

Course Syllabus: Insect Pest and Vector Management
ENY 5236/4905
3 credit hours

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For each section, view the course material on CD-rom or WWW.

1. Introduction

2. Overview

Part I. Background to Insect Pest and Vector Management

- 3. Pests and humans** (Reading Assignment: Text, Chapter 1 and Supplementary Readings 1, 2, 3)
Direct pests, and vectors of plant and animal diseases
Pest status: major, minor, occasional, migrant, potential
Human practices and the occurrence of pests
Not all arthropods are pests: some benefits
- 4. The causes of pest and vectored disease outbreaks** (Reading Assignment: Text, Chapter 2 and Supplementary Reading 11)
Population biology
Factors affecting abundance
Density dependence and independence
How people cause outbreaks
- 5. Sampling and monitoring arthropods** (Reading Assignment: Supplementary Reading 5)
Methods of sampling and monitoring
Components of a sampling plan
Types of sampling plans
Allocation of sampling units

Part II. Approaches to Insect Pest and Vector Management

- 6. Insecticides** (Reading Assignment: Text, Chapter 3 and Supplementary Reading 18)
Background

- Issues affecting introduction of new products
- Types of insecticides
- Formulation
- The pesticide label
- Toxicity and safety

7. **Application of insecticides** (Reading Assignment: Text, Chapter 4 and Supplementary Readings 7, 14)

- Targets
- Droplet size
- Application equipment
- Rational application

8. **Problems associated with using insecticides** (Reading Assignment: Text, Chapter 5 and Supplementary Readings 8, 10)

- Toxicity to humans and wildlife
- Resistance
- Insecticides and disease transmission

9. **Environmental and cultural control** (Reading Assignment: Text, Chapter 6 and Supplementary Reading 4)

- Mechanical techniques
- Irrigation
- Fertilizer
- Sanitation
- Alternate hosts
- Multiple and intercropping
- Separation in time and space
- Crop geometry

10. **Biological control** (Reading Assignment: Text, Chapter 7 and Supplementary Readings 23, 25, 27)

- Successes of biocontrol
- Types of biocontrol agents
 - Predators
 - Parasitoids
 - Nematodes
- Techniques of biocontrol
 - Inoculation
 - Inundation
 - Conservation
- Reasons for failure of biocontrol

11. **Insect pathogens** (Reading Assignment: Text, Chapter 8 and Supplementary Reading 15)

Advantages and disadvantages
Types of pathogens: fungi, viruses, bacteria, microsporidia
Transmission of pathogens

12. **Genetic control and area-wide management** (Reading Assignment: Text, Chapter 9 and “community participation” from Chapter 12, plus Supplementary Reading 6, 12, 13)
 - Sterile insect technique
 - Eradication
 - Other genetic approaches
 - Area-wide management
13. **Pheromones** (Reading Assignment: Text, Chapter 10 and Supplementary Reading 17, 19)
 - Pheromones/allelochemicals
 - Monitoring
 - Attract-and-kill
 - Mating disruption/confusion
 - Alarm pheromones and oviposition deterrents
14. **Host resistance** (Reading Assignment: Text, Chapter 11 and Supplementary Reading 21, 22, 29)
 - Basis for resistance
 - Mechanisms of resistance
 - Compensation
 - Induced resistance
 - Problems of using resistance
 - Repellents
15. **Physical measures** (Reading Assignment: Text, Chapter 12 [except legislative section] and Supplementary Reading 20)
 - Exclusion and barriers
 - Traps
 - Physical disturbance
 - Sound
 - Lethal temperature
 - Controlled atmosphere
 - Dusts and particulates
 - Irradiation
16. **Legislation and regulation** (Reading Assignment: Text, Chapter 12 [legislative section] and Supplementary Reading 24)
 - Exclusion and routes of entry
 - Risk assessment
 - Pesticide legislation
 - Effects of regulation

Genetically modified organisms

17. **Emerging concepts and practices** (Reading Assignment: Text, Chapter 13 and Supplementary Readings 9, 16, 26, 27, 28, 30)

The integrated control/ IPM concept

Damage thresholds

Forecasting

Increasing agroecosystem resistance

Pesticide selectivity

Eradication versus control

What limits IPM adoption

Decision support

Managing desert locusts: a case study

Course Description

The principles and practices used in pest management, emphasizing arthropod pests affecting crop and ornamental plants, humans and livestock.

Prerequisite

An introductory course in entomology.

Course Goals and Objectives

All the class material can be found on WWW at:

<http://entomology.ifas.ufl.edu/capinera/eny5236/pest1/>

and

<http://entomology.ifas.ufl.edu/capinera/eny5236/pest2/>

If you read the syllabus closely it should be self-explanatory. Email me if you do not understand something, however. **Do not look for this course on the Sakai course site; it is not found there.**

The course also exists on CD-roms. Because the entire course wouldn't all fit on one CD, I divided the material into two units (chapters 1-10, 11-17), and the WWW material is exactly the same as the CDs; hence, there are two separate WWW sites. The course consists of narrated Powerpoint presentations and some supplemental videos and readings. I recommend the textbook, and reading it will enhance your understanding, but it is not a requirement.

If you have WWW access you are ready to go. In the rare instance that you can't access the course via WWW, I can provide CDs.

I suggest that you print out the Powerpoint notes and use them to make any additional notes or comments/questions as you listen to the CD. If something is not clear, do not hesitate to email me with questions.

There are 2 exams and a project for this course. **I can schedule the exams at any time**, but you should plan on having one at about, or before, the mid-point of the semester (covering sections 1-9) and another before the end (sections 10-17). Note that the distribution of the class material on the CDs does not exactly reflect the exam content; exam 1 covers only sections 1-9.

Deadlines and due-dates are given in the a 'welcome to the course' letter.

You should indicate to me when you want to take the exam, and I will email the questions to you. You should provide the answers to me within a week. The project is due two weeks before the end of the semester.

Exams are open-book, and will be sent to you by email. You can use any written materials to help you with the exams, but **you must work alone; do not consult other people**. You can return the exams to me, as well as your project, as an email attachment. Please return the exams within a week. **IT IS IMPORTANT** that you acknowledge my emails, and I will acknowledge yours; otherwise we will be uncertain of receipt of materials. The only way you can be assured that your tests and project have been submitted successfully is to have my acknowledgment.

As you complete your exams and project, keep in mind that because it is open-book, and you are not time-limited, so I expect that spelling and grammar will be correct.

Grading for Course

The course grade is based on performance on 2 exams and a project. Each exam represents 40% and the paper 20%. The final grade will be assigned as:

A=>93

A-=90-92.9

B+=87-89.9

B=83-86.9

B-=80-82.9

C+=77-79.9

C=73-76.9

C-=70-72.9
D+=67-69.9
D=63-66.9
D-=60-62.9
E=<60

Questions are provided in each of the lessons. They are based on the material presented on the CD and text readings, and the supplementary readings. They are designed to help you understand some of what is important for you to know. However, this course is not simply a memorization activity, I expect you to analyze/interpret the information and to answer my test questions creatively. Because you are not under a time constraint (you have a week to complete the exam,

Grade point equivalencies for grades are found at:
<http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html>

Project requirement

This requirement is to prepare a 5-10 page analysis of one type of pest management technique. You can choose any technique in which you have an interest, so long as it is not too narrow. You should explain how it works, where it is applied, and its advantages and disadvantages. Cite references using standard journal citation format (consult a scientific paper such as the supplemental reading contained herein for examples). Remember, you have electronic access to journals and books in the UF library, so there should be journal and/or review (book) article citations, not simply 'grey' literature from the WWW.

Examples might be topics such as:

- Predatory fish for mosquito suppression
- Animal dung destruction by beetles for suppression of biting flies
- Nematodes for suppression of below-ground insect pests
- Hormone analogs for selective control of insects
- The use of *Bacillus thuringiensis* for insect control
- Molecular manipulation of toxins for enhanced plant resistance.
- Fire as an insect management tool
- Water management for insect control
- Pheromones for fruit pest management
- Augmentative release of beneficial insects in greenhouses.
- The safety of insecticides freely available to the public.

Check with me about your paper topic BEFORE you start, please.

This report can be submitted in either electronic or hard copy form, and must be received by the instructor before the end of the semester (see the

'welcome to the course letter for specific date). Late submissions automatically will receive one lower letter grade.

Textbook/Readings

Van Emden, H.F. and M.W. Service. 2004. Pest and Vector Control. Cambridge University Press. 349 pp. (**Note: Text is recommended, not required**)

Other readings as assigned (see supplemental reading list).

List of supplemental readings (Note: Required reading)

These readings are on your CD. You should print and read them.

1. History and insects. Pages 1158-1169 in Encyclopedia of Entomology (2008).
2. Decomposer insects. Pages 1810-1826 in Encyclopedia of Entomology (2008).
3. Transmission of plant diseases by insects Pages 3853-3885 in Encyclopedia of entomology (2008).
4. Host plant selection by insects. Pages 1163-1173 in Encyclopedia of Entomology (2008).
5. Sampling arthropods. Adapted from pages 3231-3246 in Encyclopedia of Entomology (2008).
6. Area-wide insect pest management. Pages 266-282 in Encyclopedia of Entomology (2008).
7. Insecticide application: the dose transfer process. Pages 1958-1974 in Encyclopedia of Entomology (2008).
8. Management of insect-vectored pathogens of plants. Pages 2277-2280 in Encyclopedia of Entomology (2008).
9. Economic injury level and economic threshold concepts in pest management. Pages 1282-1286 in Encyclopedia of Entomology (2008).
10. Plant viruses and insects. Pages 2938-2945 in Encyclopedia of Entomology (2008).

11. North American vegetable pests; the pattern of invasion. *American Entomologist* 48: 20-39 (2002).
12. Medfly (Diptera: Tephritidae) genetic sexing: large-scale field comparison of males-only and bisexual sterile fly releases in Guatemala. *Journal of Economic Entomology* 97: 1547-1553.
13. Recapture of sterile Mediterranean fruit flies (Diptera: Tephritidae) in California's preventative release program. *Journal of Economic Entomology* 97: 1554-1562 (2004).
14. Effect of temperature on efficacy of insecticides to differential grasshopper (Orthoptera: Acrididae). *Journal of Economic Entomology* 97: 1595-1602 (2004).
15. Plant-incorporated *Bacillus thuringiensis* resistance for control of fall armyworm and corn earworm (Lepidoptera: Noctuidae) in corn. *Journal of Economic Entomology* 97: 1603-1611 (2004).
16. Tactics for management of thrips (Thysanoptera: Thripidae) and tomato spotted wilt virus in tomato. *Journal of Economic Entomology* 97: 1648-1658 (2004).
17. Comparison of sticky wing and cone pheromone traps for monitoring seasonal abundance of black cutworm adults and larvae on golf courses. *Journal of Economic Entomology* 97: 1666-1670 (2004).
18. Evaluation of a nonconventional insecticide and appropriate application timing for destruction of gypsy moth (Lepidoptera: Lymantriidae) egg masses. *Journal of Economic Entomology* 97: 1671-1674 (2004).
19. Monitoring western corn rootworm (Coleoptera: Chrysomelidae) susceptibility to carbaryl and curcurbitacin baits in the areawide management pilot program. *Journal of Economic Entomology* 97: 1726-1733 (2004).
20. Management of aphid-borne viruses and *Bemisia argentifolii* (Homoptera: Aleyrodidae) in zucchini squash by using UV reflective plastic and wheat straw mulches. *Environmental Entomology* 33: 1447-1457 (2004).
21. Efficacy of permethrin-treated uniforms in combination with DEET topical repellent for protection of French military troops in Ivory Coast. *Journal of Medical Entomology* 41: 914-921 (2004).

22. Laboratory evaluation of mosquito repellents against *Aedes albopictus*, *Culex nigripalpus*, and *Ochlerotatus triseriatus* (Diptera: Culicidae). *Journal of Medical Entomology* 41: 726-730.
23. Release, establishment and monitoring of *Bemisia tabaci* natural enemies in the United States. Pages 58-65 in *International Symposium on Biological Control of Arthropods* (2002).
24. Field effects of BT corn on the impact of parasitoids and pathogens on European corn borer in Illinois. Pages 278-283 in *International Symposium on Biological Control of Arthropods* (2002).
25. Classical biological control of arthropods in the 21st century. Pages 3-16 in *International Symposium on Biological Control of Arthropods* (2002).
26. Augmentation biological control using the entomopathogenic nematode *Steinernema feltiae* against the South American leafminer *Liriomyza huibrensis*. Pages 136-140 in *International Symposium on Biological Control of Arthropods* (2002).
27. Augmentation in orchards: improving the efficacy of *Trichogramma* inundation. Pages 130-135 in *International Symposium on Biological Control of Arthropods* (2002).
28. Bioclimatic models in entomology. Pages 478-481 in *Encyclopedia of Entomology* (2008).
29. Push-pull strategy for insect management. Pages 3074-3082 in *Encyclopedia of Entomology* (2008).
30. School IPM, or pest management on school grounds. Pages 3289-3299 in *Encyclopedia of Entomology* (2008).

Academic Honesty, Software Use, Services for Students with Disabilities, UF Counseling Services

Academic Honesty:

The University requires all members of its community to be honest in all endeavors. Cheating, plagiarism, and other acts diminish the process of learning. When students enroll at UF they commit themselves to honesty and integrity. Your instructor fully expects you to adhere to the academic honesty guidelines you signed when you were admitted to UF.

Plagiarism is the use of ideas or writings produced by someone else. You should not use the writings of another person, including material from the internet WWW), without putting the ideas in your own words, or placing the copied material in quotes and attributing authorship. In the scientific literature, quotations are rarely used. You should use your own words for answering questions on exams, and in your class project.

As a result of completing the registration form at the University of Florida, every student has signed the following statement:

“I understand the University of Florida expects its students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University. “Furthermore, on work submitted for credit by UF students, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.”

It is to be assumed that all work will be completed independently unless the assignment is defined as a group project, in writing by the professor.

This policy will be vigorously upheld at all times in this course.

Software Use:

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator.

Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate.

Campus Helping Resources

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university’s counseling resources. These are confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- *University Counseling and Wellness Center, 3192 Radio Road, 392-1575, www.counseling.ufl.edu/cwcl*

Alcohol and Substance Abuse Program (ASAP)

Attention Deficit Hyperactivity Disorder (ADHD)

Center for Sexual Assault / Abuse Recovery & Education
(CARE)

Eating Disorders Program

Employee Assistance Program

Suicide Prevention Program

- *Career Resource Center*, CR-100 JWRU, 392-1601 ext: 0,
www.crc.ufl.edu/
- *Student Complaints*
<http://www.distance.ufl.edu/student-complaints>
- E-learning help desk
<http://helpdesk.ufl.edu/>

Students With Disabilities Act:

The Dean of Students Office coordinates the needed accommodations of students with disabilities. This includes the registration of disabilities, academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services, and mediating faculty-student disability related issues.

- *Disability Resource Center*
<http://www.dso.ufl.edu/drc/>
- *Dean of Students Office*, 202 Peabody Hall, 392-7066,
www.dso.ufl.edu