EEB 511 Graduate Evolutionary Biology (CORE) - Fall 2013

The EEB graduate ecology and evolutionary biology class is intended to provide a rigorous introduction to current knowledge in key, "core", areas of evolution and ecology. Successful completion of this course should bring you to a level of sophistication that allows you to read and critically evaluate the current literature, and to discuss both evolutionary topics with visiting speakers and (ultimately) search committees and potential employers. A spring complementary course will do the same for ecology.

Central learning objectives: This course is not intended to teach you everything you need to know about evolution. Instead, we hope to help you develop a foundation of knowledge and confidence upon which to build the specialized knowledge needed for your individual research program and the breadth of knowledge needed to participate in academic science. We also hope that the course and the topics discussed may lead to new collaborations.

Course Organizers:	Brian O'Meara (bomeara@utk.edu, 974-2804, 427 Hesler) Ben Fitzpatrick (benfitz@utk.edu; 974-9734; 524 Hesler)
Other instructors:	Jeremy Beaulieu, Joe Williams, & Jim Fordyce
Meetings:	427 Hesler Biology Mon & Wed 2:30 – 4:25
Course Number:	Fall: EEB 511 – 4 credit hours
Office Hours:	O'Meara, Mondays at 1:30 in Hesler 446. Other faculty available by appointment.
Readings:	Assigned readings available on BlackBoard (http://online.utk.edu) *An Introduction to Population Genetics Theory and Applications*, Nielsen & Slatkin. Sinauer Associates.
Software:	R (free online)

Format: This course covers a series of modules that represent major conceptual areas within EEB in evolution; a similar course will follow for ecology. The course will include a combination of lectures, discussions, in-class exercises and/or homework led by a variety of faculty members. Promoting interaction between diverse faculty and first-year students is an important function of the core. A strong emphasis will be placed on independent reading. Several papers for each module will be made available to students via the course BlackBoard site. These papers will include both classic papers and modern treatments or examples. Some of these papers will be discussed in class, but not necessarily all. Students are expected to have read and studied all papers prior to coming to class. We strongly suggest that you form a reading group to discuss the papers outside of class time.

Grading: There will be a midterm and a comprehensive final exam. There are two possible dates for the final exam, based on the exam schedule: Dec. 12 and Dec. 5. The date of the exam will be chosen early in the semester through consultation with students. Questions from each module

will be included on these exams. Each module might also include writing assignments, problem sets, and/or in-class exercises (which may be announced ahead of time or not). Your grade will also be based on your preparation for, and participation in, class discussions. You may be quizzed on earlier material later in the course. A final grade of B or higher is required in this course for students to be classified as making adequate progress in the graduate program. [Note: consult the graduate student handbook on annual progress reports].

Grades in graduate study have the following meanings.
A (4 quality points per semester hour) superior performance.
B+ (3.5 quality points per semester hour) better than satisfactory performance.
B (3 quality points per semester hour) satisfactory performance.
C+ (2.5 quality points per semester hour) less than satisfactory performance.
C (2 quality points per semester hour) performance well below the standard expected of graduate students.
D (1 quality point per semester hour) clearly unsatisfactory performance and cannot be used to satisfy degree requirements.
F (no quality points) extremely unsatisfactory performance and cannot be used to satisfy degree requirements.

Any student who feels s/he may need an accommodation based on the impact of a disability should contact the instructors privately to discuss your specific needs. Please contact the Office of Disability Services at 865-974-6087 in Hoskins Library to coordinate reasonable accommodations for students with documented disabilities.

This syllabus is subject to change at the discretion of the instructors. Students will be informed of relevant changes during the course.

This section of the course will feature exercises in R. We recommend bringing a laptop with R installed to the first class. If you do not have a laptop, please let the instructors know; there may be teaching laptops available.

Schedule of Topics and Instructors:

Week	Date	Day	Subject	Instructor
0	21-Aug	W	Welcome, pre-test, laptop test	All
1	26-Aug	M	History and overview	Fitzpatrick
	28-Aug	W	Mechanics of research	O'Meara
2	2-Sep	M	Labor day	
	4-Sep	W	R for EEB	Fordyce
3	9-Sep	M	R for EEB	Fordyce
	11-Sep	W	R for EEB	Fordyce
4	16-Sep	M	Alleles, genotypes, and Hardy-Weinberg	Fitzpatrick
	18-Sep	W	Drift and mutation	Fitzpatrick
5	23-Sep	M	Coalescence	Fitzpatrick
	25-Sep	W	Population subdivision	Fitzpatrick
6	30-Sep	M	Inferring population history	Fitzpatrick
	2-Oct	W	LD and QTL mapping	Fitzpatrick
7	7-Oct	M	Selection I	Fitzpatrick
	9-Oct	W	Selection in finite populations	Fitzpatrick
8	14-Oct	M	Neutral theory	Fitzpatrick
	16-Oct	W	Interaction and conflict	Fitzpatrick
9	21-Oct	M	Quantitative genetics	Fitzpatrick
	23-Oct	W	Phylogenetics and systematics	O'Meara & Beaulieu
10	28-Oct	M	Phylogenetics and systematics	O'Meara & Beaulieu
	30-Oct	W	Phylogenetics and systematics	O'Meara & Beaulieu
11	4-Nov	M	Phylogenetics and systematics	O'Meara & Beaulieu
	6-Nov	W	Evolutionary processes and inference	O'Meara & Beaulieu
12	11-Nov	M	Evolutionary processes and inference	O'Meara & Beaulieu
	13-Nov	W	Evolutionary processes and inference	O'Meara & Beaulieu
13	18-Nov	M	Evolutionary processes and inference	O'Meara & Beaulieu
	20-Nov	W	Evolutionary processes and inference	O'Meara & Beaulieu
14	25-Nov	M	Evo Devo	Williams
	27-Nov	W	Evo Devo	Williams
15	2-Dec	M	Overview and review	All

Fall Writing Assignment

Writing grant proposals is a very important part of science. This is, after all, how we fund our research. Writing proposals also functions to help focus our minds on what we actually plan to do to contribute to science. You will be required to write a grant proposal as part of this course, but it will also function to (1) get you started on a research project that will contribute materially to your career, and (2) provide a real funding opportunity. Your finished proposal will be submitted to our internal graduate research funding competition, should be submitted to any number of external funding sources, and might form a foundation for your thesis/dissertation proposal. **Note that you should adhere to the structure guidelines included below** (i.e., page length). The assignment will be completed in 5 stages:

1. **Pre-proposal: 18 Sep, 20 points.** Write a **one page** summary of what your proposal will address. Here you will present the specific research questions your proposal will address. Describe how they fit into the larger context of evolution/ecology. Describe the organisms (or equations) you will study and what methods you propose to answer your specific questions. This is basically a mini proposal for your proposal. It should emphasize the broader context and big ideas, while clearly spelling out focused, answerable research questions. Use references, properly cited (We strongly recommend that you use a bibliography program like EndNote or Bibdesk – this is a great way to quickly reformat your documents for different grant opportunities or journals. If you start now to build an organized database of papers, you will benefit for the rest of your career!). **This pre-proposal should be read and approved by your adviser.**
2. **Annotated bibliography: 25 Sep, 20 points.** Write an annotated bibliography entry for each of 3 papers relevant to your proposal. Start with a paragraph summarizing your proposed project. For each paper, give the full bibliography entry, the published abstract (cut and paste), and then write your own summary that includes (i) the question(s) addressed, (ii) why they are important, (iii) brief statement of the methods used, (iv) results and conclusions, (v) why the study is relevant to your project, (vi) questions or criticisms you have of the study. Ideally, you should identify a few key papers that are valuable primarily for helping you with concepts, and others that are valuable primarily for ideas about methods.
3. **Full draft: 16 Oct, 20 points.** This complete draft will be read by three of your classmates. It should be no longer than **3 pages (12 pt font, single spaced, 1 inch margins).** Proper citations should be used throughout. Tables and figures may be placed as appropriate in the body of the proposal. Be sure that any material that is reproduced from sources is done so legally and with proper citation (ask if you have a question). The proposal should clearly present your research questions and why they are important. Provide background and explain why this work will advance evolution/ecology. Explain how results will be interpreted to provide answers. The proposal should include the following parts: (1) brief summary stating the goals and importance of the project, (2) introduction providing a review of the important literature. The conceptual background and previous research should be explained so that the readers will understand why the work is interesting and important (get people excited and curious). The introduction should end with a clear set of questions/hypotheses/predictions (it's OK to present a bulleted list). (3) A methods section clearly relating each of the questions/hypotheses/predictions to an investigative activity. Include proposed data

analysis and interpretations of alternative outcomes. (4) Budget and budget justification. (5) Literature cited.

4. **Peer review: 23 Oct, 20 points.** You will be assigned three proposals to read and provide constructive criticism. This is an opportunity to see what other people are doing and think about what works and doesn't work. Your review should go over how well each of the 5 sections address their goals, how clear/correct is the writing from a technical standpoint, and how well the ideas and activities are described and presented in an integrated package. Are you convinced this is a good idea?
5. **Final draft: 4 Nov, 20 points.** Turn in your final proposal after incorporating suggestions from the peer review and any additional development of your ideas. Again, it should be no longer than **3 pages (12 pt font, single spaced, 1 inch margins).** This final proposal should be read and approved by your adviser.
6. **Optional:** Submit to the NSF Graduate Research Fellowship program: http://www.nsfgrfp.org/ . Deadline is Nov. 5 for mathematical sciences, Nov. 7 for STEM education & learning research, and Nov. 8 for life sciences and geosciences.