**INTRODUCTION TO FIELD BIOLOGY: DISEASE ECOLOGY**

BIOL-201

**Faculty:**

Michael Hood

### Office: Life Sciences 325, Phone: Ext 8538 Office Hours: by appointment

**Description:**

Advances in organismal biology hinge upon an understanding of natural history and are enhanced by quantitative observation, hypothesis formation, and experimentation with systems that occur in nature. In this course, we will apply these principles specifically to the study of infectious diseases in natural populations. With a combination of lecture, discussion, and field-based activities, the course will focus on deriving important questions and the variety of approaches to address them. While covering the fundamentals of disease ecology, the applicability of the field-based approaches to other areas of organismal biology will be emphasized as a foundation for further studies. Three classroom hours and three laboratory/field work hours per week. Prerequisite: BIOL 181

**Meeting:**

There are two 3-hour meetings per week; Wednesday and Friday 2:00-05:00, LSB 146

**Weekly Activities, Course Requirements and Assignments:**

*Overall Structure*: We will focus on discussing readings and conducting field and laboratory exercises. Some lecturing will take place, often to review/preview basic principles necessary to understand the readings. We will usually spend the first part of class on the readings, then the day's lab introduction, and continue with field or lab work. The semester will start with material on approaches to field biology, and we will transition to independent projects. Students must be prepared to be outside for classes, but flexibility is needed to handle weather or seasonal conditions.

*Presentation of Course Material*: Readings will be journal articles on e-Reserves and textbook chapters that follow the semester's progression in subject matter. Everyone will participate in presenting and discussing journal articles. In addition, students will present individual or group projects. Attendance and participation is required.

*Student Questions on Readings*: By 9am the morning of class, you must submit on the Moodle Forum at least one *thoughtful* question about each of the readings. All questions will also be presented in class for discussion.

**Grades:**

Final grades will be based on the following formula: 5% attendance, 15% submission of thoughtful questions, 15% discussion participation, 30% class project write-ups, 35% independent project write-up and presentation. Late assignments without Dean's approval will have the grade reduced.

Write-ups/Presentations: 1) Students will prepare and present a poster of a disease-of-interest during the week of October 21st. Example posters and instructions will be provided. There will be two write-ups. For the class projects, students can choose for which field study they will prepare a paper. 2) As a major effort of the semester, independent research projects matching the students own interests will be undertaken by each student. An abstract will be due by November 13th. Ideas and examples for possible independent projects will be provided and discussed at length. The independent projects must involve the collection of some original data or correlative analysis of existing data to address a research question. Write-ups take the form of 6-pages, single spaced, with a 4-point abstract, figures and references (more details will be provided). There will be no final exam.

**Intellectual responsibility:**

Make sure you are aware of the AC Honor Code: www.amherst.edu/~dos/conduct/rightsrespon.html

**Safety:**

There are several hazards to note and avoid in this course. First, we will be in the field, and there are two main precautions. One is against poison ivy, which can cause an itchy rash. The species will be identified in the field repeatedly. The second precaution is against tick, which can carry Lyme disease. Students should wear long pants, socks and shoes. Light colors are better, and insect repellent can be used. Also, any time we are working on roadside plants, great caution is needed to stay safe from passing vehicles. Always be mindful of other people's property. Any known allergies (e.g. bee stings) must be identified.

Schedule (progression through the fall semester; each item is about a week):

1. Introduction to Field Biology using Infectious Disease as a Model Topic.

Assessing our awareness: List and discuss diseases we know.

Field Activity: Walk through the wildlife sanctuary; what can we see?

Exercise on finding primary research papers.

Safety and course mechanics.

2. Theory and Experiment in Ecology and Evolutionary Biology.

Discussing how we pursue knowledge in this discipline:

Dichotomies of description vs. hypothesis, and observation vs. manipulation.

Introduction to first study system: fruit flies of mushrooms parasitized by nematodes

(papers by John Jaenike, Amherst alum).

3. Picking a Question and Awareness of its Value.

‘Basic’ and ‘applied’ research and the idea of a question’s relevance.

Field Activity: Quantifying infection rates in nature.

4. Starting with the Obvious: Disease Specialization and Host Range.

Discussing how to rationalize (communicate) pursuit of a question.

Characterizing the ‘shape’ of the Introduction sections of science papers.

Introduction to second study system: foliar fungal diseases of trees.

Field Activity: Construct and set up experiment to test the host range of pathogens.

5. Asking Questions: the Adjustment of Focus.

Speculations on the role of disease in ecological competition.

Re-posing a question at different levels of specificity/generality.

Introduction to third study system: powdery mildew of wild clover.

Field Activity: Set up experiment to test the effect of disease on artificial populations.

6. Presentations of Posters on Particular Diseases.

Researching a topic in primary, secondary, and historic literatures.

Structuring a brief (10-minute) presentation to a broad audience.

7. Reinforcing the Principles (#s 2, 3, and 5) using a Series of Disease Projects.

Introductions and establishment of field studies on the several topics:

Disease Transmission: smut disease of wild carnations (Apex Orchards).

Escape from Enemies: malaria parasite relative in earthworms.

Effects on the Individual: tarspot and leaf drop in Norway maples.

Parasite Variation: extant strains of the Chestnut Blight fungus.

8. Limitations to our Knowledge: We Know What We Study.

Research Activity: ‘Diseases are like the stars,’ the more you look the more you see.

9. Student Presentations of Independent Projects.