites, host-parasite interactions and pathology, disease patterns and zoonotic potential of parasites to human disease, economic importance of parasitic diseases, taxonomy and parasite control programs. Information presented in this course will be useful to students interested in pursuing a career in veterinary medicine or careers dealing with animal care and management. Evaluation of student performance is achieved by 6 quizzes, three examinations and 3 writing assignments. The course is offered each spring semester with an enrollment of 15 to 25 students.

Prerequisite: BIOL 110
Cross-listed with: VBSC 402W
Writing Across the Curriculum

ENT 410: Insect Structure and Function
3 Credits
Integrated physiology and anatomy of insects; emphasis on unique adaptations, genetic regulation of development, insects as model systems, environmental physiology.

Prerequisite: BIOL 110, BIOL 220W, BIOL 230W, BIOL 240W

ENT 420: Introduction to Population Dynamics
3 Credits
Principles of population regulation, demographic analysis, modeling of dynamic processes are discussed; laboratories involve the exploration of population growth models.

Prerequisite: BIOL 110, BIOL 220W
ENT 424: Sensory Biology of Insects

3 Credits

This course provides students an understanding of insect sensory systems contributing to behaviors performed for survival and reproduction.

Prerequisite: BIOL 110

ENT 425: Freshwater Entomology

3 Credits/Maximum of 3

Collection and identification of insects and other arthropods in freshwater ecosystems; field study of habitats.

ENT 432: Insect Biodiversity and Evolution

4 Credits

In this course students learn insect taxonomy, evolutionary history, collection and preservation techniques, morphology, fossils, and natural history. ENT 432 Insect Biodiversity and Evolution (4) In this course students learn insect taxonomy, evolutionary history, collection and preservation techniques, morphology, fossils, and natural history. Lab work focuses on adult forms, especially of insects found in Pennsylvania. Students learn how to handle specimens, use diagnostic keys, and identify insects by sight. Collecting techniques will be honed during field trips. Upon completion of this course students should be able to: (1) teach others how to collect, preserve, and transport insect specimens, (2) name and sight-identify all insect orders and several common local families, (3) label a generalized insect diagram with external anatomy terms, (4) draw a phylogenetic tree of relationships between insect orders, (5) teach others how to read a phylogenetic tree, what kinds of data are used to estimate trees, how those data are analyzed, and what it means to be monophyletic, (6) describe key innovations and life history strategies of major insect lineages, (7) solve taxonomic problems and describe how species and other taxa are named and described, i.e., understand the fundamentals of taxonomic practice, (8) name and briefly describe the latest developments in insect biodiversity research, (9) describe how hexapods inform us about biodiversity and influence our conservation decisions.

Prerequisite: ENT 313

ENT 450: Medical Entomology

3 Credits

Transmission of human and animal pathogens by insects, mites and ticks, including emergent pathogens, envenomization, and forensic entomology. This course presents principles of transmission of human and animal pathogens by insects, mites and ticks. Non-transmission based aspects of medically important arthropods such as envenomization, forensic entomology and genomics will be discussed also. Basic arthropod biology with special attention to biological properties of vectors and their interactions with pathogens will be presented. We will cover basic components of arthropathogen disease cycles and principles of pathogen transmission dynamics. The major groups of arthropod-borne pathogens and vectors will be discussed. Special topics will include emergent pathogens, vector genetics, traditional and modern disease control strategies and venomous arthropods.

Prerequisite: ENT 313, or BIOL 011 and BIOL 012, or BIOL 110 or BIOL 220W

ENT 457: Principles of Integrated Pest Management

3 Credits

Integrated study of pest complexes and their management, emphasizing ecological principles drawing on examples from a range of agricultural, forestry and urban systems. This course is designed for sixth, seventh, and eighth semester students and graduate students. AGECO 457 / ENT 457 Principles of Integrated Pest Management (3) The goal of this course is to introduce upper level undergraduates and graduate students to the principles and practices of integrated pest management (IPM). This course addresses IPM issues concerning insects, plant diseases, and weeds in agriculture, natural systems and urban environments. Rooted in ecology, IPM also addresses the influence of human social, economic and regulatory systems in pest management. Emphasis is placed on the basic tactics and tools of IPM including biological, cultural, legal, mechanical and chemical controls, host plant resistance, pest monitoring and decision making. The overarching goals of environmental protection, economic viability and social welfare are considered throughout the course. In addition, students will learn about IPM program implementation both domestically and internationally, including pest population modeling and the use of internet resources to inform decision makers. Several projects will provide real-world examples. These may include field trips and a semester-long project where students research and solve an actual pest management problem.

Prerequisite: Must take two or more of the following: ENT 313, PPEM 405, PPEM 318, or HORT 238

Cross-listed with: AGECO 457

ENT 484: Insect Behavior

3 Credits

Insects are one of the most ecologically successful and diverse taxonomic groups on the planet, and their success is attributed to the amazing range and complexity of the behaviors they exhibit. This course provides an introduction to fundamental concepts and processes in the study of animal behavior, with an emphasis on insect examples, insect diversity and a theoretical and empirical overview of insect behavior. The course is structured around four complementary categories to study behavior based on their development, adaptive value, function, and evolution. Students will learn how scientists study insect behavior, why insects behave the way they do, what functions these behaviors serve, and how behavior is shaped by the evolutionary forces of natural and sexual selection.

Prerequisite: ( BIOL 110 or BIOL 110H ) and ( BIOL 230W or BIOL 230M or BIOL 220W or BIOL 220M )

ENT 496: Independent Studies

1-18 Credits/Maximum of 18

Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
ENT 496H: Independent Studies
1-18 Credits/Maximum of 18
Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.

Honors
ENT 497: Special Topics
1-9 Credits/Maximum of 9
Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.