

**ENT 158: Forensic Entomology.
Spring 2003. RB Kimsey
Syllabus**

Lecture Topics and Reading Assignment Schedule

Date	Topic	Reading Assignments
April 1 (Tu)	1. Introduction to Course	Syllabus
April 3 (Th)	2. Sampling, and Preservation Techniques	Daly, Doyen & Purcell (DD&P) pp. 601- 612; Catts & Haskell (C&H) pp. 82-97
April 8 (Tu)	3. Entomology in Civil vs. Criminal Law	C&H pp. 1-8; DD&P pp. 183-184
April 10 (Th)	4. Insect Structure, Function	DD&P pp. 21-50, 61-82
April 15 (Tu)	5. Insect Life History and Diversity	C&H: pp. 38-41; DD&P pp. 187-208
April 17 (Th)	6. Insect Succession	C&H pp. 124-135
April 22 (Tu)	7. Insect Development and Temperature	DD&P pp. 181-184
April 24 (Th)	8. Human Decomposition	C&H pp. 9-37
May 29 (Tu)	9. Entomology in Human Death	C&H pp. 9-37
May 1 (Th)	MIDTERM EXAM	
May 6 (Tu)	10. Decomposing Arthropods- Beetles et al.	C&H 41-71 DD&P pp. 333-344, 362-366, 370-376, 379-382
May 8 (Th)	11. Decomposing Arthropods II- Flies Term paper draft due (optional)	DD&P pp. 454-483, 493-523, 529-558, 570-600
May 13 (Tu)	12. Decomposing Arthropods III- Blow Flies	DD&P pp. 454-483, 493-523, 529-558, 570-600
May 15 (Th)	13. Decomposing Arthropods IV- Flesh and Houseflies	DD&P pp. 454-483, 493-523, 529-558, 570-600
May 20 (Tu)	14. Water, Drugs, Toxins and Insect Decomposition	
May 22 (Th)	15. Forensic Medical Entomology	
May 27 (Tu)	16. Arthropod Borne Disease Litigation	
May 29 (Th)	17. Arthropod Infestation Litigation, TERM PAPER DUE	
Jun 3 (Tu)	18. Entomology in Archaeology	
Jun 5 (Tu)	19. Scientific Evidence	C&H pp. 138-154

FINAL EXAM: Tuesday, June 10, 8:00 AM-10:00 AM, 122 Briggs Hall

Lecture Content

1. Introduction to the Course

Course structure, outline, requirements, grading. Introduction of TA's and special guests. Introduction to scope of Forensic Entomology, topical nature of the course and recent evolution of this area of Entomology. Warning about the graphic and explicit nature of the course including death, murder, rape- respect for the beliefs of others. Introduction to the use of a taxonomic key.

2. Sampling and Preservation Techniques

How to collect, kill, prepare, fix, preserve, and curate the various different kinds of arthropods found in forensic studies. Emphasis is on techniques students will use in their field studies. Techniques for gathering evidence in cases of human death, what to look for, what data to collect, what and how to collect arthropods, how to interpret these data, etc.

3. Entomology in Civil Vs Criminal Law

Compare and contrast these two very different forms of action in court, how they are defined, what their potential outcomes are and how entomology is used as evidence or as the basis for litigation.

4. Insect Structure and Function

Introduction to the basic insect body plan, structure of the cuticle, anatomy and physiology.

5. Insect Life History and Diversity

Review and survey of insect life histories, life cycles, metamorphosis and a survey of the most important forensically significant groups.

6. Insect Succession

The community ecology of succession of arthropod populations. Succession in decomposition, a local and global perspective. Introduction to previous and current theories of succession.

7. Insect Development and Temperature

Temperature mediated insect development and principal variables that would affect the estimation of a PMI or establishment of an arthropod infestation.

8. Human Decomposition

Review of the several schemes for classifying stages of decomposition in human and animal remains and how this may vary geographically and seasonally. Simulation and study of human decomposition processes using various dead animal models, particularly pigs, including previous studies worldwide.

9. Entomology in human death

Uses of entomology in investigation of the causes of human death, the duration of the post-mortem interval (PMI), what has occurred in the PMI, some specific case studies illustrating each of these.

10. Decomposing Arthropods I- Beetles et al.

The diversity and biology of insects other than flies found in decomposing human and animal remains.

11. Decomposing Arthropods II- Flies

The diversity and biology of flies other than calypterate muscoids found in decomposing human and animal remains.

12. Decomposing Arthropods III Blowflies

The diversity and biology of blowflies found in decomposing human and animal remains.

13. Decomposing Arthropods IV Flesh and House Flies

The diversity and biology of flesh flies and houseflies found in decomposing human and animal remains.

14. Water, Drugs, Toxins and Insect Decomposition

Arthropods and decomposition in the aquatic environment, effects of recreational chemicals, various poisons and insecticides on population biology and development of insects.

15. Forensic Medical Entomology

Forensic entomology in medical problems caused by insects including spider bite and various envenomizations.

16. Arthropod borne disease litigation

Forensic entomology in public health, arthropod borne disease litigation, and public health policy.

17. Arthropod infestation litigation

Forensic entomology in delusory parasitosis, and mite and other infestations.

18. Entomology in Archaeology

Insect parts and infestations in archaeological remains and their ramifications in ancient life styles and in human commensal insect distribution.

19. Scientific Evidence in Law

Discussion of what constitutes fact, truth, evidence and proof in law, together with an introduction to the 1975 Federal Rules of Evidence. Review of how scientific evidence has been and is viewed and used in the courts. Several major case studies resulting in major changes in how courts perceive scientific evidence will be reviewed, including *Daubert v. Merrell Dow Pharmaceuticals*, *Frye v. United States*, *The state of Alabama v. Perry* and others.

Course Administration

CRN: 62375

Instructor: Robert B. Kimsey Ph.D., Department of Entomology, **Email:** rbkimsey@ucdavis.edu, **Voice:** 752 1597

Office hours: Tuesday and Thursday 12:00 PM –1:00 PM, Rm. 396B Briggs Hall

Lecture times and place: Tuesday, Thursday 11:00-11:50 AM, 122 Briggs Hall

Laboratory times and place: Tuesday, Thursday 3:10-5:00 PM, 122 Briggs Hall

TA: Rebecca A. Bullard, **Email:** rabullard@ucdavis.edu, **TA Office hours:** Monday and Wednesday 11:00 PM – 12:00 PM, Rm. 50 Briggs Hall

Textbooks:

Cats EP & Haskell NH. (Eds.) 1990. *Entomology & Death: A Procedural Guide*. Joyce's Print Shot Inc. Clemson, South Carolina. xii+182pp.

Daily, HV, Doyen, JT & Purcell AH. 1998. *Introduction to Insect Biology and Diversity*. Oxford University Press, New York. vii+680pp.

Administrative Matters: Christy Forristall, Rm. 367, Briggs Hall, 2-0475

Course prerequisites: Open to juniors and seniors that have taken either Bio Sci 1b or Ent 100. The graphic nature of the material presented in this course together with laboratory field trips to the

Sacramento County Coroner's Office (optional) and collection of succession data from decomposing pigs mandates a more mature student audience.

Introduction to the Course

Forensic Entomology incorporates arthropods and their general biology, succession, developmental cycles and population biology into matters of criminal prosecution and civil litigation. Course emphasis is on basic arthropod biology, ecological and developmental concepts, methods, development of reasoning abilities, hypothesis formulation, development of opinions and evidence.

Entomological data are increasingly being used in civil and criminal trials and other legal arenas as evidence in matters of litigation or criminal liability. The professional onus placed on Entomologists is one of developing and presenting reasonable reconstructions of events based on these data. Thus, our opinions and testimony must be drawn from a diverse professional background and presented in a carefully reasoned manner to largely non-educated audiences laden with emotional responses and numerous misconceptions. In essence, we bring biology to the people to help decide matters with serious, sometimes life or death consequences. This course constitutes an effort to train potential Entomologists in how to apply biology to forensic inquiry and to acquaint them with the seriousness of their responsibilities in such matters.

The lectures provide you with the primary material for the course. Thus, it is important that you attend each lecture, take careful notes and do the assigned reading.

Laboratory Sequence, Topics and Schedule

April 1 (Tu) 1.	Sampling, rearing and preservation techniques in Forensic Entomology
April 3 (Th) 2.	Group Project planning meeting at WFCB Ecosystem Facility
April 8 (Tu) 3.	Identification of orders of insects and other arthropods of forensic significance; introduction to the use of pictorial and written taxonomic keys
April 10 (Th) 4.	Families of insects. The beetles, Order Coleoptera
April 15 (Tu) 5.	Families of insects: Adult Nematocera, Brachycera and Cyclorrhapha- Aschiza
April 17 (Th) 6.	Families of insects: Adult Acalypterate Muscoid flies
April 22 (Tu) 7.	Families of insects: Adult Calypterate Muscoid flies
April 24 (Th) 8.	Group Project Setup at WFCB Ecosystem Facility
April 29 (Tu) 9.	Biology and identification of fly maggots
May 1 (Th).	Biology and identification of fly maggots
May 6 (Tu) 10.	Midterm Laboratory Practical Exam
May 8 (Th) 11.	Species identification of adult calypterate flies
May 13 (Tu) 12.	Biology and identification of stored product pests
May 15 (Th).13	Project data processing and preparation for reports
May 20 (Tu).14	Project data processing and preparation for reports, Project reports
May 22 (Th).	Project data processing and preparation for reports, Project reports
May 27 (Tu).	Project reports
May 29 (Th).	Courtroom proceedings (Moot Court Rm., King Hall, Law School)
May 3 (Tu).	Project reports, Review for practical
June 5 (Tu).	Laboratory Practical Exam

You must attend all the labs- they are an integral part of the course. The labs include collection, identification, preservation, rearing, life tables and biology of arthropods common in civil law and in human decomposition. You will be required to participate in a field project in which we shall trace the species and development of arthropods in murder victims, simulated by dead pigs, held under various conditions. You will have the opportunity to participate in field trips to the Sacramento County Coroner's Office (optional) where you may apply what you have learned in real murder cases.

The structure of the early part of the course is determined by two competing objectives, the need to introduce you to some basic concepts in Entomology, Forensics and Law, and to provide you with the information and skills necessary to do the decomposing pig experiments. We must set these up early in the course so that data can be collected over the longest period possible and so that students will have adequate laboratory time to prepare and analyze the data that they collect daily. These experiments are very time consuming and most productive of data in the first 2 weeks, when enormous numbers of specimens are collected and processed, maggots are collected and reared, etc. As the rate of inflow of data diminishes, the time involvement converts to identifying specimens, analyzing and collating data, establishing colonies and the like. These conflicting needs make it difficult to organize and present the course in a logical manner.

Term Paper

You are required to write a 5-page term paper on some aspect of Forensic Entomology. Select one of the topics listed below or devise one of your own. If you chose one of your own then see me about it before you get started.

Use of computer simulations in Forensic Entomology
Molecular biology and genetics in Forensic Entomology
Life table analysis and developmental rates in Forensic Entomology
Forensic Entomology in Archaeology and human Paleontology
Diversity and succession of arthropods in tropics
Effect of recreational chemicals on development of cadaver infesting insects
Contrasting urban and rural forensic entomology
Maggots: succession, development and meaning in decomposing dead people

The report must follow the guidelines listed below. You must have at least 5 references for this paper, *only two of which can be from the Internet*. **DO NOT** refer to any class lectures as part of your paper. I grade on style as well as content. The paper must be double-spaced with 1" margins all around. Final draft due date is May 8. We will review the draft of your term paper, make corrections and suggestions for improvement, and hand it back to you with a grade. At this point, if you are unhappy with the grade, *you have the option of making corrections and turning it back in to improve your grade*. Final due date is May 29.

Introduction - including background information, importance of the subject, and a general overview of the subject.

Discussion - Present a logical sequence of information and discussion. Build your case and support it.

Conclusions - A final overview of the subject, presenting your final concluding remarks – the overall conclusions that you have drawn from your research.

References: References should be given in the text to show where your information came from. **DO NOT use footnotes**. We are using a **science-style** of writing. Direct quotes are rarely used in scientific papers. Rather you should put the information in your own words and attribute the information to the author you got it from. You should use the following citation form in the text (these are given in bold to point out the style. Do not use bold in your paper:

There are 4,500 species of noctuid moths in North America (**Powell et al., 1989**).

Holmes was active in London in 1850 (**Watson, 1988**)

Use the following style for citing references:

Journal:

Powell, J. A., F. R. Andrews and G. Lindsley. 1989. Biodiversity of North American insects. *Amer. Entomol. Soc.* 66:1-14.

Entire Book:

Holmes, S. 1990. *The criminal element in southern London*. Oxford Univ. Press, Oxford, xii + 503 pp.

Book Chapter:

Watson, J. 1988. Living with Holmes. *In*: Watson, W. X. and J. E. Ames. *The history of famous criminologists*. Academic Press, New York, iv + 621 pp.

Grading

The final grades will be based on 1 mid term exam (20%), a final exam (20%), a term paper (20%), two laboratory exams (20%) participation in experiments (20%).

I grade on an absolute scale rather than a curve. This is done to encourage you to study and work together. Because the course is graded on an absolute scale, everyone can get an "A" if they earn it. I hope that you will work in teams and study groups, since they often produce the best results for everyone. In general, I adhere to the following guidelines:

A > 90% B > 80% C > 70% D > 60% F < 60%, with a target average course grade of 75%

I will never raise these cutoffs, but I may lower them if I feel that an exam was unfair or overly challenging.

Lecture exams are comprehensive, with an emphasis on the material since the last exam. Exams may be a combination of multiple choice, fill in the blank, label-the-figure, matching, or similarly formatted questions. There may be unique contexts of questions and material that you have not seen before, requiring you to apply your knowledge to a new situation.

Midterm makeup exams: **My basic policy is "no makeup exams."** They are given only for extraordinary circumstances including hospitalization, serious (and documented) illness or a documented personal crisis. In addition, you must contact me **at least 2 days before the exam** (unless the crisis occurs at the last minute). I will contact you as soon as possible to reschedule a new exam, and I reserve the right to give an oral makeup exam in place of a written one.

Final makeup exam: I do not reschedule final exams, as per university policy.

Forensic Entomology Course Web page

The Ent 158 Web Page will develop as the course proceeds and will have organizational material, office hours, and other important administrative information. It will be a constantly evolving site, so you should check it periodically for relevant material. It is available at:

<http://entomology.ucdavis.edu/courses/ent158/>

Sensitive materials that I do not want the general public to have access to will be posted in a restricted portion of this URL

Some Study Guides and Hints

1. Take careful notes – they are the most important single study tools that you have.
2. Make sure that your notes make sense *soon after class*, while they are still fresh in your mind. If they don't make sense try:
 - a) discussing them with another student.

- b) talking with the TA.
 - c) coming to my office hours or sending me an email.
3. Use lecture handouts and information on the web site - these can be important study tools.
 4. Try to do the reading assignments *before* each lecture. One effective strategy is to briefly go over the readings before the lecture to familiarize yourself with the material. Then go over it again after the lecture, making sure that you emphasize those parts of the reading that were covered in lecture.
 5. Use the laboratory for access to me, study materials, demonstrations, and as a place to study with friends.
 6. Spend all of the time available for the lab **in the lab**.
 7. This course requires a combination of memorization and conceptual understanding. Identify conceptual issues in the lectures and ensure that you can apply them. Try to understand the material, not just memorize it.
 8. Keep up with the course. This is a very tough course to cram in your brain at the last minute. There is too much material for this strategy to work.
 9. An effective study strategy is to try to look at each lecture and identify 3 to 5 major points that were covered in the lecture. You can almost count on getting an exam question on them.
 10. Seek to understand what you got wrong on the exams, and why it was wrong. Learn the right answer (the course is cumulative).

A Word of Advice:

If you find that you are having trouble in this course, please see me early. Do not wait until the last week of class and hope to salvage a poor grade. Be aware that I am not going to cut special deals with individual students for last minute grade improvement. Make it a habit to talk with me, and other students about the course. My job is to help you in whatever way I can to make your experience in this class productive, interesting and enjoyable. However, I cannot seek you out, you must make the effort to contact me! Have a good quarter.