

# FUNDAMENTALS OF PLANT-PEST MANAGEMENT

**IPM 3022**

**SPRING 2015**

**Credits: 3**

**Instructor: Dr. Ronald D. Cave**

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**Description and Objectives.** This course will examine the fundamental concepts, philosophies, strategies, and tactics to manage pest populations. Terms, history, and an overview of pest groups will be presented. Ecological principles, disease vector ecology, and the value of biodiversity in agroecosystems will be examined. Sampling strategies, decision-making criteria, management tactics, and area-wide pest management will be discussed. Specific cases of pest management in plant production systems will be studied. Videos and readings will provide more in-depth information for responding to questions on exams. Assignments will synthesize information in the lectures and assigned readings and review information available on the Internet. Project papers on pest management for a selected crop will be prepared by teams of students. Discussion sessions will allow students to share opinions, perspectives, and experiences.

In this course, the student will learn:

1. What is pest management, what it does, and to whom it provides benefits.
2. Ecological principles related to pest management.
3. Vector-pathogen relationships.
4. Objectives of scouting and sampling strategies.
5. Economic injury level and economic threshold concepts.
6. Management tactics in pest management: their function and limitations.
7. Area-wide pest management.
8. Examples of successful implementation of IPM.

The course is comprised of 11 modules. Each module has 1-4 narrated PowerPoint presentations (**PPTs**) that are 12-30-minute lectures. All presentations and other course materials and activities are available on UF e-Learning and conducted using the Canvas online course management system. The lecture presentations should be viewed weekly in order to complete all exams and assignments in a timely fashion and participate in the discussions.

The **READING ASSIGNMENTS** should be read during the same week as the associated PPT. The purpose of these readings is to provide supplemental information on topics discussed in the PPTs. The course's textbook is:

**Norris, R. F., Caswell-Chen, E. P., and M. Kogan. 2003. Concepts in Integrated Pest Management. Prentice Hall, Upper Saddle River, New Jersey. ISBN 0-13-087016-1 or 978-0130870162**

**STUDENT ASSESSMENT:**

Syllabus quiz	10 points
Five module exams (70 points each)	350 points
Four assignments (40 points each)	160 points
Group project paper	250 points
Four discussions (40 points each)	160 points
One final exam	70 points
<b>TOTAL</b>	<b>1,000 points</b>

**COURSE GRADING SCALE:**

A = 100-93%	B+ = 89-87%	C+ = 79-77%	D+ = 69-67%	
A- = 92-90%	B = 86-83%	C = 76-73%	D = 66-63%	E = 0-59%
	B- = 82-80%	C- = 72-70%	D- = 62-60%	

**CRITICAL DATES**

January 6-20 – Discussion #1

January 20 – Syllabus quiz due

January 25-26 – Exam 1 (Modules 1+2)

January 27-February 10 – Discussion #2

February 3 – Assignment #1 due

February 9 – Project Paper team formation and topic selection deadline without penalty

February 8-9 – Exam 2 (Modules 3+4)

February 17 – Assignment #2 due

February 22-23 – Exam 3 (Modules 5+6)

March 10 – Assignment #3 due

March 15-16 – Exam 4 (Module 7)

March 17-31 – Discussion #3

March 23 – Project Paper draft due

March 24 – Assignment #4 due

April 5-6 – Exam 5 (Module 8)

April 7-21 – Discussion #4

April 19-20 – Exam 6 (Modules 9-11)

April 20 – Final version of Project Paper due

April 26-27 – Final Exam

## **COURSE SCHEDULE 2015**

### **January 6-13:**

- View introductory video
- Obtain textbook
- Read syllabus and take syllabus quiz before January 16
- Discussion #1 January 6-20

### **January 13-20:**

- View two PPTs of Module 1: Introduction to Pest Management
- Reading assignment: Chapters 1 and 2 of textbook
- Discussion #1 January 6-20

### **January 20-27:**

- View two PPTs of Module 2: Ecological Principles
- Reading assignment: Chapters 4 and 7 of textbook
- Exam 1 (Modules 1+2) January 25-26

### **January 27-February 3:**

- Discussion #2 January 27 - February 10
- View two PPTs of Module 3: Monitoring and Making Decisions
- View video on IPM for blueberries
- Reading assignment: Chapter 8 of textbook
- Assignment #1 due February 3

### **February 3-10:**

- View two PPTs of Module 4: Regulatory Control
- Reading assignment: Chapters 9 and 10 of textbook
- Project Paper team formation and topic selection approved by instructor by February 9
- Exam 2 (Modules 3+4) February 8-9
- Discussion #2 January 27 - February 10

### **February 10-17:**

- View two PPTs of Module 5: Cultural Control
- Reading assignment: Chapter 16 of textbook
- Assignment #2 due February 17

**February 17-24:**

- View one PPT of Module 6: Behavioral Control
- View video on IPM for tomatoes
- Reading assignment: Chapter 14 of textbook
- Exam 3 (Modules 5+6) February 22-23

**February 24-March 10:**

- View first two PPTs of Module 7: Biological Control
- View videos on IPM for foliage plants and for strawberries
- Reading assignment: Chapter 13 of textbook
- Assignment #3 due March 10

**March 10-17:**

- View second two PPTs of Module 7: Biological Control
- View videos of biological control of tropical soda apple and of mole crickets
- Reading assignment: Chapter 13 of textbook
- Exam 4 (Module 7) March 15-16

**March 17-24:**

- Discussion #3 March 17-31
- View first two PPTs of Module 8: Chemical Control
- Reading assignment: Chapters 11 and 12 of textbook
- Project Paper draft due March 23
- Assignment #4 due March 24

**March 24-31:**

- View second two PPTs of Module 8: Chemical Control
- Reading assignment: Chapters 11 and 12 of textbook
- Exam 5 (Module 8) March 29-30
- Discussion #3 March 17-31

**March 31-April 7:**

- View one PPT of Module 9 Physical Control
- Reading assignment: Chapter 15 of textbook

**April 7-14:**

- View two PPTs of Module 10: Genetic Control
- Reading assignment: Chapter 17 of textbook
- Discussion #4 April 7-21

**April 14-21:**

- View one PPT of Module 11: Area-Wide Pest Management
- Reading assignment: Chapters 18 and 20 of textbook
- Exam 6 (Modules 9-11) April 19-20
- Final Project Paper due April 20
- Discussion #4 April 7-21

**April 21-28:**

- Final Exam April 26-27

## STUDENT PERFORMANCE ASSESSMENTS

### SYLLABUS QUIZ

Read the syllabus completely. Then take a short quiz of five multiple choice and true/false questions (2 points each). You are allowed three attempts, and only your top score will be recorded.

### MODULE EXAMS

These short exams are taken on-line. Students may use notes, books, and Internet as resources. However, because the exams are time-limited (70 minutes), students should prepare themselves for the exam beforehand rather than depend on finding information during the exam. Each exam consists of five true/false questions (1 point each), 20 multiple choice questions (2 points each), five fill-in questions (2 points each), one five-part matching question (5 points), and two short answer questions (5 points each). For short answer questions, all responses must be in your own words. There are six module exams, each worth 70 points. For each student, the exam with the lowest score is discarded and not included in calculating the final course grade.

Each module exam is accessible from Sunday 8:00AM EST to Monday 11:59PM EST.

Exam schedule:

Exam 1 (Modules 1+2): January 25-26	Exam 2 (Modules 3+4): February 8-9
Exam 3 (Modules 5+6): February 22-23	Exam 4 (Module 7): March 15-16
Exam 5 (Module 8): March 29-30	Exam 6 (Modules 9-11): April 19-20

### ASSIGNMENTS

The assignments are to be done individually, not as a group. **Use of information gathered from Wikipedia is not allowed. Citation of Wikipedia will automatically result in a 0 on the assignment.** All assignments must be delivered via UF e-Learning by 11:59PM of the due date. An assignment delivered after the due date will be penalized 2 points for each calendar day it is late. **Grammar, neatness, formatting, and spelling will be considered in the evaluation of these assignments.**

#### ASSIGNMENT #1: Extension poster for identifying and monitoring a pest

Research one plant pest species and develop an extension poster using PowerPoint. A sample poster is on UF e-Learning. Address the following topics in the poster:

- Identification, brief biology, and injury caused by the plant pest.
- Detailed sampling method(s) to monitor the pest and whether the sampling method(s) measures absolute density or relative abundance.

- Other information besides pest numbers that should be monitored (*e.g.*, rainfall, plant stage, beneficial organisms) and how it is monitored. **DO NOT** mention any control methods.
- References cited.

Use the poster template available on the UF e-Learning site (see Assignment #1 instructions). Graphs, tables, and photographs are encouraged, but do not make them too large.

**TIPS:**

- Use font Arial or Tahoma
- Use font size 72 for title, font size 40 for your name, font size 32 or 36 for text.
- Use a uniform, pale background with dark letters in bold (no shadowing)
- Give each figure a number and a caption, and cite each figure in the text.
- Remember: It is an extension poster, so make it attractive yet informative to the extension client.

**ASSIGNMENT #1 IS DUE FEBRUARY 3, 2015**

**ASSIGNMENT #2: Descriptions of cultural control for three pests**

Research three target-specific cultural control methods, either three different methods used in the same crop or in 2-3 different crops. Complete the form provide on the UF e-Learning site (see Assignment #3 instructions). For each of the three methods, this form will ask you to provide: 1) the scientific and common names of the pest and the crop in which the method is used; 2) the specific objective of the method, including an explanation of how the method interferes biologically with the pest's survivorship, dispersal, establishment, and/or reproduction, and how the method is employed; and 3) where (state or geographic region or country other than USA) the method is used. For each method, provide references of your sources of information.

**ASSIGNMENT #2 IS DUE February 17, 2015**

**ASSIGNMENT #3: Comparative analysis of four commercially available natural enemies**

For each of the four natural enemies listed below, locate three companies on-line that sell them (the three companies need not be the same for all four natural enemies). For each natural enemy, compare the products among the three companies. Compare pricing, quantities available, packaging (*e.g.* stage shipped), and availability of supporting information (*e.g.*, release recommendation, target pests, biology, anything else). Also, mention from which company you would purchase the natural enemy and briefly explain your choice. The four natural enemies are:

\**Trichogramma* sp.: There are several species but all attack insect eggs; select ONE species and compare it across the three companies. Be sure to provide the name of the species.

\**Chrysopa/Chrysoperla* (predators commonly called aphid lions and green lacewings): There are several species; select ONE species and compare it across the three companies. Be sure to provide the name of the species.

\**Hippodamia convergens* (convergent lady beetle)

\*a predatory mite: There are several species but all attack insect eggs; select ONE species and compare it across the three companies. Be sure to provide the name of the species.

Provide the name of each company mentioned and its website address. The information provided may be presented in chart form.

**ASSIGNMENT #3 IS DUE March 10, 2015**

#### **ASSIGNMENT #4: Comparative analysis of four commercially available biopesticides**

For each of the four types of biopesticides listed below, locate three companies on-line that sell them (the three companies need not be the same for all four biopesticides). For each biopesticide, compare the products among the three companies. Provide the name of the product sold by each company and the organism species on which the product is based. Compare pricing, quantities available, and availability of supporting information (*e.g.*, application recommendation, target pests, website quality, anything else). Also, mention which biopesticide product from which company you would purchase to control a specific pest and briefly explain your choice. The four biopesticide groups are:

- \* Fungus-based biopesticide: There are several fungus species sold for pest management; select and compare three products that contain the same fungus species.
- \* Bacteria-based biopesticide: There are several bacteria species sold for pest management; select and compare three products that contain the same bacteria species.
- \* Nematode-based biopesticide: There are several nematode species sold for pest management; select and compare three products that contain the same nematode species.
- \* Any biopesticide not based on a fungus, bacterium, or nematode: The three products compared should all be based on the same species of organism (*e.g.*, virus, protozoan, plant).

Provide the name of each company mentioned and its website address. The information provided may be presented in chart form.

**ASSIGNMENT #4 IS DUE March 24, 2015**

#### **GROUP PROJECT PAPER**

The project paper is a synthesis of information from literature and/or experience on pest management in a cropping system. Students will form teams of 4-5 individuals to collectively research, prepare, and present a project paper on pest management in a cropping system they have selected from a list provided here. No two project papers on the same crop may be done, so decide on a crop and have it and the team membership approved by the instructor soon. ALL students should send an email to the instructor notifying him who the other members of his/her team are and the cropping system selected. Team formation and crop selection is not approved until ALL team members have sent their membership email to the instructor. This should be done on or before **11:59PM February 9, 2015**. Team membership and crop selection approval after this date will be penalized 1 point for each calendar day it is late.

The project paper should include a title, author names and location, and the following six sections with the headers given here:

#### **TITLE IN BOLD, SMALL CAPS, AND FONT SIZE 14**

Authors in alphabetical order of surname  
City, state (*e.g.*, Gainesville, FL) of each author

#### **Introduction**

This section should describe the crop, its economic importance, and general aspects of its production. The geographic scope of the pest management addressed in the paper should be clearly stated. For example, cotton is grown worldwide, but it is far too much to discuss in the project paper cotton pest management for all regions of the world. If the paper focuses on cotton production in the southeastern USA, state that. Limit this section to no more than 300 words.

### Major Pests

Subheadings followed by a period (*e.g.*, **Nematodes.**, **Pathogens.**, **Weeds.**, **Insects.**) at the beginning of a paragraph can be used to distinguish text concerning each pest group. Not all pests associated with the crop need be addressed in this section, only the important ones in the relevant geographic area. Provide scientific and common (if any) names of the pests. Describe the injury they cause, why they must be managed, whether they are native or invasive, and any important and relevant aspects of their biology that are critical to their management. Images of the pests (not necessarily all) and their damage will add to the quality of the project paper.

### Monitoring Key Pests

In this section, you should describe in detail yet concisely and clearly how to monitor the key pests of the crop. Monitoring of all pests mentioned in the previous section is not required, just the key pests (see Module 1 for the concept of a key pest). Explain how, when, and where the pest monitoring (sampling) is performed. If economic thresholds exist, explain them. Details are good.

### Management Tactics

All tactics used for pest management in the cropping should be thoroughly described in this section. You may use subheadings (*e.g.*, **Cultural Control.**, **Biological Control.**, **Chemical Control.**, **Physical Control.**, **Host Plant Resistance.**) at the beginning of a paragraph to distinguish text concerning each control type. Again, details (*e.g.*, rates of pesticide applications, species of natural enemies released, species or common name of companion crops) are good.

### Conclusion

Write a summary conclusion here. If there are any data on grower adoption of IPM methods, summarize them here. Mention ideas for future research or what is needed to improve pest management in the crop. Limit this section to no more than 400 words.

### References Cited

At least three journal articles and/or books must be cited and their references listed. Google Scholar is a good starting point. Use of information gathered from Wikipedia is not allowed. Citation of Wikipedia will automatically result in a 0 on the project paper. Cite in the text all references listed. Use this format for in-text citations:

Spangler (1991) or (Spangler 1991) for one author; Wood and Bright (1987) or (Wood and Bright 1987) for two authors; Orbach *et al.* (1995) or (Orbach *et al.* 1995) for three or more authors. Include all authors' names under References Cited. Names of persons who provide unpublished information should include initials in the text, *e.g.*, N. E. Woodley, personal communication (for information obtained orally) or N. E. Woodley, *in litt.* (for personal communication obtained in writing).

List references alphabetically by author surname under References Cited. Do not list references that are not cited in the text, tables, or figure legends. Do not italicize journal names. **Spell out the complete titles of journals.** Follow the format examples here:



Book:

**Norris, R. F., Caswell-Chen, E. P., and M. Kogan. 2003.** Concepts in Integrated Pest Management. Prentice Hall, Upper Saddle River, NJ.

Chapter in a book:

**Myers, J. H., and G. Hosking. 2002.** Eradication [pp. 293-307]. *In: Invasive Arthropods in Agriculture Problems and Solutions* (G. J. Hallman and C. P. Schwalbe, editors). Science Publishers, Inc., Enfield, NH.

Journal article with two authors:

**Young, F. N., and G. Longley. 1976.** A new subterranean aquatic beetle from Texas (Coleoptera: Dytiscidae-Hydrophilidae). *Annals of the Entomological Society of America* 69: 787-792.

Journal article with three or more authors:

**Orbach, E., L. Bartolozzi, and A. Sforzi. 1995.** A new Afrotropical species of *Rhinopteryx* Lacordaire (Coleoptera: Brentidae). *The Coleopterists Bulletin* 49(1): 17-22.

Website:

**Zalom, F. G., and E. M. Miyao. 2014.** UC IPM Pest Management Guidelines: Tomato Monitoring for Potato Aphid and Tomato Fruitworm. Available at: [www.ipm.ucdavis.edu/PMG/r783900211.html](http://www.ipm.ucdavis.edu/PMG/r783900211.html) (Accessed 30 January 2015).

The project paper must **not exceed 10 pages** in length. The text must be single-spaced with font Times New Roman size 12. Use 1" margins on all sides and no space between paragraphs. Do not use contractions (*e.g.*, aren't, it's, wasn't). Figures (images and graphs) and tables are encouraged, but each figure and each table must be assigned a unique number (*e.g.*, Fig. 1, Table 2), and all figures and tables must be cited in the text. On the LAST page of the document, describe the portion of the project paper that each team member contributed, in others "who did what" towards the content of the project paper. This LAST page does NOT count in the 10-page limit.

A complete and well-written draft should be delivered through UF e-Learning by **March 23, 2015**; drafts received after this date will lose 3 points per day late. Only one team member needs to submit the draft.

The instructor will review the paper, make comments and suggestions, and return the draft to the students by April 8. The students will revise the project paper according to the instructor's comments and suggestions, and return the final version to the instructor **no later than April 20, 2015**. A late final version of the paper will be penalized 5 points for each calendar day it is late. **Grammar, neatness, formatting, and spelling will be considered in the final evaluation of your paper.**

## SCORING:

Team formation and crop selection approved by February 9	10 points
Draft delivered on or before March 23	30 points
Content of final version	160 points
Organization, grammar, format	50 points

**Cropping systems:**

Each team should collectively select one crop from this list. No two teams may select the same cropping system.

almonds	apples	bananas	cabbage/broccoli
citrus	coffee	corn	cotton
grapes	green peppers	greenhouse-grown ornamental plants	
peaches	peanuts	pineapples	rice
soybeans	strawberries	tomatoes	turf

**DISCUSSIONS**

The first discussion is an introduction of yourself and learning about your classmates. In your self-introduction, give your name, major, and hometown. State why you are in the course (for example, required course, want to control pests in your organic garden). Describe any previous experience with pest management. Describe your career goals and how pest management might fit in. Posting a photograph is optional. Respond to at least three other students.

The other three discussions are responses to questions on current topics in pest management and replies to the topic responses from your classmates in this course. Students will be randomly divided into groups of about 15 per group; students will only be discussing or debating the discussion topic with members of their assigned group. The discussion periods will be open for two weeks for you to take time for a thoughtful, researched, yet personal response. After you provide your response, you should read the responses from others in your group and reply with your thoughts and opinion in an academic manner. "I agree" type of reply is not sufficient to receive a grade.

**SCORING:**

One response per discussion = 25 points each discussion  
 Three replies per discussion = 15 points each discussion

Discussion #1 is open January 6-20

Discussion #2 is open January 27 - February 10

Discussion #3 is open March 17-31

Discussion #4 is open April 7-21

**FINAL EXAM**

This exam is taken on-line. Students may use notes, books, and Internet as resources. However, because the exam is time-limited (70 minutes), students should prepare themselves for the exam beforehand rather than depend on finding information during the exam. The Final Exam covers all 11 modules and consists of 25 multiple choice questions and four short answer questions. For short answer questions, all responses must be in your own words. The Final Exam is open from Sunday April 26 8:00AM EST to Tuesday April 27 11:59PM EST.

## UNIVERSITY OF FLORIDA POLICIES AND ASSISTANCE

### Absences and Make-Up Work

Requirements for class attendance and make-up exams, assignments, and other work are consistent with university policies that can be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.

### Academic Honesty

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: *“We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.”* You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, 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 assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g., assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <http://www.dso.ufl.edu/SCCR/honorcodes/honorcode.php>.

### 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. The Counseling & Wellness Center provides 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 & Wellness Center, 3190 Radio Road, 352-392-1575,*  
[www.counseling.ufl.edu/cwc/](http://www.counseling.ufl.edu/cwc/)

Counseling Services  
Groups and Workshops  
Outreach and Consultation

Self-Help Library  
Training Programs  
Community Provider Database

□ *Career Resource Center*, First Floor JWRU, 392-1601, [www.crc.ufl.edu/](http://www.crc.ufl.edu/)

### **Services for Students with Disabilities**

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation

0001 Reid Hall, 352-392-8565, [www.dso.ufl.edu/drc/](http://www.dso.ufl.edu/drc/)

### **Distance Courses**

Each online distance learning program has a process for, and will make every attempt to resolve, student complaints within its academic and administrative departments at the program level. See <http://distance.ufl.edu/student-complaints> for more details.