

COURSE SYLLABUS: INSECT TOXICOLOGY (ENY 6651)

Semester: Spring 2008
Credits: 3
Lecture: **Monday and Wednesday** 4th period (10:40-11:30 AM), room ENY 1031
Laboratory: **Tuesday** 6th-8th period (12:50-3:50 PM), room ENY 3118

Instructor:

Dr. Mike Scharf
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Course Objectives:

To introduce the student to concepts associated with the toxicology, chemistry and formulation, modes of action, metabolism, resistance to, and environmental fate of insecticides.

Prerequisites

This course is directed toward Entomology, Nematology and Doctor of Plant Medicine Students. There are no formal prerequisites, although a basic understanding of organic chemistry, insect physiology, agriculture, pest management, and pesticides is assumed.

Approach:

Emphasis will be placed on basic, applied and environmental aspects of insect control with insecticides. The lecture portion of the course will be used to introduce and overview key concepts. The laboratory portion of the course will complement the lecture portion and provide hands-on experience with insecticide toxicity testing, as well as insecticide biochemistry and physiology.

Office Hours

I can be reached at work via email or phone during normal business hours. However, I maintain a busy schedule and travel frequently, and therefore may not always be able to respond quickly. Please understand this and be patient. I will be available at designated "real-time" appointments. Please use email as the PRIMARY means of contact during business and non-business hours.

Textbook and Readings:

No textbook is required. A course packet will be provided on CD and some supplemental readings will be provided:

- Neurological Effects of Insecticides by M.E. Scharf (2003). Marcel-Dekker, NY.
- Toxicology of Insecticides by F. Matsumura (1986). Plenum Press, NY.
- Pesticide Resistance in Arthropods, edited by R. Roush & B. Tabashnik (1990). Chapman & Hall, NY.
- Myths, models and mitigation of resistance to pesticides, by Hoy, M.A. (1999). *In* Insecticide resistance -- from mechanisms to management, pp. 111-119 (Denholm, Pickett and Devonshire, Eds.). CABI Publishing, NY.

Grading:

Lecture 75% (4 exams; each exam = 18.75% of final grade)

Laboratory 25% (10 laboratory reports in required format)

Letter grades in this course will be determined in the following manner:

Grading scale:

A 90 - 100%

B 80 - 89%

C 70 - 79%

D 60 - 69%

E <60%

NOTE: Grades will not be given out over the telephone or by email.

Make-up Policy

If you know of a conflict or problem that means you will miss a class, let the instructor know ahead of time. To avoid a grade penalty, you will be required to provide appropriate written documentation (e.g., from a doctor in case of a severe illness, or a funeral notice or obituary in case of a death of a close relative).

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.

UF Policy on E-mail

“Official University business email will be communicated to students using the University GatorLink email account. That is, official email will be sent exclusively to GatorLinkUserName@ufl.edu. The preferred email address recorded for all students will be the GatorLink address. This is the email address displayed in the online phonebook. Students may continue to use the forwarding mechanism to deliver their email to other mail services, if they wish. However, it is the student’s responsibility to insure that the forwarding address is current so that they receive official communications from the University”.

Academic Honesty

As a result of completing the registration form at the University of Florida, every student has signed the following statement: “I understand that 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.” We agree to comply with the new Honor Code, which specifies that “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.”

University policy regarding “Standard of Ethical Conduct” is available from the 2002-2003 Student Guide at <http://www.dso.ufl.edu/stg/>.

Further information on academic honesty and integrity is available from the Graduate School at: http://gradschool.rgp.ufl.edu/handbook/graduate_student_handbook/integrity.html

The minimum consequence for cheating and/or plagiarism is getting a zero on the assignment and possibly failing this course. Do not cheat. Do not plagiarize. Collections and written

assignments should represent your own work. If you are not sure what constitutes plagiarism, please read these webpages, and ask your instructor to clarify before beginning the project.

UF Counseling Services

Resources are available on campus for students having personal problems or lacking clear career and academic goals which interfere with their academic performance. These resources include:

1. University Counseling Center, 302 Peabody Hall, 352-392-1575, personal and career counseling;
2. Student Mental Health, Student Health Care Center, 352-392-1171, personal counseling;
3. Sexual Assault Recovery Services, Student Health Care Center, 352-392-1161, sexual counseling; and
4. Career Resource Center, Reitz Union, 352-392-1601, career development assistance and counseling.

Information for Students with Disabilities

Students with disabilities are encouraged to register with the Office for Student Services to determine the appropriate classroom accommodations. Any student requesting classroom accommodations must be registered with the Dean of Students Office, P202 Peabody Hall, 392-1261 (TDD - 392-3008), and have documentation on file in the office of Student Services in order to receive classroom and/or examination accommodations. For students with hearing disabilities trying to contact an office that does not list a TDD, please contact the Florida Relay Service at 1-800-955-8771.

LECTURE OUTLINE - ENY6651 (Monday and Wednesday; 10:40 - 11:30)

| # | Date | Topic |
|------------|-------------------------|--|
| 1. | Mon-Jan 07: | Introduction to insect toxicology |
| 2. | Wed-Jan 09: | Toxicity measurement |
| | Mon-Jan 14 | Martin Luther King Day - No class |
| 3. | Wed-Jan 16: | Insecticide chemistry and formulations |
| 4. | Mon-Jan 21: | Neurophysiology I: form and function of the nervous system |
| 5. | Wed-Jan 23: | Neurophysiology II: review and more nervous system function |
| 6. | Mon-Jan 28: | Sodium channel toxins I: DDT and pyrethrins |
| 7. | Wed-Jan 30: | Sodium channel toxins II: pyrethroids and dihydropyrazoles |
| 8. | Mon-Feb 04: | EXAM I |
| 9. | Wed-Feb 06: | Chloride channel toxins: cyclodienes, phenylpyrazoles, abamectins |
| 10. | Mon-Feb 11: | Acetylcholinesterase inhibitors: organophosphates and carbamates |
| 11. | Wed-Feb 13: | Acetylcholine receptor toxins: nicotine, nicotinoids and spinosyns |
| 12. | Mon-Feb 18: | Insect Growth Regulators I: insect endocrinology & development |
| 13. | Wed-Feb 20: | Insect Growth Regulators II: IGR toxins and modes of action |
| 14. | Mon-Feb 25: | Biochemical toxins -- inhibitors of energy production |
| 15. | Wed-Feb 27: | EXAM II |
| 16. | Mon-Mar 03: | Miscellaneous Toxins I |
| 17. | Wed-Mar 06: | Miscellaneous Toxins II |
| | March 10-14 | Spring Break - No class |
| 18. | Mon-Mar 17: | The insect cuticle and insecticide penetration |
| 19. | Wed-Mar 20: | Detoxification: phase I |
| 20. | Mon-Mar 24: | Detoxification: phase I continued |
| 21. | Wed-Mar 26: | Detoxification: phase II and excretion |
| 22. | Mon-Mar 31: | Toxin activation, metabolic inhibitors and synergists |
| 23. | Wed-Apr 02: | EXAM III |
| 24. | Mon-Apr 07: | Insecticide resistance I: evolution and mechanisms |
| 25. | Wed-Apr 09: | Insecticide resistance II: measurement and management |
| 26. | Mon-Apr 14: | Insecticide resistance III: management strategies |
| 27. | Wed-Apr 16: | Insecticides in the Environment |
| 28. | Mon-Apr 21: | Pesticide regulation, testing, and toxicogenomics |
| 29. | Wed-Apr 23: | OPEN |
| 30. | Apr 26 - May 02: | EXAM IV (Finals Week - date & time to be announced) |

LABORATORY OUTLINE - ENY 6651 (Tuesdays; 12:50 - 3:50)

Weekly lab reports will be due at the beginning of Tuesday lab periods, or if there is no lab for a given week (*), reports will be due to the instructor by 5PM of the day indicated.

| # | Date | Topic |
|--|--------------|---|
| 1. | Tues-Jan 08: | Lab intro and lab safety (no report required). |
| 2. | Tues-Jan 15: | General laboratory procedures (weighing, pipetting, pH and buffers). |
| 3. | Tues-Jan 22: | Neurophysiology: insecticide effects on the central nervous system. |
| 4. | Tues Jan 29: | Neurophysiology: temperature effects on nervous system function. |
| 5. | Tues-Feb 05: | NO LAB (exam week) * |
| 6. | Tues-Feb 12: | Insecticide dilutions and molarity calculations, dosage range finding, probit analysis. |
| 7. | Tues-Feb 19: | Bioassays: LD50 determination using probit analysis. |
| 8. | Tues-Feb 26: | NO LAB (pre-exam review session) * |
| 9. | Tues-Mar 04: | Bioassays: LC50 determination, probit analysis and resistance ratios |
| March 10-14 Spring Break - No class | | |
| 10. | Tues-Mar 18: | Chemistry: Physical properties of insecticides and their metabolites |
| 11. | Tues-Mar 25: | Enzyme biochemistry: protein isolation and total protein determination. |
| 12. | Tues-Apr 01: | NO LAB (pre-exam review session) * |
| 13. | Tues-Apr 08: | Enzyme biochemistry: Esterases (phase I metabolism). |
| 14. | Tues-Apr 15: | Enzyme biochemistry: Glutathione-S-transferases (phase II metabolism). |
| 15. | Tues-Apr 22: | OPEN |