

**BIOLOGY 481/681 -- PRINCIPLES OF EVOLUTION
COURSE SYLLABUS – Fall 2005**

This course will focus on both the pattern and process of evolution. It will consider explanations for patterns of diversity and for the apparent "good fit" of organisms to the environment. Topics covered include phylogenetic classification, the processes of evolutionary change, concepts of fitness and adaptation, speciation, and macroevolutionary pattern.

Lectures: TR 9:45-11:15, Elvey Aud.

Labs: T 2:00 – 5:00, BUNN 409

W 2:15 – 5:15, BUNN 409

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Textbook: Futuyma, D.J. 2005. *Evolution*, 1st Edition, Sinauer Associates.

Prerequisites: BIOL 271, BIOL 362, STAT 200

Course Goals

Biol 481 is the 'capstone' course for UAF biology majors, and Biol 681 provides a foundation in evolutionary theory for graduate studies in biology and wildlife. The biological disciplines are unified by underlying evolutionary processes. This course presents an overview of the field of evolutionary biology. It will draw on the information you have gained in other courses and should also assist you in finding links between seemingly disparate fields of biology. You may find the study of evolution to be more conceptual than some of your earlier biology courses. This is both the nature of the discipline and also the nature of more advanced learning in any field – the material turns from concrete facts to more abstract concepts. Therefore another goal of this course is to expose UAF biology students to a more advanced level of study and prepare them to go on in biology-related fields. Finally, we use this course to ensure that our undergraduates are exposed to the full process of scientific research: generation of questions and hypotheses, experimental design, data collection, analysis, interpretation, and presentation.

Student Learning Goals

The successful student will complete this course with a variety of new knowledge and skills. I always stress that at the very least, everyone should come away understanding the four forces of microevolution and how they interact to bring about evolutionary change or to perpetuate stasis. In addition, students should gain an understanding of the manner in which organisms are phylogenetically classified, the major modes of speciation, predominant macroevolutionary patterns and the forces behind them. In addition to this knowledge, students should gain skills in critical thought and the experimental method.

Course Mechanics

BIOL 481 Grading

Breakdown:

Exam 1	10%	Graded Lab Exercises	16%
Exam 2	10%	Questions on Journal Articles	8%
Exam 3	10%	Semester Project	18%
Final Exam	18%	Lab Attendance**	
Quizzes	10%		

BIOL 681 Grading

Breakdown:

Exam 1	10%	Graded Lab Exercises	16%
Exam 2	10%	Questions on Journal Articles	10%
Exam 3	10%	Semester Project	26%
Final Exam	18%	Lab Attendance**	

**Your final course grade will be adjusted based on your lab attendance. Three unexcused absences will equal a drop of one letter grade (i.e., B becomes C). Arriving late or leaving before the lab is over will also contribute to your attendance grade. Two unexcused late arrivals and/or early departures will equal one absence (i.e., six late arrivals will result in the drop of one letter grade)

Overall course grades will be assigned on the following scale:

<u>Numerical Score</u>	<u>Grade</u>
90.0-100%	A
80.0-89.9	B
70.0-79.9	C
60.0-69.9	D
below 60	F

Blackboard Site

This course has a Blackboard site. Your grades will be recorded on this site and we encourage you to check that all grades are entered here are in agreement with those on your returned work. Copies of the course syllabus, lecture and lab schedules, old exams, and exam keys will also be posted on this site.

Lectures and Readings

I do not teach directly from the text and purposely use many examples that are not covered in the text. I think that you will find that attending lectures is important and hopefully also interesting. I encourage you to use the text to help solidify the topics covered in lectures and labs. If you must arrive late to a lecture please be courteous and sit towards the back of the lecture hall.

Exams

Exams will consist primarily of short essay questions, but may also include short answer or longer essay questions and quantitative problems. They will cover lecture material, assigned readings (text and journal articles), and lab material. The final exam will be cumulative. Written requests for re-grades, justifying why the grade was incorrect, must be submitted within one week of the return of an exam.

Quizzes (BIOL 481)

Quizzes will take place in lab and will cover material from the previous week's lectures. The purpose of the quizzes is to get you to look over your lecture notes on a regular basis and to clear up things you don't understand in a timely manner. At the beginning of each lab section, you will have a chance to ask questions about lecture material. The quiz will directly follow this question and answer period. The lab schedule indicates the dates on which quizzes will be given. There will be 12 graded quizzes during the semester. The two lowest grades will be dropped and each of the 10 remaining quizzes is worth one percentage point of your course grade.

Lab Attendance/Participation and Questions on Journal Articles

Lab attendance is required. This means that you must show up on time and stay until lab is dismissed. You need to set aside the full lab period in your schedules. If you must miss a lab, you should talk to your TA prior to the lab to arrange to make up the work. Likewise you are expected to prepare for and participate in all lab activities. This will include reading journal articles for discussion and turning in short written assignments about these readings.

Lab Exercises

Four graded lab exercises are planned for the semester.

Term Project—Biol 481

The term projects will be discussed in length in your lab section. These experiments will be done either by individuals or small groups (maximum group size = 3). They will address evolutionary questions of general interest and must be placed in this general context. Each student will write his/her own research paper; the early sections of this paper will be turned in for critique and returned with comments for revision to better insure a quality end product. In addition, each individual or group will present a preview of their project early in the semester and a brief oral project report at the end of the course.

Term Project—Biol 681

Students registered for Biol. 681 will have the option of completing an experiment, research paper, or grant proposal. These “projects” may not be central to a student’s thesis research but may be related more tangentially. In some instances, it may be appropriate to work in pairs. I will work with each student to design his/her “project”.

Students with Disabilities

Any student needing accommodation of a disability should provide me with a letter from the Office of Disability Services. The Office of Disability Services also requires students contact them at least 3 days in advance of any exam for which they need special arrangements.

Important Course Policies

Plagiarism and fabrication of data are unacceptable practices both in this course and in science more generally. All of your work should be your own and only your own unless it is explicitly assigned and completed as a group. Plagiarism or data fabrication will result in a course grade of F and possible referral to the University Disciplinary and Honor Code Committee. Also see p.73-74 of the 2005-2006 UAF Catalog to review the UAF Student Code of Conduct.

LECTURE AND READING OUTLINE

<u>Week</u>	<u>Date</u>	<u>Lecture Topic</u>	<u>Reading in <i>Evolution</i></u>
1	Sept. 1	Introduction	C1:ALL
2	Sept. 6	Phylogeny I	C2:17-22; C3:48-54
	Sept. 8	Phylogeny II	C2:22-32; C3:43-47
3	Sept. 13	Gene Trees & Molecular Clocks	C3:32-35, 39-40; C19:465-467
	Sept. 15	Evidence & Inference	C3:48-49, 56-65; C22:ALL
4	Sept. 20	Earth History & the Fossil Record	C4:ALL
	Sept. 22	Historical Biogeography	C6:ALL; Figs. 5.17 (pp.104-105) & 5.29 (p. 113)
5	Sept. 27	Human Evolution	C4:79-83.
	Sept. 29	EXAM 1	
6	Oct. 4	Microevolution I	C9:199-211
	Oct. 6	Microevolution II	C9:192-197
7	Oct. 11	Natural Selection Overview	{ C12:ALL
	Oct. 13	Natural Selection & Population Genetics	
8	Oct. 19	Natural Selection & Quantitative Genetics	C13:ALL
	Oct. 20	Mutation & Gene Flow	C8:ALL; C9:216-219
9	Oct. 25	Genetic Drift & Small Populations	C9:197-199, 201-202; C10:ALL
	Oct. 27	EXAM 2	
10	Nov. 1	Integration of Evolutionary Forces	C10:241-244; C12:287-288
	Nov. 3	Adaptation and Constraint	C11:247-257, 260-265
11	Nov. 8	Sexual Selection	C14:329-339
	Nov. 10	Levels of Selection & Kin Selection	C11:257-260; C14:339-348; C17:406-407
12	Nov. 15	Evolution of Reproductive Systems	C17:416-422
	Nov. 17	EXAM 3	
13	Nov. 22	Species Definitions	C15:ALL
	Nov. 24	THANKGIVING HOLIDAY	
14	Nov. 29	Speciation I	{ C16:ALL
	Dec. 1	Speciation II	
15	Dec. 6	Macroevolution & Extinction	C7:144-158, C21:ALL
	Dec. 8	Micro- & Macro-Evolution	
Dec. 17		FINAL EXAM	

LAB SCHEDULE

<u>Week</u>	<u>Dates</u>	<u>Quiz</u>	<u>Reading</u>	<u>Activity</u>
1		No Lab
2	Sept. 7-8	Yes Practice	None	Introductions; semester project description; begin project planning
3	Sept. 14-15	Yes	phylogenetics	Phylogeny Exercise; Project Planning
4	Sept. 21-22	Yes	examples of scientific writing	Project Previews; How to write papers
5	Sept. 28-29	Yes	historical biogeography	Review for Exam
6	Oct.5-6	Yes	human evolution	Discuss Theories of Emergence of Modern Humans
7	Oct. 12-13	Yes	microevolution	Microevolution Worksheet
8	Oct. 19-20	Yes	microevolution	Microevolution Worksheet (cont.)
9	Oct. 26-27	Yes	None	Review for Exam
10	Nov. 2-3	Yes	None	Wolf Lab
11	Nov. 9-10	Yes	natural selection	Long Discussion of Papers
12	Nov. 16-17	Yes	TBA	Lizard Lab
13	Nov.23-24	No	None	Work on projects
14	Nov. 30 - Dec. 1	Yes	speciation and extinction	Long Discussion of Papers; help with finalizing projects
15	Dec. 7-8	Yes	none	Project Presentations