FUNDAMENTALS OF PLANT-PEST MANAGEMENT

IPM 3022

SPRING

Credits: 3

INSTRUCTOR INFORMATION

Instructor: Dr. Gideon Alake
Entomology & Nematology Department
University of Florida,
1881 Natural Area Dr, Gainesville, FL 32611
Tel: 352-745-9907.
Email: ***agideon@ufl.edu***

Teaching Assistant: Ms. Amina Twaibu
WFREC, Entomology & Nematology Depart.
University of Florida
4253 Experiment Dr., Hwy 182 Jay, FL 32565
Email: ***twaibu.aa@ufl.edu***

IMPORTANT INFORMATION

- The course is comprised of 14 modules. Each module has 1-5 narrated PowerPoint presentations (PPTs) that are 5-30-minute lectures. All presentations and other course materials (except the textbook) and activities are available on UF e-Learning and managed using the Canvas online course system.
- The lecture presentations of each module should be viewed weekly to complete all exams and assignments in a timely fashion and participate in the discussions.
- **Office hours:** The student should always contact the instructor or the TAs by Canvas and always copy both in the message. Meeting by Zoom can be scheduled if the student needs to discuss a specific topic with the instructor or TA.
- **Communication:** All students must turn on the notification system in his/her Canvas in order to receive real-time alerts about the course. Students should check the announcement section in Canvas at least once a day to keep informed about the course.
- Internet access is the responsibility of the student. Problems related to access to the internet will not be considered an excuse for failing in exams/assignments, etc. Students having problems accessing Canvas must contact E-learning technical support: 352-392-4357/ helpdesk@ufl.edu
- Students requesting special accommodation should submit the accommodation letter to the instructor during the first week of the course.

COURSE DESCRIPTION

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 and the value of biodiversity in agroecosystems will be examined. Sampling strategies, decision-making criteria, management tactics, area-wide pest management, and insect resistance management will be discussed. Examples of specific cases of pest management in plant production systems will be presented.

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. Discussion sessions will allow students to share opinions, perspectives, and experiences about specific topics.

OVERALL LEARNING OBJECTIVES

1. Recognize insect injuries in plant tissues caused by insects and associate with the life stage of the pest.
2. List and discuss the principles of insect ecology related to pest management.

3. List the historical events of pest control and the concept of Integrated Pest Management (IPM).
4. Define the concept of IPM and Insect Resistance Management (IRM) and list their components.
5. Analyze examples of area-wide pest management programs.
6. Criticize examples of IPM programs.
7. Discuss the application of strategies and tactics in pest management and list their limitations.
8. Formulate IPM tactic recommendations.

REQUIRED TEXTBOOK

Textbook reading must be done during the same week as the associated module. This course is not entirely based on the textbook so the lectures and other materials provided in each module should be accessed. However, the textbook is an important educational material, and the purpose of these readings is to provide supplemental and in-depth information on topics discussed in the module. Topics in textbook chapters may appear as questions on the exams.

Required Text (7th edition): *Pedigo, L.P.; Rice, M.E.; Rayda K. Krell, 2021. Entomology and Pest Management, 7th edition, 584 pages. Waveland Press, Inc.*

STUDENT PERFORMANCE ASSESSMENT

Assessment	Points	Percentage
Course Orientation Quiz	50 points	5%
Introductory Video	50 points	5%
Three Discussions (60 points each)	180 points	18%
Four Module Exams (75 points each)	300 points	30%
Three Assignments (80 points each)	240 points	24%
Final Exam	180 points	18%
TOTAL	**1000 points**	**100%**

COURSE GRADING SCALE

Grade	Percentage
A	92-100
A-	90-91
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	63-66
D-	60-62
E	<60

Information on current UF grading policies: catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

CRITICAL DATES

Deadline	Activity	Points
Week 2	Course Orientation Quiz	40 (4%)
Week 2	Introductory Video	40 (4%)
Week 3	Assignment #3 – Part One – Group Submission	2 (0.2%)
Week 3	Discussion #1	50 (5%)
Week 4	Exam 1 (Modules 1, 2, 3, and 4)	75 (7.5%)
Week 4	Assignment #1	80 (8%)

Deadline	Activity	Points
Week 8	Assignment #2	80 (8%)
Week 8	Exam 2 (Modules 5, 6, and 7)	75 (7.5%)
Week 9	Discussion #2	50 (5%)
Week 10	Assignment #3 – Part Two	78 (7.8%)
Week 12	Exam 3 (Modules 8, 9, and 10)	75 (7.5%)
Week 14	Discussion #3	50 (5%)
Week 15	Exam 4 (Modules 11, 12, and 13)	75 (7.5%)
Week 17	Final Exam	150 (15%)

COURSE SCHEDULE AND ACTIVITIES

Week 1 - January 12-17

- View the introductory video of the instructor and the TAs
- Obtain textbook
- Read the syllabus and take the course orientation quiz before the deadline
- Post an introductory video
- **Module 1:** Insect Ecology – Principles Related to Pest Management (3 PPTs)

Textbook readings: Chapter 2 (pp. 34-39), Chapter 4 (pp. 144-148), Chapter 5 (pp. 167-170, 183-186), Chapter 7 (pp. 236-239)

Week 2 - January 20-24

- **Module 2:** Introduction to Pest Management (4 PPTs)
- Take orientation quiz, post introduction videos, set and submit group for Assignment #3
- Assignment #3 – Part One (Group submission before deadline)
- Post Discussion #1 before the deadline

Textbook readings: Chapter 1 (pp. 11-30), Chapter 8 (pp. 254-261, 268-269)

Week 3 - January 26-31

- **Module 3:** Pests Surveillance and Sampling (4 PPTs)

Textbook readings: Chapter 6 (pp. 189-192, 193-211, 213-215, 217-218, 221-222, 239-240)

Week 4 - February 2-7

- **Module 4:** Making Decisions: Economic Injury Levels and Economic Threshold (2 PPTs)
- Assignment #1 due before deadline

Textbook readings: Chapter 7 (pp. 227-232, 250, 252-253)

Week 5 - February 9-14

- **Module 5:** Regulatory Control (3 PPTs)
- **Exam 1** (Modules 1, 2, 3, and 4)

Textbook readings: Chapter 16 (pp. 484-487)

Week 6 - February 16-21

- **Module 6:** Ecological Management of the Crop Environment (3 PPTs)

Textbook readings: Chapter 10 (pp. 298-305, 311-320)

Week 7 - February 17-21

- **Module 7:** Host Plant Resistance (1 PPT)
- Assignment #2 due 11:59 PM before the deadline

Textbook readings: Chapter 13 (pp. 398-401, 405-407, 419-420)

Week 8 - February 23-28

- **Module 8:** Biological Control (4 PPTs)
- **Exam 2** (Modules 5, 6, and 7)

Textbook readings: Chapter 9 (pp. 275-291), Chapter 12 (pp. 380-385)

Week 9 - March 2-7

- **Module 9:** Behavioral Control (2 PPTs) + biological control videos
- Post Discussion #2 before deadline
- Assignment #3 – Part Two due

Week 10 - March 9-13

- **Module 10:** Biopesticides (1 PPT)

Textbook readings: Chapter 12 (pp. 379-385)

Week 11 - March 14-21

SPRING BREAK – No Classes

Week 12 - March 23-28

- **Module 11:** Chemical Control with Conventional Insecticides (3 PPTs)
- **Exam 3** (Modules 8, 9, and 10)

Textbook readings: Chapter 11 (pp. 326-377), Chapter 17 (pp. 602-605)

Week 13 - March 30 – April 4

- **Module 12:** Genetic Control (2 PPTs)
- Discussion #3 due before deadline

Textbook readings: Chapter 12 (pp. 385-386), Chapter 13 (pp. 408-416), Chapter 15 (pp. 456-459)

Week 14 - April 6-11

- **Module 13:** Insect Resistance and IRM in an IPM Framework (2 PPTs)

Textbook readings: Chapter 17 (pp. 495-501, 506-508)

Week 15 - April 13-18

- **Module 14:** Development of an IPM Program (1 PPT)
- **Exam 4** (Modules 11, 12, and 13)

Textbook readings: Chapter 16 (pp. 472-481), Chapter 17 (pp. 515-516)

Week 16 - April 23-24

Reading Days

Week 17 - April 27-29

Final Exam

STUDENT PERFORMANCE ASSESSMENT DETAILS

Course Orientation Quiz

Watch the "Orientation" session on Canvas and read the syllabus completely. Then take a short quiz of 20 multiple choice and/or true/false questions (2 points each) on or before the deadline. You are allowed two attempts, and only your top score will be recorded.

Introductory Video

You will post an introduction of yourself and learn about your classmates. In your self-introduction, you must provide the following information:

1. Name
2. Major
3. Hometown
4. Describe any previous experience with pest management
5. Describe why you are in the course and career goals
6. Describe your workstyle when collaborating in group projects
7. Your hobby or what you like to do in your free time
8. 1.5 minutes maximum

Find in FILES and in Introductory Video (Discussion section) the steps to attach a video to a discussion thread. The quality of the video will be graded based on the following criteria: answer of the seven items previously listed; sound recording quality; good light (give preference to record outside for clarity); and image focus.

Module Exams

These exams are taken online. Students may use notes, books, and the Internet as resources. However, because the exams are time-limited (50 minutes), students should prepare themselves for the exam beforehand rather than depend on finding information during the exam. Each exam could include true/false questions, multiple choice questions, fill-in questions, matching questions, and short answer questions.

There are four module exams, each worth 75 points (7.5%/exam in the final grade). For each module exam, the student is allowed two attempts, and the top score will be recorded. For each student, the exam with the lowest score among the four module exams will be discarded and not included in calculating the final course grade. Each module exam is accessible from Monday 8:00 AM EST to Tuesday 11:59 PM EST.

Final Exam

This exam is taken online. Students may use notes, books, and Internet as resources. However, because the exam is time-limited (50 minutes), students should prepare themselves for the exam beforehand. The Final Exam covers all 14 modules and may consist of true/false questions, multiple-choice questions and short answer questions. The student is allowed two attempts, and the top score will be recorded. The Final Exam is worth 150 points (15% in the final grade) and is open from Monday to Tuesday.

Assignments

Assignments #1, #2, and #3 Part One are to be done individually, not as a group. Assignment #3 Part Two is to be done 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 11:59 PM EST of the due date. An assignment delivered after the due date will be penalized 2 points for each calendar day it is late. The limit for late submission is one month after the due date. Grammar, neatness, formatting, and spelling will be considered in the evaluation of these assignments.

Assignment #1: Portfolio with Plant Injury

The learning objectives of this assignment are to identify the three general types of insect mouthparts and recognize the most common injuries on plant tissues caused by different insect mouthparts. You will prepare a photo-based portfolio with 8 photos of plant tissue injuries caused by insects representing the following categories: 1) defoliation; 2) sapper assimilation; 3) fruit feeding; and 4) plant architecture modifier (2 pictures for each category).

Important Rules:

1) It is recommended that you take your own photos. If using photos from the internet, observe copyrights and cite the sources.
2) Photos with bad composition or bad focus will receive no credit.
3) You can use photos of plant injury caused by immature insect pests.
4) Include figure numbers, captions with all required information.
5) Prepare portfolio in PowerPoint using Arial or Tahoma, uniform pale background.
6) Name the file lastname_assig1 and submit as PDF via Canvas.

Assignment #2: Extension Poster for Identifying and Monitoring a Pest

Research one of the listed plant pest species and develop an extension poster using Microsoft PowerPoint. Address the following topics in your poster:

- **Identification** - Identification is arguably the most critical section for correct diagnosis in the field. Your goal is to help someone recognize the pest with confidence.

  High-Quality Visuals: Use clear, high-resolution photographs. This is non-negotiable. Include images of all relevant life stages (e.g., egg, larva/nymph, pupa, and adult).

  Adult Description: Provide a measurement in millimeters (mm) and a relative size (e.g., "about the size of an apple seed"). Describe the dominant colors and any distinctive stripes, spots, or patterns. Be specific (e.g., "metallic green elytra with four white spots"). Describe its overall shape (e.g., oval, elongated, slender). Mention key features like antennae length, wing structure, or unique mouthparts.

  Immature Stages (Larva/Nymph): Describe their appearance, as they often cause the most damage and look very different from the adult.

  Color & Size: Note their color and how it might change as they grow.

  Key Features: Do they have legs? Are they caterpillar-like (Lepidoptera) or soft-bodied like aphids (Hemiptera)?

  Eggs & Pupae: Describe what the eggs look like (e.g., color, shape, how they are laid—in clusters, singly, on a specific part of the plant). If applicable, describe the pupal case and where it is typically found (e.g., in the soil, in a rolled leaf).

  Look-Alikes: Include a small section with images and brief descriptions of common non-pest or beneficial species that are often confused with your pest. This is incredibly valuable for preventing unnecessary pesticide applications.

- **Biology and life cycle:** This section explains the pest's life story, which is crucial for timing control measures. Key content to include:

  Life cycle diagram: A simple, circular infographic showing the progression from Egg -> Larva/Nymph -> Pupa -> Adult is extremely effective. Include approximate time spent in each stage (e.g., "Egg stage: 5-10 days").

  Number of generations: State how many generations (voltinism) occur per year in your region (e.g., "Bivoltine - two generations per year").

  Overwintering stage: Clearly state where and in which life stage the pest survives the winter (e.g., "Overwinters as a pupa in leaf litter" or "Adults seek shelter in bark crevices"). This is a key vulnerability for management.

  Feeding: How does it feed? (Chewing mouthparts, sucking mouthparts).

  Reproduction: Any interesting mating behaviors? How many eggs does a female lay?

  Movement: Is it a strong flyer? Does it crawl? Is it introduced on transplants?

- **Host plants:** Be specific. "Affects many crops" would not helpful for a grower.

  Primary hosts: List the most economically important or commonly affected plants. Use both common and scientific names (e.g., "Corn (*Zea mays*), Soybean (*Glycine max*)").

  Secondary/occasional hosts: List other plants the pest may feed on, especially if they are common in the surrounding landscape (e.g., weeds, ornamental plants).

Plant part affected: Specify where on the plant the pest is found (e.g., "Larvae feed within the fruit," "Adults congregate on new growth").

- **Injury & Symptoms: What Does the Damage Look Like?** Connect the pest to the problem. Show it, do not just tell what the damage looks like.

  High-quality photos of damage: Show clear images of injured plants. Include close-ups and wider shots.

  Damage by life stage: Differentiate the damage caused by larvae vs. adults if they are different (e.g., "Adults skeletonize leaves, while larvae bore into stems").

  Types of Injury: Use descriptive terms:

  Chewing: Holes in leaves, notched edges, defoliation.

  Sucking: Yellowing, wilting, stunting, curling leaves, honeydew (sticky substance), sooty mold.

  Boring: Holes in stems or fruit, frass (insect excrement) visible at entry points, wilting or dieback.

  Signs vs. symptoms: Differentiate between direct signs of the pest (e.g., the insect itself, webbing, frass) and the plant's symptoms (e.g., yellowing, wilting).

- **Economic impact**: **Why Should We Care?**

  You may want to justify the need for monitoring and management. Quantify the problem whenever possible.

  Yield loss: Provide data on typical yield reductions if the pest is left uncontrolled (e.g., "Can cause up to 40% yield loss in severe infestations").

  Quality reduction: Explain how the pest affects marketability (e.g., "Feeding scars render fruit unmarketable for fresh market," "Contamination with larvae leads to rejection by processors").

  Cost of control: Mention the estimated economic cost of management strategies (e.g., "Insecticide applications for this pest cost growers an estimated $X per acre annually").

  Quarantine significance: Is this pest a regulated species? Does its presence trigger trade restrictions or quarantine measures? This is a major economic driver.

- **Detailed sampling methods, and other monitoring information**.
- **References cited (following ESA guidelines)**.

Alternatively, you could create a detailed infographic that addresses similar topics as above, and with the detailed pest information as above.

Pest Species Options:

- Brown marmorated stink bug (*Halyomorpha halys*)
- Cabbage aphid (*Brevicoryne brassicae*)
- Corn earworm/cotton bollworm/tomato fruitworm (*Helicoverpa zea*)
- Fall armyworm (*Spodoptera frugiperda*)
- Western corn rootworm (*Diabrotica virgifera virgifera*)
- Spotted wing drosophila (*Drosophila suzukii*)

Assignment #3: Group Project – Commercial Biological Control Agents

The learning objective of this assignment is to be familiar with and make decisions when adopting commercial natural enemies and formulations available to **manage insect pests**. The project paper should be a synthesis (see table below) of information commercial natural enemies and formulations available to pest biological control, providing a comparative analysis of six commercially available natural enemies/pesticides.

Part one

Students will **form teams of four members** to collectively research, prepare, and present a table for each of the six agents of biological control listed below with the name of three companies on-line (including their website address) that sell commercial formulations of them.

You will be able to get to know the students on the course by the Introduction Video and contact them by replying to their video post. **The team should have four students**. The list of the names of the students and the name of the group (the members should decide a group name) should be submitted to Canvas before or at the deadline. The name of the group will be used in the file when submitting part two of the assignment #3.

Part Two

The four members of the team shall decide how to divide among themselves the six parts of the group project. Then, they will need to prepare a table for each of the six agents of biological control listed below with the name of three companies on-line (including their website address) that sell commercial formulations of them. The information should be combined in a table (see example of table below). The three companies do not need to be the same for all six agents of biological control.

For each commercial biological control agent, the group will need to list the products among the three companies (see example of a table below), including information about:

1. pricing.
2. target pests.
3. release/application recommendation and any availability of supporting information.
4. packaging (*e.g*., stage shipped).
5. which company you would purchase the natural enemy from and briefly explain your choice.

The tables should be prepared and combined in a Word document, named with your ***groupname_assig3*** and submit via Canvas.

The six agents of biological control are:

- *Trichogramma* spp.: 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.
- Any species of lady beetle (Coccinellidae): There are several species; select ONE species and compare it across the three companies. Be sure to provide the name of the species.
- Any species of 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.
- Bacteria-based biopesticide: There are several bacteria species sold for **insect management**; select and compare three products that contain the same bacteria species.
- Fungus-based biopesticide: There are several fungus species sold for **insect management**; select and compare three products that contain the same fungus species.

Example of table (the second part of the assignment #3 worth 78 points):

Agent of biological control	Company name	Commercial name	Price ($US)	Target pests	Quantity/ formulation available	Stage shipped	Release /Application recommendation	Company choice and explanation
Chrysoperla carnea	1							
	2							
	3							

<u>An assignment delivered after the due date will be penalized 2 points for each calendar day it is late. The limit for late submission is two weeks after the due date.</u>

Discussion Board

Discussions are opportunities to interact, share thoughts and ideas, and learn from each other about IPM concepts and applications. After providing your response, read postings from others and reply with a well-researched, thoughtful response to the discussion prompt. If possible, include specific examples or case studies demonstrating IPM applications. "I agree" type replies are not sufficient. You must reply to at least three statements posted by classmates. No late submissions for discussions.

UNIVERSITY OF FLORIDA POLICIES

Absences and Make-Up Work

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies at: catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

Online Course Evaluation Process

Students are expected to provide feedback on the quality of instruction by completing online evaluations at evaluations.ufl.edu. Summary results are available at evaluations.ufl.edu/results/

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."

It is assumed that you will complete all work independently unless the instructor provides explicit permission for collaboration. Violations of the Honor Code will be reported to the Dean of Students Office. For more information: www.dso.ufl.edu/SCCR/honorcodes/honorcode.php

Software Use

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

CAMPUS RESOURCES

Health and Wellness

- **U Matter, We Care:** umatter@ufl.edu, 352-392-1575, umatter.ufl.edu
- **Counseling and Wellness Center:** counseling.ufl.edu, 352-392-1575
- **Student Health Care Center:** shcc.ufl.edu, 352-392-1161
- **University Police Department:** police.ufl.edu, 352-392-1111 (or 9-1-1 for emergencies)
- **UF Health Shands Emergency Room:** 352-733-0111, 1515 SW Archer Road

Academic Resources

- **E-learning Technical Support:** 352-392-4357, helpdesk@ufl.edu
- **Career Connections Center:** Reitz Union Suite 1300, 352-392-1601, career.ufl.edu
- **Library Support:** cms.uflib.ufl.edu/ask
- **Teaching Center:** Broward Hall, 352-392-2010, teachingcenter.ufl.edu
- **Writing Studio:** 2215 Turlington Hall, 352-846-1138, writing.ufl.edu/writing-studio

Services for Students with Disabilities

The Disability Resource Center coordinates accommodations for students with disabilities. Students should first register with the DRC (352-392-8565, www.dso.ufl.edu/drc) by providing appropriate documentation. Once registered, students will receive an accommodation letter to present to the instructor. Follow this procedure as early as possible in the semester.

Student Complaints

- **On-Campus:** sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code
- **Online Students:** distance.ufl.edu/student-complaint-process