

SYLLABUS

ENT 5061: Insect Molecular Science (2 credits) Instructor: Dr. Ann Fallon

420 Hodson Hall

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Office hours: by arrangement

The course announcements, readings from the primary literature, and other materials will be available on Moodle. The course will meet for two hours per week, with three take-home exams.

Class Time: Mon, Wed: 4-5 pm

Scope:

In the past few decades, molecular techniques have revolutionized the study of insects, leading to new insights into evolution, physiological and behavioral processes, responses to chemical insecticides, and basic developmental biology. Approaches pioneered with *Drosophila* are now being extended to species for which classical genetic tools are not available, leading to new insights for monitoring and control of insect pests. This course will explore molecular biology of insects and its applications, including the controversial release of genetically modified species. Participants will have the opportunity to explore applications of molecular techniques directly relevant to their thesis projects. Although there are no formal prerequisites required for this course, students will benefit from undergraduate exposure to cell biology, microbiology, or genetics and/or access to textbooks in these areas.

Objectives:

1. To acquire basic familiarity with concepts and tools used in molecular biology
2. To understand contemporary applications of molecular biology to insect systems
3. To acquire competence in critiquing publications that describe the use of molecular tools as applied to insect systems

Textbook: Marjorie A. Hoy

Insect Molecular Genetics, 3rd edition ISBN 978-0-12-415874-0

Available online through the U of M Library

It is strongly suggested that students download chapters from the Hoy text and bring them to class.

Format and Evaluation:

The principal format will be lectures. Assigned readings will be essential and should be read by assigned class date. Readings will consist of the text, other review articles and primary literature. Materials will be posted on the Moodle site.

Discussion or problem sessions will be held on alternate class periods (typically Wednesday classes). Discussion sessions will be on assigned papers from the primary literature. All students will have read the primary papers and be prepared to make critical commentary.

One or two facilitators will be designated to present a verbal and visual summary of the assigned paper(s) and lead the discussion. Facilitators should introduce the question(s) posed in the paper and rationale, briefly outline the methods and results, and pose some questions for discussion, using PowerPoint and/or blackboard. These sessions will reinforce textbook information with examples from the literature.

The facilitators will provide a typed (≤ 2 single-spaced pages) critical review of their paper for distribution to the class and a grade.

Assignments: Will be based on Discussion/problem sessions, with related assignments due the following week. Late assignments will be accepted only with notification before the original due date.

Exams: There will be 2 mid-terms and a final exam.

Genes and Genome Organization (Topics by class week; papers for discussion to change according to student interests and be posted on Moodle)

Section 1. Genes and Genome Organization

1. DNA, Gene structure, DNA replication
2. Transcription and Translation; Regulation of gene expression
3. Nuclear and extranuclear DNA in insects
4. Genetic systems, Genome Evolution, genetic control of embryonic development
5. Physiological processes; metamorphosis and reproduction EXAM 1

Section 2: Tools and Techniques in Molecular Biology

6. Restriction enzymes, gels, blots
7. Sequencing; genomics
8. PCR amplification of DNA
9. Cloning; genetic modification of DNA EXAM 2

Section 3: Applications in Entomology

10. Sex determination in insects
11. Genetics of populations
12. Insecticide resistance
13. Systematics and evolution of arthropods
14. Genetic modification of pest and beneficial FINAL EXAM