METHODS IN ECOLOGY (BIO 22): SUMMER 2018

STAFF

Instructor: Carissa Aoki (LSC 025)
Office hours: Tues. 10-11:30, Wed. 9:30-11:00, Fri. 2:30-4:00
or by appointment

Laboratory Director: Craig D. Layne (LSC 121)

Teaching Assistant: Rebecca Finger (Silsby 4th floor/LSC knuckle)
Office Hours: W 2:00-3:00 or by appointment

COURSE OBJECTIVES

This is an intermediate-level course offering hands-on experience in ecological research methods and the statistical methods required to gain insight from data. Prerequisite: Bio 16 (Ecology). If you have not taken introductory ecology, please contact the instructor as soon as possible, as this course assumes prior familiarity with that material and remedial help is not available.

The goals of this course are to:

- Introduce ecological research methods in a variety of systems
- Introduce statistical methods commonly used in ecological research, and develop fluency in the use of statistical software
- Demonstrate the importance of temporal and spatial scale in influencing the design, results, and conclusions of an ecological study
- Engender an appreciation for natural history and its role in ecological research
- Explore the concept of “inference space”, the degree to which results from one study may or may not be broadly applicable to other times and places
- Provide repeated practice in linking the steps of the scientific process, from the development of an ecological question, through study design and data collection, to analysis and inference
- Improve your skills in finding, reading, and appropriately citing scientific articles relevant to a particular research question
- Gain skills in collaborative work: designing, conducting, analyzing, and interpreting ecological studies in a group context
- Practice giving and implementing constructive feedback
- Hone your ability to communicate your results graphically, orally, and in writing
COURSE MEETINGS

This is an immersive experience in ecological methodology. As such, your prompt attendance at all course meetings is required. If you need to miss a class, please let me know as soon as possible so that appropriate arrangements can be made. Unexcused tardiness or absences will be penalized.

“Lectures”: Mondays, Wednesdays, and Fridays, 12:50-1:55 pm, LSC 105
x-Hours: selected Tuesdays 1:20-2:10 pm (see calendar for details), LSC 105
Laboratories: Monday afternoon, 2:15-6:15 pm, LSC 102 (we may not use the whole time every week).
Exam: This course does not have a final exam, but you are required to be present during the time scheduled for an exam, for final project presentations. The date is Saturday, August 25 at 3:00 PM.

STUDENT RESPONSIBILITIES
1. Attend all course meetings: “lectures”, x-hours, and laboratories.
2. Actively participate in all class activities
3. Come to each class activity prepared (i.e., having done the required preparations for “lecture”, wearing appropriate clothing for lab, etc.)
4. Turn in all written assignments on time
5. Read and comprehend the papers and other readings cited in assignments
6. Actively try to make connections across assignments to build a big picture of how ecological knowledge is obtained and grows over time
7. Work effectively as a member of a research team
8. Seek help when needed through office hours, one-on-one appointments, email, or phone

FACULTY RESPONSIBILITIES
1. Be organized and well-prepared throughout the course
2. Be knowledgeable about the course material
3. Stimulate interest in the course material
4. Explain course material clearly and efficiently
5. Answer student questions thoroughly
6. Be available for, and amenable to, consultations regarding the course & course material
7. Use methods of evaluation (e.g., worksheets, presentations, projects) that provide a representative test of student knowledge and understanding of the course material
8. Grade student work fairly and return it promptly
9. Be receptive to student suggestions for improvement

TEACHING ASSISTANT RESPONSIBILITIES
1. Attend all class activities
2. Serve as a liaison between students and the professor
3. Grade student work fairly and return it promptly
4. Coordinate data entry after each laboratory session
5. Be available for, and amenable to, consultations regarding all aspects of the course material
GENERAL INFORMATION

Course Website: We will make extensive use of Canvas to distribute digital materials for this course and for electronic submission of part or all of many assignments. Details will be discussed at our first few course meetings. Each course participant should ensure that they will be emailed Canvas announcements immediately upon posting and should also check the site regularly for updates.

Resources:
(1) JMP® Statistical Software. You will need access to JMP in order to analyze the data we collect in our weekly laboratory sessions. (If you do not have a laptop, please see Craig right away to make alternate arrangements.) The following links will take you to the download pages. **You will need to have JMP running on your computer prior to our June 26 x-hour. Please be sure to install JMP Pro (advanced), not JMP (basic).**
   - Macintosh: [http://tech.dartmouth.edu/its/services-support/help-yourself/knowledge-base/install-jmp-or-jmp-pro-mac](http://tech.dartmouth.edu/its/services-support/help-yourself/knowledge-base/install-jmp-or-jmp-pro-mac)
   - Windows: [http://tech.dartmouth.edu/its/services-support/help-yourself/knowledge-base/install-jmp-or-jmp-pro-windows](http://tech.dartmouth.edu/its/services-support/help-yourself/knowledge-base/install-jmp-or-jmp-pro-windows)

(2) There is no required textbook for this course, but there will be readings from the scientific literature, in addition to two books (assignments related to these readings will be posted on Canvas):

(3) If you find you need more reference reading, you’ll find most ecology books at “Dana Library,” which requires that you identify the book you need in the library catalog, then request that the book be delivered from storage.

(4) Peer-reviewed articles: Required readings will be available on Canvas. Those you track down on your own can be found using library-based resources such as ISI Web of Science: [http://isiknowledge.com/wos](http://isiknowledge.com/wos). **Note:** you will need to be logged in to Dartmouth Secure (on campus) or through the VPN client (off campus) to access Web of Science and related papers. We will have a class session to develop the skills you’ll need to find peer-reviewed papers for the preparatory and synthesis assignments.

Late assignment policy: Other than for special circumstances that are documented (e.g., a medical issue accompanied by a note from Dick's House), late assignments will be docked 10% of the total score per day late. Please contact me as soon as possible if you anticipate an issue submitting an assignment on time.

Help: *This is a subject best learned by doing*—falling behind in the early weeks of this course will be fatal. Immerse yourself in the material. Do not be afraid to seek help early and often! Help can be obtained from the teaching staff during office hours or by appointment. Note that we strongly encourage you to work in groups for much of this course, since much can be learned from comparing how different people address the same problem. The instructions for each
quantitatively graded assignment will clearly spell out when it is and is not appropriate to work with others (see also HONOR PRINCIPLE, below).

**Special Needs:** I encourage students with disabilities, including “invisible” disabilities such as chronic illnesses and learning disabilities, to arrange for accommodations that might be helpful. Please meet with me as early as possible in the term to discuss possible accommodations. If you are already working with the Student Accessibility Services (SAS) office, please bring your original Services and Consent Form and/or a letter on SAS letterhead to the meeting. If you are new to accommodations, you will need to register with the SAS office and obtain authorization first (see dartmouth.edu/~accessibility). All inquiries and discussions will be kept confidential by the teaching staff.

**Mental health:** We recognize that the academic environment at Dartmouth is challenging, that our terms are intensive, and that classes are not the only demanding part of your life. Dartmouth offers resources to support your wellness, including:

- Your undergraduate dean (http://www.dartmouth.edu/~upperde/);
- Counseling and Human Development (http://www.dartmouth.edu/~chd/); and
- The Student Wellness Center (http://www.dartmouth.edu/~healthed/).

I encourage you to use these resources and to feel free to come speak with me about related issues that may impact your coursework.

**Religious holidays:** If you have a religious observance that conflicts with the course schedule, please come speak with me early in the term and I will be happy to develop appropriate accommodations.

**COURSE REQUIREMENTS**

As stated above, this is an immersive experience in ecological methodology. We are asking you to work steadily throughout the term by spending several hours preparing for each course meeting. Your performance in the class will be assessed continuously through daily preparatory assignments, your performance during class meetings, weekly synthesis exercises, a final project, and class participation. Each of these methods of assessment is explained in more detail below.

**Out-Of-Class Preparation For Class Activities**

*Advance preparation is essential to this course running smoothly.* To maximize productivity during our in-class time, you will come to most MWF class meetings having completed some sort of assignment. You may also be asked to take a short quiz or to submit one or more of your answers online through our class Canvas site.

After each lab, individuals or teams of students will be responsible for completing sample processing and having the data entered into Excel spreadsheets by 9 AM on Tuesday morning.

All preparatory assignments will be graded on the following qualitative scale: Excellent, well above expectations (4 of 4); Above expectations (3.5-3.75); Good, meets expectations (3-3.5); Needs improvement (2.5-3); Inadequate (2); < 24 hours late (1) and > 24 hours late (0). Taken together, these assignments will be worth 25% of your final grade, beginning with the second unit. The first unit will be recorded as pass/fail.
Synthesis Assignments
At the end of each unit, we will ask you to synthesize what you have learned by completing a synthesis assignment. These will typically be due at the start of class on Monday as printed, typed documents complete with embedded figures and captions. The questions on these assignments will ask you to analyze your findings from that week’s lab and to integrate what you’ve learned with the course goals, including thinking about follow-up questions, hypotheses, and studies to test those hypotheses. These assignments will be graded on a numeric scale (i.e., out of 20 pts, 40 pts, etc.) and be worth 35% of your final grade. All assignments will be included in this calculation.

Field Notebook / Natural History
Keeping a good notebook is an essential skill for field ecology. You will be asked to keep a field notebook for the duration of the class. In addition to taking notes for labs, you will also have a natural history assignment that will require you to go out on your own several times during the summer, to make observations and take notes. Notebooks will be periodically collected for grading. A short weekly Canvas assignment related to natural history will also be part of this grade. The notebooks plus the Canvas assignments will add up to 10% of your grade.

Final Project
During the last two weeks of the term, we will ask you to complete an exercise that will put together much of what you’ve learned in this class (counting for 15% of your final grade). It will combine group and individual work, be graded on a numeric scale (in several discrete parts), with the final portion due during the final exam period: Saturday, August 26 at 3pm. (There will be no final exam, but your attendance at this session is required.)

In–Class Performance
Bio 22 assumes active participation of all students throughout the term. We will assess how you’re doing on in-class activities by assigning qualitative scores for a number of regular in-class course activities. These scores will be worth 10% of your final grade. Not all presentations, discussions, and labs will be “graded”, but you should assume that a member of the teaching staff is taking note of the quality of your contributions to our in-class activities.

Class Participation
Finally, class participation will count for 5% of your final grade, based on:
• Attendance, timeliness, politeness, and appropriate dress, as judged by the student and the teaching staff. Tracking of attendance will occur on ten random days throughout the term.
• Being a good “team player” in group activities.
Summary: weighting of different assessment tools

Your final grade will be based on the total number of points earned relative to other students in the class, summed across the different methods of assessment and weighted as follows:

<table>
<thead>
<tr>
<th>Method of Assessment</th>
<th>Contribution to Final Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Out-of-class preparation for class activities</td>
<td>25%</td>
</tr>
<tr>
<td>Synthesis assignments</td>
<td>35%</td>
</tr>
<tr>
<td>Final project</td>
<td>15%</td>
</tr>
<tr>
<td>Field Notebook / Natural History</td>
<td>10%</td>
</tr>
<tr>
<td>In-class performance</td>
<td>10%</td>
</tr>
<tr>
<td>Class participation</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

**HONOR PRINCIPLE**

The Dartmouth Honor Principle applies to all work you submit for a grade in this course. Consequently, all work you turn in must be your own unless the assignment is explicitly identified as a group activity. We will work hard to make these identifications clear and consistent, but when in doubt, err on the side of caution and don’t collaborate!

You are allowed to:

- **Discuss** the preparatory assignments with classmates, so long as ideas from others are acknowledged appropriately. In this context, “discuss” means face-to-face contact, not communication via email or the web. For example, a group of 2-3 students might get together to look for references that might be appropriate for a Friday prep assignment, divvy up the most interesting-looking papers among group members, and then compare notes on what they’ve found in those papers. Alternatively, they might meet to compare notes about data analysis plans for a Wednesday prep assignment. However, all actual writing of worksheet answers must be done independently.

- Use ideas from the class discussions in a synthesis assignment, so long as they are appropriately acknowledged.

- Share electronic files associated with data analysis (e.g., Excel graphs, JMP output, model output) or group presentations (e.g., PowerPoint shows).

You may not:

- Share electronic files for preparatory or synthesis assignments with classmates (except for group data analysis, as described above).

- Discuss the synthesis assignments with classmates outside of class time.

- Discuss the final project individual synthesis assignment with teammates.

When in doubt, please ask!
LAB SCHEDULE
(Subject to change, see Canvas calendar for updates)

<table>
<thead>
<tr>
<th>Lab Date</th>
<th>Topic and Location</th>
<th>Tips on Lab Attire</th>
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<tbody>
<tr>
<td>25 June</td>
<td>Hubbard Brook Field Trip: Introduction to Field Data Collection</td>
<td>Any of our trips to outdoor field locations could be buggy, rainy, cold or hot.</td>
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<tr>
<td>2 July</td>
<td>Bat acoustic ecology / Moths</td>
<td>You are responsible for bringing your own water and snacks.</td>
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<tr>
<td>9 July</td>
<td>Ecology of land use change</td>
<td>Ticks and poison ivy may be issues. We highly recommend that you wear:</td>
</tr>
<tr>
<td>16 July</td>
<td>Crawfish: Behavioral ecology</td>
<td>• Long pants</td>
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<tr>
<td>23 July</td>
<td>Organic Farm: Agricultural experiments</td>
<td>• Boots/sneakers</td>
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<tr>
<td>30 July</td>
<td>Marsh-Billings Park: Utilizing inventory and monitoring data</td>
<td>Long socks are also helpful against ticks (tuck your pants into the socks). A long- sleeved shirt can help protect you from sun and insects.</td>
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<tr>
<td>6 August</td>
<td>Charles Brown Brook: Fish life history and communities</td>
<td>You may also want to bring:</td>
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<tr>
<td>13 August</td>
<td>Group Projects – Week 1 Data collection</td>
<td>• Rain gear</td>
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<td>20 August</td>
<td>Group Projects – Week 2 Data collection and/or indoor group work, depending on progress</td>
<td>• Bug spray</td>
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<td>• Sunglasses</td>
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<td>• Hat</td>
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<td>• Sunscreen</td>
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<td></td>
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<td>• Head net</td>
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