

ENTO 4330 Medical & Veterinary Entomology

I. General Information

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Semester: Spring 2016
 Credits: Lec /Lab 4.0
 Class Hrs: Lec/Lab: MW 8:00-11:50
 Room: N210

IMPORTANT NOTE: The California Faculty Association is in the midst of a difficult dispute with management. It is possible that the faculty union will call a strike or other work stoppage this term. I will inform the class as soon as possible of any disruption to our class meeting schedule.

II. Course Description

(Catalog Description) Natural history and taxonomy of arthropods of medical (including forensic) and veterinary importance in temperate, tropical, and subtropical regions of the world with emphasis on the role arthropods play as vectors and transmitters of disease. The laboratory involves techniques of collection and taxonomic identification, dissections, and field experiments on carrion-arthropod succession to demonstrate the utility of arthropods in medicolegal investigations. Satisfies the departmental diversity requirement. This course is acceptable for section 1.c requirement for the major. (Formerly ENTO 3330.) Prerequisite: BIOL 1050 and BIOL 1150 or equivalents. (Lecture, 3 hours; laboratory, 3 hours; field trips and experiments) (Spring of alternate years).

Broadly stated, this course is the study of arthropods, especially insects, the diseases they vector, and other issues/problems that affect humans (including medicolegal) and other animals (pets, livestock). A central feature of this course is **biological taxonomy and systematics** which refers to organisms by their scientific names that you will need to master (i.e., correctly memorize, identify, pronounce, and spell). Thus, it is important that you set aside sufficient time to learn these concepts. An integral goal of this course is your continued development of critical thinking, written and verbal communication, and quantitative reasoning. Lectures, assignments, and laboratory exercises will guide you in the development of these skills. For lectures, the readings will be drawn from two sources: textbooks and the primary literature (journal papers).

Students who are physically present, but inattentive (including, but not limited to, sleeping, excessive conversation, texting, emailing, web-surfing, being disruptive, arriving late, leaving early, etc.) may be asked to leave. Repeat offenders will be turned over to the Dean of Students. Unexcused absences for gradable events will result in no score, but in the event of a documented compelling circumstance, an attempt will be made to work out the conflict prior to the absence.

III. Specific Learning Objectives

1. The student will become conversant in the terminology, life history, public health, disease cycles, and phylogenetic relationships (i.e., tree thinking) of insects and other arthropods of medical, veterinary, and forensic significance;
2. The student will recognize scientific and common names for arthropods, pathogens transmitted by those arthropods, and the names of the resulting disease in humans and other animals;
3. The student will become familiar with the direct injury that arthropods cause, including but not limited to phobias, psychoses, annoyance, allergies, toxins, venoms, and myiasis;
4. Through the sister discipline of veterinary entomology, the student will learn how arthropods cause injury to domestic animals, particularly livestock and pets, by feeding or invasion, exsanguination,

introduction of venom or saliva, and by transferring disease organisms from infected animals or contaminated sites;

5. Through the medico-legal discipline of forensic entomology, the student will become familiar with evidence recovery techniques from a model corpse and learn how practitioners use insect development and succession to estimate time-of-death from human remains for law enforcement and related forensic disciplines (i.e., pathology, anthropology, taphonomy);
6. The student will review the primary literature (i.e., journal & secondary sources) to critically evaluate current topics in M/V/F entomology and become conversant on these topics through oral (PowerPoint) presentations;
7. The student will gain knowledge on the factors that cause disease outbreaks, methods for reducing their spread, and resulting geopolitical and socioeconomic pressures public health professionals face when confronting arthropod-borne diseases.

IV. Course Requirements

The course grade for the 4-credit course will be determined from the combined grades from lecture (60%) and the laboratory (40%). It is your responsibility to know where you stand in the class at any one time.

This is a senior-level class; as such it is your responsibility to keep abreast with exam dates, course materials, assignments and updates. **Graduate and post-baccalaureate students are expected to perform at a higher level than undergraduates (see handout); subsequently (and according to university policies), these students will receive additional assignments.** Allow at least 2 weeks for exams, lab exercises, and homework to be graded and returned. If you are requesting a makeup exam, it is your responsibility to immediately contact me and provide relevant documentation (e.g., letter from a physician) documenting your absence. The final decision to offer a makeup exam rests with me and in past terms makeups have only been granted for clear and compelling circumstances (e.g., medical emergency, death of family member).

The laboratory will rely mostly on handouts and these will be provided one week (or less) before the next lab meeting. **Use of cameras/phones to photograph live, pinned, or microscopic specimens for use on exams is forbidden** and considered cheating; such misconduct will be dealt with swiftly and severely according to the California Code of Regulations (see below). Your project presentation will be evaluated from a *PowerPoint* presentation that you will turn in, citing the most recent scientific findings (see below).

Behavior that interferes with the instructor's ability to teach or the ability of students to learn will not be tolerated. Examples include: audible ring tones, repeated late arrivals or early departures, irrelevant conversation, and inappropriate use of phones or computers. Inappropriate behavior will be dealt with as severely as university regulations allow. Behavior that is not consistent with the Student Conduct Code – including any form of academic dishonesty (see below) – will result in immediate expulsion from the course, a failing grade, and a referral to the Office of Student Judicial Affairs.

Executive Order 1037 (effective August 2009) allows students to only repeat a course twice and in which they have earned less than a C grade. Students are only allowed to replace the first 16 units they repeat; those reaching the 16 unit limit may repeat an additional 12 units, but the resulting grade is averaged with all other grades. Students repeating this class will not be allowed to choose the same project as they worked on previously.

V. Required Texts/i>clicker (To be purchased/rented before 2nd class day)

(1) ***Medical and Veterinary Entomology, 2nd ed.*** by Mullen & Durden. Academic Press. Chapters for this text (e.g., MD1, MD2) are indicated in the schedule.

(2) ***Entomology & Death, 2nd ed.*** by Haskell and Williams. Forensic Entomology Partners. Chapters for this text (e.g., HW1, HW2) are indicated in the schedule.

(3) ***i>clicker*** (rental/used/new available). Numerous pedagogical studies have shown that i>clickers improve student retention and learning. You are required to purchase or rent an i>clicker remote to receive in-class participation and performance points. In order to receive this credit, you must register your i>clicker remote online at www.iclicker.com/registration. Complete the fields: first name, last name, student ID, remote ID. Your i>clicker will be used every class (and lab) meeting (worth 5% of your overall grade). Using another student's i>clicker or using multiple remotes is a form of cheating and will be dealt with the same way as other forms of academic dishonesty.

On occasion, I will also assign/pass out primary literature on medical/forensic/veterinary entomology (journals/book chapters/review papers), web site information (see also below), and will show videos in lab on an occasional basis that I will test you on.

VI. Grading Procedure

Two midterm exams (**March 7** and **April 27**) will be 125 point mixed format (short answer/essay, matching, some multiple choice, long essay). Questions for the exams will come from the lecture notes, textbooks, videos, and handouts. Lab practicals will be 50 fill-in-the-blank questions taken from slides, specimens, field materials, and demonstrations. The final exam (**May 20**) will be comprehensive (250 pts) over all the class (lecture) material. **No extra credit will be offered beyond the points shown below.**

Your active participation in lectures and labs are expected. You will WORK COLLABORATIVELY on group lab and field exercises, but INDEPENDENTLY on written exams and homework assignments. On the group (forensic) activity, students will use a scoring rubric to anonymously evaluate each other's contribution to lab reports (i.e., peer review) and will be part of the individual's final grade on lab reports (a practice recommended by students in previous semesters).

Cheating in any form is inappropriate conduct and will be dealt with swiftly and severely according to Sections 41301 through 41304 of Title 5 of the California Code of Regulations which includes expulsion, suspension and probation.

Lecture Exams (2 @ 125 points each)	250 (25%)
Comprehensive Final (1 @ 250 points)	250 (25%)
Lab Practical (2 @ 100 points each)	200 (20%)
Project (PowerPoint Presentation) on Selected Topic	200 (20%)
i>clicker questions	50 (5%)
Misc. (i.e., homework, participation, conduct, attendance)	50 (5%)
Total	1000

A = 900-1000, B = 800-899, C = 700-799, D = 600-699, F < 600 points. No +/- grading will be applied to your final grade.

Homework/lab assignments will be passed out in lab and will be due at the next lab meeting (1 week later, no exceptions). Your project (*PowerPoint*) presentation will come from a list of provided topics. Your performance will be evaluated using a standardized rubric (and peer graded in the case of the group forensic project). **Deadlines will be set for submitting your PowerPoint file and your talk will have a scheduled date/time (max time = 18 minutes). In the event that you miss your assigned date/time, you will receive a '0' for the 200-point assignment. Your PowerPoint file (.ppt or .pptx) can be forwarded either by email or offered in person (on CD/memory card). More details to follow as we approach the talk dates.**

VII. Recording Policy:

Taxonomic specimens are best understood when you systematically examine and draw them while using the microscope and reviewing them against the textbook/handouts. **Thus, recording of classes or of live, pinned, or microscopic specimens is not permitted; if you do not intend to comply with this policy, please discuss this with the instructor or take another class.** An exception is made for students registered with Disability Resource Services, who are approved for this accommodation. In such exceptions, DRS students will be asked to sign a "Recording Agreement" which disallows them from sharing recordings with other individuals unless approved by the DRS program.

Important Dates to Remember:

January 28	First Class Day
February 24	Census Date (Last Day to Add or Drop)
March 7	Lecture Exam 1
March 14	1 st Lab Practical
March 28-April 1	Spring Break, No Classes
March 31	Cesar Chavez Day, No Class
April 13, 18, 20	Oral Presentations
April 27	Lecture Exam 2
May 13	Warrior Day (no afternoon classes)
May 16	2 nd Lab Practical
May 18	Last Day of Classes (catch-up and review day)
May 20	Comprehensive Final (start time 8:30)

LECTURE OUTLINE & READING ASSIGNMENTS*

Topic(s)	Chap(s) or Exam Date
1. Introduction to M/V/F Entomology <ul style="list-style-type: none"> a. Introduction & Short History of M/V/F Entomology b. Arthropod Classes & Orders, Tree-Thinking c. Direct Injury by Arthropods d. Venomous Arthropods e. Vector-Borne Diseases f. Host-Parasite Interactions g. Entomophobia 	MD1, HW1, Handouts
2. Overview of Parasitic Arthropods <ul style="list-style-type: none"> a. Origin & Evolution of the Blood-Feeding Habit 	Handouts, MD2, 22-26

- b. Morphological Adaptations
3. Epidemiology of Arthropod-Borne Diseases MD3, Handouts
 - a. Short History of Vector-Borne Disease Discovery/Control
 - b. Transmission Cycles: Terminology, Components, Modes
 - c. Vector Incrimination & Infection Rates
 - d. Surveillance
 - e. Emerging Vector-Borne Diseases
 4. Forensic (=Medicocriminal) Entomology MD4; HW1, 3, 8-11
1st Exam (March 7)
 - a. Corpse Fauna, Ecological Succession
 - b. Time, Manner, and Cause of Death
 - c. Lab Procedures, Climate Data, Analysis
 - d. Case Records and Sample Problems
 5. Diptera (Flies) of M/V/F Importance MD10-19; Handouts
 - a. Moth & Sand Flies (Psychodidae)
 - b. Black Flies (Simuliidae)
 - c. Mosquitoes (Culicidae)
 - d. Bot and Warble Flies (Oestridae)
 - e. Louse Flies, Keds (Hippoboscoidea)
 - f. Life History, Behavior and Ecology
 - g. Public Health, Veterinary Importance, Prevention & Control
 6. Hemiptera (True Bugs) of M/V Importance MD7, Handouts
 - a. Kissing Bugs (Reduviidae), Bedbugs (Cimicidae)
 - b. Life History, Behavior and Ecology
 - c. Public Health, Veterinary Importance, Prevention & Control
 7. Phthiraptera (Lice) of M/V Importance MD6, Handouts
2nd Exam (April 27)
 - a. Chewing (Mallophaga), Sucking Lice (Anoplura)
 - b. Life History, Behavior and Ecology
 - c. Public Health, Veterinary Importance, Prevention & Control
 8. Siphonaptera (Fleas) of M/V Importance MD9, Handouts
 - a. Human, Rat, and Sand Fleas (Pulicidae, Tungidae)
 - b. Fleas of Poultry (Ceratophyllidae)
 - c. Life History, Behavior and Ecology
 - d. Public Health, Veterinary Importance, Prevention & Control
 9. **Comprehensive Lecture Final (May 20, starting time: 8:30)**

*Reading assignments listed on the course outline above are from Mullen & Durden (MD) and Haskell & Williams (HW). Topic content and dates of coverage in the syllabus may be changed due to extenuating circumstances.

LAB SCHEDULE*

Week Beginning	Topic(s)	Chapters in Text(s) or Test
February 1	Introduction, Lab Safety, Topic Assignments, (a), Microscope Assignment & Review, Tree Thinking (Phylogenetics) Quiz, (b)	MD1, 2; Handouts
February 8	Taxonomy Exercise, Collecting Methods, (c), Arthropod Body Plans & Phylogeny	HW4-7, Handouts
February 15	Non-Insect Arthropods (ticks, mites, spiders, scorpions), (d), Insect Mouthparts, (e)	MD2, 22-26; Handouts
February 22	Corpse Fauna, (f), Developmental- & Successional-Based PMI Estimation, (g)	HW3, 7; MD4; Handouts
February 29	Blood-Sucking Flies I: Psychodidae, Ceratopogonidae, Simuliidae	MD10-13, Handouts
March 7	Blood-Sucking Flies II: Tabanidae, Muscidae, Glossinidae, Review for 1 st Lab Practical (W)	MD8, 15-17; Handout
March 14	1st Lab Practical, (h) (M) , Mosquitoes I	MD14, Handout
March 21	Mosquitoes II, (i), Myiasis-Causing Flies	MD14, 18; Handouts
March 28-April 1	Spring Break, no labs	
April 4	Hemiptera (true bugs), Phthiraptera (lice)	MD7, 6; Handouts
April 11	Siphonaptera (fleas), (j), Presentations (W)	MD9, Handouts
April 18	Presentations (M & W)	
April 25	Miscellaneous insects (beetles, moths, wasps, bees, ants), (k)	MD8, 20, 21; Handouts
May 2	Misc. Insects II (biting bugs), (l)	MD8, 20, 21; Handouts
May 9	Catch-up Week, Clean-up, Review for Lab Practical	
May 16	2nd Lab Practical (M) , Microscope Check, Review for Lecture Final	

*Reading assignments listed on the course outline above are for Mullen & Durden (MD) and Haskell & Williams (HW). Topic content and dates of coverage in the syllabus may be changed due to extenuating circumstances.

List of Scientific Videos (shown during lab time)

The following videos are listed in chronological order in the lab syllabus. Ones marked * have Q/A sheets you will complete while viewing them (they make good study guides) or a homework assignment:

- a) Rats, Bats and Bugs (Bugs only portion) (50 min)
- b) The Real “CSI” (55 min)*
- c) Collection and Preservation of Insect Evidence from Crime Scenes (20 min)
- d) Deadly Bugs (50 min)*
- e) Ticks: The Real Vampires (50 min)*
- f) Creatures in Crime (50 min)*
- g) The Autopsy (30 min)
- h) Post Mortem: The Death Investigation Crisis in America (55 min)*
- i) Mosquito Control and Biology (30 min)*
- j) Scourge of the Black Death (50 min)
- k) Leeches, Maggots, and Bees (50 min)*
- l) The Poisoner’s Handbook (120 min)*

Useful Web/Internet Sites on M/V/F Entomology Topics:

<http://lamarck.unl.edu/hwml/pdf-files/cdc-keys.html> (CDC Pictorial Keys)
https://extranet.who.int/photolibary/index_eng.htm (Photo Library, World Health Organization)
<http://www.cdc.gov/ncezid/dvbd/> (Div. of Vector-Borne Diseases, CDC)
<http://www.nafea.net/> (North American Forensic Entomology Association)
<http://www.eafe.org/> (European Association of Forensic Entomology)
http://www.ent.iastate.edu/List/medical_entomology.html (Iowa State ME index)
<http://www.bterfoundation.org/indexfiles/findinfo.htm> (Biotherapeutics Education and Research)

Refereed Journals on M/V/F Entomology Topics:

<http://www.annualreviews.org/loi/ento> (Annual Reviews, publishes the *Annual Review of Entomology*, as well as other review articles)
<http://www.entsoc.org/> (Entomological Society of America, publishes the *Journal of Medical Entomology* and other entomology journals)
<http://www.esc-sec.ca/> (Entomological Society of Canada, publishes the *Canadian Entomologist*)
<http://www.royensoc.co.uk/> (Royal Entomological Society of London, publishes *Medical and Veterinary Entomology* and other UK entomology journals)
<http://www.aafs.org/> (American Academy of Forensic Sciences, publishes the *Journal of Forensic Science*)
<http://www.fsijournal.org/issues> (publishes *Forensic Science International*)
<http://www.sove.org/Home.html> (Society for Vector Ecology, publishes the *Journal of Vector Ecology*)
http://www.liebertpub.com/publication.aspx?pub_id=67 (Society for Zoonotic Ecology and Epidemiology, publishes *Vector-Borne and Zoonotic Diseases*)
<http://www.mosquito.org/> (American Mosquito Control Association, publishes the *Journal of the American Mosquito Control Association*)