

INSECT PEST AND VECTOR MANAGEMENT

ENY 4905/5236

3 CREDITS
SUMMER C 2019

INSTRUCTOR INFORMATION

Instructor
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Contact Information & Hours
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GENERAL INFORMATION

Course Description

The course will cover the principles and practices used in insect pest and vector management and will also emphasize the arthropod pests affecting crops and ornamental plants, humans and livestock. The course will explore content using narrated PowerPoint presentations and assigned readings.

Learning Objectives

After completing this course, students will be able to:

- describe the philosophy of integrated pest management,
- evaluate the ecological and economic basis for the attainment of pest status,
- assess the management approaches available to pest managers, including the advantages and disadvantages of each,
- formulate the most appropriate pest management tactic for each pest situation

Prerequisite

An introductory course in entomology

Course Website

The course content, including narrated lectures, assigned readings, examinations, quizzes, and discussions will be available through the course website in Canvas at <https://elearning.ufl.edu/>. Each week, students are required to view the lectures, and associated readings, participate in the discussion activities, and take the quizzes and examinations prior to the assigned due dates in order to complete the course requirements.

Course Communications

In addition to the assigned discussion activities, students are encouraged to post general questions on topics taught in the class under the General Questions thread. The instructor will respond to the questions. Other students are also encouraged to respond to the questions. Private questions should be sent to the instructor via email.

COURSE MATERIALS

Textbooks/Readings

The following textbooks are recommended for this course.

- van Emden H. F. and M. W. Service. 2004. Pest and vector control. Cambridge University Press. 349 pp.
This textbook is available free of charge as an ebook through the UF libraries with your Gatorlink login
- Pedigo L. P. and M. E. Rice. 2009. Entomology and pest management. Waveland Press Inc. 784 pp.

The following are required readings for the course. The PDF files of these readings will be made available on the course website.

1. Herms, D. A., and D. G. McCullough. 2014. Emerald ash borer invasion of North America: History, biology, ecology, impacts and management. *Annual Review of Entomology* 59:13 – 30
2. Fasulo T. R. 2008. History and insects, Pages 1158-1169. In J. L. Capinera (Ed.), *Encyclopedia of Entomology*. Springer Dordrecht, Netherlands
3. War A. R., G. K. Taggar, M. Y. War, and B. Hussain. 2016. Impact of climate change on insect pests, plant chemical ecology, tritrophic interactions and food production. *International Journal of Clinical and Biological Sciences* 1(2): 16 – 29
4. Capinera J. L. 2002. North American vegetable pests: The pattern of invasion. *American Entomologist* 48: 20-39
5. McCravy K. W. 2018. A review of sampling and monitoring methods for beneficial arthropods in agroecosystems. *Insects* 9: 170
6. Naranjo S. E. 2008. Sampling arthropods, Pages 3231-3246. In J. L. Capinera (Ed.), *Encyclopedia of Entomology*. Springer Dordrecht, Netherlands
7. Oberemok V. V., K. V. Laikova, Y. I. Gninenko, A. S. Zaitsev, P. M. Nyadar, and T. A. Adeyemi. 2015. A short history of insecticides. *Journal of Plant Protection Research* 55(3): 221-226
8. Ebert T., and R. Downer. 2008. Insecticide application: The dose transfer process, Pages 1958-1974. In J. L. Capinera (Ed.), *Encyclopedia of Entomology*. Springer Dordrecht, Netherlands
9. Ranson H., and N. Lissenden. 2016. Insecticide resistance in African *Anopheles* mosquitoes: A worsening situation that needs urgent action to maintain malaria control. *Trends in Parasitology* 32 (3): 187 – 196
10. Sarwar M. 2015. The killer chemicals for control of agriculture insect pests: The botanical insecticides. *International Journal of Chemical and Biomolecular Science* 1(3): 123-128
11. Parker J. E., W. E. Snyder, G. C. Hamilton, and C. Rodriguez-Saona. 2013. Companion planting and insect pest control. In Soloneski S., and M. Larramendy (Eds). *Weed and pest control – Conventional and new challenges*. InTech
12. Finch S., and R. H. Collier. 2008. Host plant selection by insects, Pages 1163-1173. In J. L. Capinera (Ed.), *Encyclopedia of Entomology*. Springer Dordrecht, Netherlands
13. van Lenteren J. C., K. Bolckmans, J. Köhl, W. J. Ravensberg, and A. Urbaneja. 2018. Biological control using invertebrates and microorganisms: Plenty of new opportunities. *BioControl* 63: 39 – 59
14. Hoddle M. S. 2002. Classical biological control of arthropods in the 21st century. Pages 3-16 in *International Symposium on Biological Control of Arthropods*.
15. Sarwar M. 2015. Microbial insecticides: An ecofriendly effective line of attack for insect pests management. *International Journal of Engineering and Advanced Research Technology* 1(2): 4 – 9

16. Jisha V. N., R. B. Smitha, and S. Benjamin. 2013. An overview on the crystal toxins from *Bacillus thuringiensis*. *Advances in Microbiology*. 3: 462-472
17. Klasse W. 2008. Area-wide insect pest management, Pages 266-282. In J. L. Capinera (Ed.), *Encyclopedia of Entomology*. Springer Dordrecht, Netherlands
18. Alphey L., A. McKemey, D. Nimmo, M. N. Oviedo, R. Lacroix, K. Matzen, and C. Beech. 2013. Genetic control of *Aedes* mosquitoes. *Pathogens and Global Health* 107(4): 170 – 179
19. Megido R. C., E. Haubruge, and F. J. Verheggen. 2013. Pheromone-based management strategies to control the tomato leafminer, *Tuta absoluta* (Lepidoptera: Gelechiidae). A review. *Biotechnology, Agronomy, Society and Environment* 17(3): 475 – 482
20. Bruce T. J. A., G. I. Aradottir, L. E. Smart, J. L. Martin, J. C. Caulfield, A. Doherty, C. A. Sparks, C. M. Woodcock, M. A. Birkett, J. A. Napier, H. D. Jones, and J. A. Pickett. 2015. The first crop plant genetically engineered to release an insect pheromone for defence. *Scientific Reports* 5: 11183
21. Smith C. W., and W-P Chuang. 2013. Plant resistance to aphid feeding: Behavioral, physiological, genetic and molecular cues regulate aphid host selection and feeding. *Pest Management* 70: 528 – 540
22. Khan Z. R., and J. A. Pickett. 2008. Push-pull strategy for insect management, Pages 3074-3082. In J. L. Capinera (Ed.), *Encyclopedia of Entomology*. Springer Dordrecht, Netherlands
23. Mitchell C., R. M. Brennan, J. Graham, and A. J. Karley. 2016. Plant defense against herbivorous pests: Exploiting resistance and tolerance traits for sustainable crop protection. *Frontiers in Plant Science* 7: 1132
24. Vincent C., G. Hallman, B. Panneton, and F. Fleurat-Lessard. 2003. Management of agricultural insects with physical control methods. *Annual Review of Entomology* 48: 261 – 281
25. Cormier D., J. Veilleux, and A. Firlej. 2015. Exclusion net to control spotted wing *Drosophila* in blueberry fields. *Integrated Protection of Fruit Crops* 109: 181-184
26. Shimoda M., and K-I Honda. 2013. Insect Reactions to light and its applications to pest management. *Applied Entomology and Zoology* 48: 413-421
27. Bortolotto O. C., A. Pomari-Fernandes, R. C. O. de F. Bueno, A. de F. Bueno, Y. K. S. da Kruz, A. P. Queiroz, A. Sanzovo, and R. B. Ferreira. 2015. The use of soybean integrated pest management in Brazil: A review. *Agronomy Science and Biotechnology* 1(1): 25 – 32
28. Riley D. G. 2008. Economic injury level and economic threshold concepts in pest management, Pages 1282-1286. In J. L. Capinera (Ed.), *Encyclopedia of Entomology*. Springer Dordrecht, Netherlands
29. Bueno A. F., S. V. Paula-Moraes, D. L. Gazzoni, and A. F. Pomari. 2013. Economic thresholds in soybean-integrated pest management: Old concepts, current adoption, and adequacy. *Neotropical Entomology* 42: 439-447
30. Baldwin R. W., and C. W. Scherer. 2008. School IPM, or pest management on school grounds, Pages 3289-3299. In J. L. Capinera (Ed.), *Encyclopedia of Entomology*. Springer Dordrecht, Netherlands
31. Matthews G., M. Zaim, R. S. Yadav, A. Soares, J. Hii, B. Ameneshewa, A. Mnzava, A. P. Dash, M. Ejov, S. H. Tan, and H. van den Berg. 2011. Status of legislation and regulatory control of public health pesticides in countries endemic with or at risk of major vector-borne diseases. *Environmental Health Perspectives* 119(11): 1517 – 1522
32. Klapwijk M. J., A. J. M. Hopkins, L. Eriksson, M. Pettersson, M. Schroeder, A. Lindelow, J. Ronnberg, E. C. H. Keskitalo, and M. Kenis. 2016. Reducing the risk of invasive forest pests and pathogens: Combining legislation, targeted management and public awareness. *Ambio* 45(Suppl.2): S223 – S234

COURSE SCHEDULE

Week	Topic	Tasks
<i>Background to Insect Pest and Vector Management</i>		
1 May 13 - 17	Pests and humans	Participate in Discussion 1 - Introductions Participate in Discussion 2 Read required readings 1 - 2
2 May 20 - 24	Causes of pest and vectored disease outbreaks	Read required readings 3 - 4 Take Quiz 1 Participate in Discussion 3
3 May 28 - 31	Sampling and monitoring of arthropods	Read required readings 5 - 6 Participate in Discussion 4 Last week to submit topic of group project report
<i>Approaches to Insect Pest and Vector Management</i>		
4 June 3 - 7	Insecticides, applications, and problems with using insecticides	Read required readings 7 - 10 Take Quiz 2 Participate in Discussion 5
5 June 10 - 14	Environmental and cultural control	Read required readings 11 - 12 Take Exam 1
6 June 17 - 21	Biological control	Read required readings 13 - 14 Take Quiz 3 Participate in Discussion 6 Last week to submit group project report
June 24 - 28	<i>No classes - summer break</i>	
7 July 1 - 5	Insect pathogens	Read required readings 15 - 16 Participate in Discussion 7 Last week to submit your peer review of group project report
8 July 8 - 12	Genetic control and area-wide management	Read required readings 17 - 18 Take Quiz 4 Participate in Discussion 8
9 July 15 - 19	Attractants, repellents, and pheromones	Read required readings 19 - 20 Take Exam 2
10 July 22 - 26	Host plant resistance	Read required readings 21 - 23 Participate in Discussion 9
11 July 29 - August 2	Physical measures	Read required readings 24 - 26 Take Quiz 5 Participate in Discussion 10
12 August 5 - 9	Legislation and Regulation/Emerging concepts and practices	Read required readings 27 - 33 Take Exam 3

COURSE POLICIES

Attendance Policy

This is an online class. Students are, therefore, required to view the weekly lectures and the associated readings each week. 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>

Course Requirements

There are 3 examinations, 10 graded discussions, 5 quizzes, and a group project (for graduate students) to complete the course requirements.

Examinations

There are three, non-cumulative exams (100 points each). The first, second and third exams will cover weeks 1 - 5, 6 - 9, and 10 - 12, respectively. The exams are open-book and essay-based. Each exam will be made available and accessible in Canvas from Thursday 8:00 am EST to Friday 11:59 pm EST of the exam week. Once you begin the exam, you will have 3 hours to complete it in a single session, so do not open the exam until you are ready to complete it.

Quizzes

There are five quizzes (40 points each) scheduled every other week throughout the semester. The quizzes will consist of 10 multiple choice, mix and match, and true/false questions and will cover the lectures and/or required readings. The quizzes are closed-book and will be made available and accessible in Canvas from Thursday 8:00 am EST to Friday 11:59 pm EST of the quiz week. Once you begin the quiz, you will have 10 minutes to complete it in a single session, so do not open the quiz until you are ready to complete it.

Discussions

Every week, questions will be posted by the instructor in the Discussion forum in Canvas. Students are required to make at least one post in the discussion thread (20 points each). These questions are designed to generate discussions, provide opportunities for student engagement, and aid the students' understanding of pest management issues. Each discussion thread will be open for one week. You will not receive any grade if you do not post at all or if you simply post "I agree". Please note that there will be two discussions the first week – one is to introduce yourself and the other is based on course content.

Group Project Report (required for graduate students only)

For the group project report (100 points), students will work in groups of 3 to 4 to prepare an analysis of a pest management technique(s) for a pest or pest complex that is of medical or agricultural importance. The components of the project report should include:

1. An abstract – concise and not more than 250 words
2. A description of the insect pest problem, including the pest biology, history, monitoring techniques, and economic importance (pest impact)
3. The pest management options available, including the implications of each for pest management
4. List of references

Examples of topics for the group project report include:

- Predatory fish for mosquito suppression

- Animal dung destruction by beetles for suppression of biting flies
- Nematodes for suppression of Japanese beetles
- The use of *Bacillus thuringiensis* for insect control
- Pheromones for codling moth management

The above are just examples of topics. You are not limited to them. You are to submit your topic, and the names of the members of your group to the instructor on or before the topic submission due date. The report should be between 8 - 10 pages in length (including the title page, references, tables and/or figures). It should be double-spaced, size 12 Times New Roman with 1 inch-margin. The references should be at least 5, from primary literature, and must be according to the Journal of Integrated Pest Management style. Instructions on how to structure the report and the rubrics for evaluation will be posted in Canvas. The reports are due by 11:59 pm of the due date. Late submissions will be marked down by 5 points per day. Each group member will be evaluated by other members of their group. The reports will also be peer-reviewed by other students in the class. You are, therefore, required to post your group project report in Canvas for the instructor and other student groups to read and evaluate. Overall, group project report evaluations will be as follows:

1. Evaluation by the instructor (50 points) - The instructor will evaluate each of the reports. The score that group report receives is also the score for each member of the group.
2. Evaluation of report by peers (20 points) - Each group report will be evaluated by other students in the class, except the members of that group, using a rubric. The scores from the other students for that group report will be averaged, and that average score is also the score each member of the group receives
3. Evaluation of individual effort to group project (20 points) - The contribution of each member to the project will be evaluated by every other member of the group using a rubric. The scores from every other group member for each individual will be averaged, and the average score is also the score the individual student receives.
4. Submission of evaluations of peers' group reports (10 points) - Each student must read group reports submitted by other groups in the class and submit their evaluations.

GRADING POLICIES

The course grade is based on performance on the exams, quizzes, participation in discussion activities, and a group project report (required for graduate students only). The final grades will be converted to percentages. The final grade will be assigned as:

Course Requirement		Point Value	Undergraduate		Graduate	
			Points	Percentages	Points	Percentages
Discussions/participation		20 each	200	29%	200	25%
Quizzes		40 each	200	29%	200	25%
Exam 1		100	100	14%	100	12.5%
Exam 2		100	100	14%	100	12.5%
Exam 3		100	100	14%	100	12.5%
Group project report	Evaluation of report by instructor	50	-	-	50	6.25%
	Evaluations of report by peers	20			20	2.5%
	Evaluation of individual effort to group project	20	-	-	20	2.5%
	Submission of evaluations of peers' group reports	10	-	-	10	1.25%
Total			700	100%	800	100%

Grading Scale

Grade	Percentages
A	93 – 100
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	<59.9 and below

Online Course Evaluation Process

Student assessment of instruction is an important part of efforts to improve teaching and learning. At the end of the semester, students are expected to provide feedback on the quality of instruction in this course using a standard set of university and college criteria. These evaluations are conducted online at <https://evaluations.ufl.edu>. Evaluations are typically open for students to complete during the last two or three weeks of the semester; students will be notified of the specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results>

UNIVERSITY OF FLORIDA POLICIES AND ASSISTANCE

Grades and Grade Points

For information on current UF policies for assigning grade points, see <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

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 instructor. This policy will always be vigorously upheld in this course.

Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to the 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/process/student-conduct-honor-code>

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.

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/

Campus Helping Resources

Students experiencing crises or personal problems that interfere with their general wellbeing are encouraged to utilize the university's counseling resources. The Counseling Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal or lacking clear career and academic goals, which interfere with their academic performance.

- The University Counseling and Wellness Center, 3190 Radio Road, 352-392-1575
www.counseling.ufl.edu
 - Counseling Services
 - Groups and Workshops
 - Outreach and Consultation
 - Self-Help Library
 - Wellness Coaching
- U Matter We Care, www.umatter.ufl.edu/
- Career Resource Center, First Floor JWRU, 392-1601, <https://career.ufl.edu/>