

PCB6675: Evolutionary Biology

Catalog description:

PCB 6675 COS-BIOL3(3,0). Evolutionary Biology: PR: Admission to the MS Biology, Ph.D. in Conservation Biology, or Certificate in Conservation Biology, or C.I. Review of modern concepts and theories in evolutionary biology with emphasis on readings from the primary literature.

Class and Lab Meeting Time (note that classes and labs are combined):

Room BIO212, some labs are in BIO305, see schedule

Wednesdays: 3:00pm – 5:00pm

Fridays: 3:00pm – 5:00pm

Instructor:

Dr. Barbara Sharanowski

Biology 441, phone: 823-0675

barb.sharanowski@ucf.edu

Office Hours: Monday 1:00-4:00, Friday 9:30am – 10:30am, and by appointment

Scope: The goal of this course is to provide students with a competent understanding of evolutionary theory. It will cover a diverse range of topics including the history of evolutionary thought, the fossil record, phylogenetics, speciation, population genetics, quantitative genetics, life history evolution, the evolution of sex, behavior, and genes and genomes.

Student Learning Outcomes:

After completion of the course, students should be able to:

(Cognitive)

- Understand Darwinian evolutionary theory, including the roles of variation, inheritance, natural and sexual selection, phenotypic variation, environmental factors, life histories, and adaptation
- Comprehend the application of phylogenetic reconstruction to the study of evolutionary processes
- Describe how population genetics contributes to the understanding of key evolutionary processes, including variation, natural selection, fitness, and genetic drift
- Understand the significance of key events in evolutionary time and its effects on the history of life on earth
- Describe evolution on the molecular level, including molecular clocks and evolution of multi-gene families
- Understand the role of evolution in the development of organisms

(Behavioral)

- Use a variety of evolutionary software to analyze genetic datasets for testing evolutionary hypotheses
- Reconstruct phylogenies and test processes of speciation
- Analyze genetic datasets and test evolutionary hypotheses of population structure based on genetic statistics
- Develop hypothesis testing in evolutionary biology, through critical analysis of research articles in the primary literature and PBL modules

(Affective)

- Understand the value of scientific rigor and appropriate hypothesis testing in evolutionary research
- Appreciate the value of evolutionary research to applied science

Course Philosophy:

Students' Learning Responsibilities

Students are expected to practice personal and academic integrity and to take responsibility for one's own personal and academic commitments. Within the context of this class, regular attendance is critical to facilitate effective learning. Participation in class is expected and essential for problem-based learning. Students should respect others and contribute to cooperative learning by promoting a respectful atmosphere and striving to learn from differences in people, ideas, and opinions. Students are highly encouraged to ask for help under any circumstances, but particularly if having difficulty with material or learning in a cooperative group setting.

Classroom Conduct: By enrolling at UCF, all students have agreed to abide by the Golden Rule. Please become familiar with this document at: <http://www.goldenrule.sdes.ucf.edu/>. Please also use common courtesy in class by arriving and departing on time, refraining from sleeping/ talking during class, and **turning off** cell phones, music devices, etc. Students are responsible for all announcements made or assignments given during class. Students who fail to abide by the above may be asked to leave the class.

Academic Integrity:

Plagiarism or any other form of cheating in examinations, term tests or academic work is subject to serious academic penalty. Cheating in examinations or tests may take the form of copying from another student or bringing unauthorized materials into the exam room, including cell phones or computational devices. Exam cheating can also include exam impersonation. A student found guilty of contributing to cheating in examinations or assignments is also subject to serious academic penalty. Plagiarism involves an attempt to pass off the work and ideas of others as one's own and is considered cheating. Citing all sources for ideas, images, or otherwise is essential. Students must cite the source of images used in their presentations, but are encouraged to take their own photographs. Students should acquaint themselves with the University's policy on plagiarism, cheating, exam impersonation, and duplicate submission (see <http://www.goldenrule.sdes.ucf.edu/>). Electronic detection tools may be used to screen assignments in cases of suspected plagiarism.

Disability Access Statement:

The University of Central Florida is committed to providing reasonable accommodations for all persons with disabilities. This syllabus is available in alternate formats upon request. Students with disabilities who need accommodations in this course must contact the professor at the beginning of the semester to discuss needed accommodations. Students who need accommodations must be registered with Student Disability Services, Student Resource Center Room 132, phone (407) 823-2371, TTY/TDD only phone (407) 823-2116, before requesting accommodations from the professor.

Instructor's Notes:

The instructor reserves the right to make changes to the syllabus and the management of the class at any time during the semester. These changes will be announced in lecture. If the student is in disagreement with anything contained within the syllabus (e.g. course material, structure, grading policy, etc), it is recommended that the student withdraw from the course prior to the university posted deadline. The instructor also reserved the right to adjust grades up or down upon a request for a re-assessment by the student.

Inquiries to the Instructor:

Students are encouraged to discuss issues pertaining to assignments with the instructor well in advance of deadlines. While every effort will be made to return student inquiries via email as soon as possible,

students should expect a minimum of 24 hours to receive a response. Students are encouraged to drop by the instructor's office for assistance (Room BIO 441), particularly during office hours.

Instructional Methods:

This course combines traditional lecture, problem-based learning modules, and discussions to achieve course and learning objectives. Traditional lectures are intended to orient students to general principles of each topic to facilitate active participation in discussion and development of critical thinking skills in problem-solving. Lab sessions will involve problem-based learning activities and analysis of datasets to solve evolutionary problems.

Late Assignments:

Late assignments will be deducted 10% of the final grade for that assignment for every 24-hour period it is late. Assignments must be submitted at class time on the date and time due. Late is considered past the set time noted in the due date. Thus, if an assignment is due at 8:30am and is handed in at 1pm on the same day, it is still considered 1 day late. Late assignments should be handed in to the instructor in class.

Missed Assignments:

To pass the course, all items for which a mark is allocated must be completed and submitted. Unexcused missed assignments will result in a failure of the class. Where assignments are missed and excused through written notification such as a doctor's certification of illness, evidence of death in the family, or other circumstances that are beyond the control of the student, the student may be given the following options:

- 1) Complete the assignment and receive the late assignment penalty as described above,
- 2) Establish a new due date with the instructor and complete the assignment without penalty when handed in by the new due date, or
- 3) The final grade will be determined by increasing the value of the final class exam by the amount that would have been allocated to the missed assignment. **Option three is only viable under extreme circumstances.**

Missed Exams:

See above, however all students must write the class final exam to pass the course. If the final exam has been missed for a valid, documented reason such as illness, or death in the family, another exam date will be set at the discretion of the instructor.

Course materials:

A. Required Textbook – Evolution. Futuyma, D.J. 2009. Third Edition, ISBN: 978-1605351155

B. Supplemental material: There will be assigned readings for discussion from the primary literature as well as dataset files and information for PBL modules.

Assessment and Grades:

Grade Evaluation

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| • PBL Module 1 – Phylogenetics, Speciation, and Biocontrol (Group Work) | 20% |
| • PBL Module 2 – Populations, Genetic Variation and Conservation (Group Work) | 20% |
| • Participation (Discussions) | 10% |
| • Class Midterm | 20% |
| • Class Final | 30% |

Grading Scheme: A = 100-86; B = 85-70; C=69-60; D=59-50; E/F (fail) < 50

Description of Examinations:

Class Midterm and Final

The midterm and final exam will consist of multiple-choice, short-answer and essay questions about specific topics covered in lectures and class discussions. Questions will assess student's mastery of the content and ability to communicate and defend viewpoints on specific issues related to evolutionary biology and test evolutionary hypotheses.

An exploratory test will be given out on the first day to test student's knowledge and background information upon entering the class. There are no grades associated with this test, it is purely to assist the instructor.

Description of Assignments:

1. **Problem Based Learning (PBL) Module 1: Phylogenetics, Speciation, and Biocontrol**
 - a. Students will be assigned to groups of 3-4 students to work together to test evolutionary hypotheses on speciation. This module will focus on reconstructing phylogenies with molecular data, examining species concepts and process of speciation, and testing barriers to gene flow. There are multiple elements of the assignment and students should refer to the module handout for additional information and grading rubrics.
2. **PBL Module 2: Populations, Genetic Variation and Conservation**
 - a. Students will be assigned to groups of 3-4 students to work together to test evolutionary hypotheses on inbreeding, population structure, gene flow, and genetic drift. This module will focus on analyzing microsatellite data to understand the population structure of an endangered species. There are multiple elements of the assignment and students should refer to the module handout for additional information and grading rubrics.
3. **Participation in Discussions:** Readings will be assigned from the primary literature and discussed following lecture on certain days. The goal of in-class discussions are to enhance students understanding of hypothesis testing with real datasets and fundamentals of performing evolutionary research. The main point is to critically evaluate the reading material in context with the hypotheses being tested and critically evaluate the methodology, formulate opinions, and learn to defend those positions. Listening and expressing ones viewpoints are equally important tasks, as well as respecting diversity of opinions.

Assignment and Exam Due Dates:

- Wednesday August 24, 2016: Pretest
- Wednesday September 21, 2016: PBL Module 1
- Wednesday October 12, 2016: PBL module 2
- Friday, October 28, 2016: Midterm
- Class Final - TBA

Course Schedule:

See Next Page

Course Schedule (subject to change, see Instructor's Notes above)

Color code: pink – tests and assignments; blue – Dr. Sharanowski away; green: PBL days (attendance essential); yellow, classes cancelled by UCF. Readings and Self-labs are mandatory.

Date	Day	Topic	Tests and Assignments	Room	CH
24-Aug	W	Class Overview, PBL Overview, Intro to Evolutionary Biology		212	1
26-Aug	F	Self Reading	Reading Assignments		
31-Aug	W	History of Life on Earth	Taught by Dr. Fedorka	212	5
2-Sep	F	MEGA tutorial - PBL module 1	See instructions online; Self-lab (Help from Alexa)	305	
7-Sep	W	Classification and Phylogeny - Phylogeny Lab 1	PBL module 1 - submodule A	212/ 305	2
9-Sep	F	Species	PBL module 1 - submodule B	212/ 305	17
14-Sep	W	Speciation	PBL module 1 - submodule C		18
16-Sep	F	Patterns of Evolution, Fossil Record			3, 22
21-Sep	W	Evolution of Biodiversity	PBL module 1 due, reading assigned		7
23-Sep	F	Origin of Genetic Variation	discussion of reading	212	8
28-Sep	W	Genetic Structure of Populations	PBL module 2 - submodule A	212/ 305	9
30-Sep	F	Self lab: Population lab (hand calculation) (with help from Alexa)	Self Lab assignment	212	9
5-Oct	W	Genetic Drift	PBL module 2 - submodule B	212/ 305	10
7-Oct	F	Classes Cancelled - Football	Group work for PBL module completion		
12-Oct	W	Natural Selection and Adaptation	PBL module 2 due	212	11
14-Oct	F	Genetical Theory of Natural Selection I	reading assigned	212	12
19-Oct	W	Genetical Theory of Natural Selection II	discussion of reading	212	12
21-Oct	F	Phenotypic Evolution I	reading assigned	212	13
26-Oct	W	Phenotypic Evolution II	discussion of reading	212	13
28-Oct	F	Midterm	midterm		
2-Nov	W	Life Histories		212	14
4-Nov	F	Sex and Reproductive success I	reading assigned	212	15
9-Nov	W	Sex and Reproductive success II	discussion of reading	212	15
11-Nov	F	No Class - Veteran's Day	No Class - Veteran's Day, reading assigned		
16-Nov	W	Conflict and cooperation		212	16
18-Nov	F	Evolution of Interactions Among Species, Macroevolution	discussion of reading	212	19, 22
23-Nov	W	Evolution of Genes and Genomes			20
25-Nov	F	No Class - Thanksgiving	No Class - Thanksgiving		
30-Nov	W	Evolution and Development	reading assigned	212	21
2-Dec	F	Evolution vs. Creationism; Class Wrap Up - Review	Discussions	212	23
7-Dec	W	Final Exam	1:00pm - 3:50pm	TBA	