BioS 101 Fall 2017 Syllabus

13602

Lecture is in 250 SES at 10-11:50AM MWF. Discussions are in various classrooms. Labs are in 3084SEL.

You must be registered for the lecture and one of the LABD that goes with this lecture.

Lecture Text: Freeman et al., *Biological Sciences, Fifth or Sixth Edition.*

We do not use Mastering Biology for this course

**Instructor**
Name: Dr. Alan Molumby
Office: Lab Prep Room, 3084 SEL
Office Hours: MWF 11 or meet me outside lecture and I can talk for a few minutes
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**Learning goals of this class:** This is a survey course. We aim to impart a broad introductory knowledge and understanding of species concepts, systematics, macroevolutionary processes such as extinction, transmission genetics, the origins and maintenance of genetic variation, natural selection and adaptation, other evolutionary processes including genetic drift, population biology and community ecology, worldwide biogeography, biomes, and biodiversity, biogeochemical cycles, conservation biology, the scientific method, and human issues associated with extinction. We also aim to teach certain mathematical skills and reasoning associated with ecology and evolutionary biology, such as experimental design, the crafting of scientific figures, the reading of scientific literature, measurement, and simple methods of statistical analysis.

**Some objectives:** By the end of this course, you should be able to write a laboratory report that conforms to many of the conventions of an actual scientific paper. You should also be able to use the Chisquare test to analyze an appropriate data set, count certain types of organisms and measure their densities, draw a survivorship curve from an appropriate data set, work simple genetics crosses, and work out some of the logic behind elements of experimental design when confronted with a scientific experiment. You should also be able to distinguish between scientific reasoning and alternate explanations for phenomenon that are essentially supernatural in nature, or are not supported by scientific evidence, and have some understanding of the global issues raised by anthropogenic climate change and widespread anthropogenic extinction.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Reading in Freeman</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>28 Aug</td>
<td>What is life?</td>
<td>Chapter 1, 57</td>
<td>How to Read a Scientific Paper</td>
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<td>30 Aug</td>
<td>What is out there?</td>
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<tr>
<td>1 Sept</td>
<td>Introduction to Ecology</td>
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<td>4 Sept</td>
<td>Labor Day. No Class</td>
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<tr>
<td>6 Sept</td>
<td>Ecological Timescales, Biomes</td>
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<td>8 Sept</td>
<td>Population Ecology</td>
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<tr>
<td>11 Sept</td>
<td>Population Growth Life Histories, Demography</td>
<td>Chapter 55</td>
<td>Taxonomy</td>
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<td>13 Sept</td>
<td>Community Ecology</td>
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<td>15 Sept</td>
<td>Medieval Science</td>
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<tr>
<td>18 Sept</td>
<td>Community Interactions Food Webs, Trophic Structure Island Biogeography</td>
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<td>20 Sept</td>
<td>Ecosystems Ecology</td>
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<td>25 Sept</td>
<td>Climate Change</td>
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<td>27 Sept</td>
<td>Exam 1</td>
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<td>29 Sept</td>
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<td>2 Oct</td>
<td><strong>Genetics</strong>-Phenotypes and Genotypes, Biological Variation, Nature of the Gene Segregation Assortment, Linkage, Allelic Interactions Genetics Continued</td>
<td>Chapter 14</td>
<td>Ecology-Food Web in a Pond</td>
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<td>4 Oct</td>
<td><strong>Introduction to Evolution</strong> Evidence for evolution <strong>Microevolution</strong>-Population Genetics, Mechanisms</td>
<td>Chapter 22</td>
<td>Human Genetic and Environmental Variation</td>
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<td>6 Oct</td>
<td><strong>Mechanisms of Selection</strong> Natural Selection Behavioral Ecology</td>
<td>Chapter 23</td>
<td>Problem Set 2 Due</td>
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<td>9 Oct</td>
<td><strong>Behavioral Ecology</strong> Mating Systems Evolution of Mating Systems</td>
<td>Chapter 50</td>
<td>Oral Presentations, Continued</td>
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<td>11 Oct</td>
<td>Sexual Selection Exam 2 Macroevolution</td>
<td>Chapters 24, 25</td>
<td>Population Genetics</td>
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<td>13 Oct</td>
<td>Speciation, Isolation Mechanisms Inferring Phylogenies Extinction</td>
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<td>Human Mate Choice</td>
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<td>16 Oct</td>
<td><strong>Biodiversity</strong> Diversity of Life, Prokaryotes Diversity of Life, Eukaryotes</td>
<td>Chapter 26, 33</td>
<td>Oral Presentations II</td>
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<tr>
<td>18 Oct</td>
<td>Diversity of Life-Plants Diversity of Life, Plants and Fungi</td>
<td>Chapter 27</td>
<td>Read Janzen paper for Discussion</td>
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<td>20 Oct</td>
<td><strong>No Lecture, Thanksgiving</strong></td>
<td>Chapter 28-29</td>
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<td>23 Oct</td>
<td>Diversity of Life, Invertebrates Diversity of Life, Vertebrates</td>
<td>Chapters 30-32</td>
<td>Evolution-Beer Bottle Systematics</td>
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<td>25 Oct</td>
<td><strong>Conservation Ecology</strong> Ecosystem services Exam 3</td>
<td>Chapter 57</td>
<td>Conservation Discussion and Grade Conference</td>
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Optional Final Date to Be Announced.

**COURSE GRADING**

The total points which can be earned in this course is 415. This total includes 260 points that can be earned on examinations (counting clicker points) and 155 points associated with the Discussion and Laboratory. The point minima listed below are guaranteed to result in the following letter grades: (Please note that grade intervals go strictly by points, not percentages).

A 415 - 355  B 354 - 305  C 304 - 220  D 219 - 200  F <=200

EXAMINATIONS: Each exam is worth 80 points and will consist of 40 multiple choice questions drawn from Lecture, Discussion, Laboratory and assigned readings, as well as short answer questions. The 3 EXAMS (80 minutes each) will be given on the following dates:

Sept 29 Nov 1 Dec 8

There are NO specially prepared make-up exams. If you miss an exam, provide a written explanation to your teaching assistant and get a copy of the missed exam. Use it, along with your other exams, to study for the Optional Final. Your score on the Optional Final will be your score for the missing exam. During the 8th week you will have a conference that will enable you to determine your PROJECTED GRADE once you learn your score of the 3rd scheduled exam. Some students will be able to improve their Letter Grade by doing well on
the Optional Final, but for others it will be impossible to improve their Letter Grade by taking the Optional Final. Additional details on this procedure will be forthcoming.

In addition, there will be twenty points worth of clicker questions given during lecture (a half a point for participation, a half a point for getting it right, there will actually be more than 20 questions, so you can afford to miss quite a few and still get full credit). There is no make-up for these, if you are not there, you miss the points. No excuses, medical, family, or otherwise will be accepted for missing these. In the event that a lecture is missed because of jury duty or military service, special arrangements will be made. Register your iclicker unit on blackboard via the button under course tools. If your clicker is not registered by the second to last week of the semester, you may not receive these points even if you have been attending and answering questions.

The OPTIONAL FINAL EXAM will be given during the scheduled final exam time. The Optional Final will be comprehensive and the score on this exam can replace your lowest exam score.

DISCUSSION & LABORATORY: A total of 155 points may be earned. Before each Discussion students will answer the Discussion questions/problems. This answer will be submitted at the beginning of the assigned Discussion period. Each Discussion is worth a maximum of 1 point for a total of 15 points. Three 10 point problem sets will be posted on the blackboard site and due by Safe Assign. During each Laboratory students will fill in Data Sheets based on their observations and understanding of observations. Each data sheet is worth a maximum of 2 points for a total of 30 points. Additionally, there are two oral presentations, with other members of your lab section, worth 20 points each. The first project will be on a scientific experiment of the group’s choice, intended to illustrate 1) the hypothesis the experimenters intended to test 2) the results of the experiment and their significance 3) the underlying factors that caused the researchers to formulate the hypothesis, and 4) the larger significance of the results. The second project will focus on a lab exercise (your group’s choice) conducted over the course of the semester. Reports should be twenty minutes long, and should be PowerPoint files or something similar. Each member of the group will receive a grade based upon the laboratory instructor’s and student’s assessment of their contribution, as well as their participation in class discussions of the projects.

LABORATORY REPORTS: There will be 2 formal written reports. Each will be worth 20 points, for a total of 40 points. Due dates, by Safe Assign, are listed on the syllabus above. More information will be available later. We also ask that you provide a hard copy, in class, so that your teaching assistant can provide feedback on your work.

If you have disability accommodations, please discuss your specific accommodations with Dr. Molumby. Exams taken at the DRC must be taken at the same time the class meets, and cannot be taken later (keys are posted right after the exam). Please keep in mind that a major teaching goal of Bios 101 as an introductory class is to establish common expectations regarding due dates. Extra time to complete assignments compromises this goal, and thus, we do not make that particular accommodation in 101. We have an alternative approach to that accommodation we would be happy to discuss.

Animals are used in instruction, but students are never put in a position where they are required to harm a multicellular living organism if they choose not to. Do not post any of our content on sites like Course Hero.

**Learning goals and objectives in this course.** 101 courses are not easy by any means. 100 level courses are broad in scope, but loaded with material.

**Goals:**

Students should be able to identify, and understand the fundamental properties that define a living thing.

Students should be able to compare and contrast four different species concepts, and understand the advantages, assumptions, and weaknesses of each one.

Students should be familiar with the different levels of biodiversity, and the extent of biodiversity that is currently unknown to science.

Students should understand the extent to which ecology and evolution influence each other.
Students should understand the scientific method as it is currently practiced, including the notions of hypotheses testing, scientific paradigms, observational vs experimental hypothesis testing, experimental design, and falsifiability.

Students should be able to identify the major vegetation biomes

Students should be able to identify the levels of ecology.

Students should be able to distinguish climate vs weather, and should understand the key factors influencing vegetation biomes.

Students should be able to compute exponential population growth, and identify the factors that create the biological phenomenon of carrying capacity.

Students should understand the key emergent properties of a population

Students should be able to identify the factors that influence the distribution of species.

Students should understand some of the key factors influencing life history evolution

Students should be able to identify the emergent properties of a community, including ecological succession and disturbance.

Students should be able to distinguish between biological communities, populations, and ecosystems.

Students should be able to identify and understand the key interactions that occur among species in a community.

Students should be able to identify the major assumptions of the theory of island biogeography, and its predictions

Students should understand the basic principles that underpin the cycling of matter, and flow of energy, in ecosystems.

Students should be able to think critically about anthropogenic climate change and evaluate scientific evidence.

Students should have a basic definition of a gene, a locus, and an allele, as well as recombination, assortment, segregation, haploidy, and diploidy.

Students should be able to identify the potential causes of variation.

Students should have a basic understanding of Mendelian genetics, including the interaction of alleles at a locus, the cytological basis of assortment and segregation, the extent to which sex chromosomes produce the phenomenon of sex linkage, the interactions among alleles that produce dominance vs codominance, and the extent to which genetic variation interplays with the environment to produce phenotypes from genotypes.

Students should be able to work a monohybrid cross, a dihybrid cross, a test cross, and a cross with sex linkage. Students should be able to infer which cross is occurring from data.

Students should be able to distinguish between sex, recombination, fertilization, reproduction, copulation, and gender.

Students should have a basic understanding of what a transgenic organism is, and the potential consequences of the technology that produces them.

Students should understand the scientific evidence for evolution

Students should be able to define evolution, and the different mechanisms of evolution.

Students should be able to compute simple calculations of allele frequencies and genotype frequencies, and compare the expectations of the Hardy-Weinberg equilibrium to data

Students should have a basic understanding of the tree of life, and the major branches of the tree of life, to the extent that they can name attributes of major animal phyla and plant divisions, identify key groups of non-animal eukaryotes, and identify some major features of the groupings on the tree of life.

Students should be able to explain how humans are a product of biological evolution, and identify some of the most important factors influencing our continuing evolution as a species.

Students should understand the major mechanisms that underpin sexual selection.
Students should understand the relationship between reproductive effort and the pattern of sexual selection that is likely to be evident.

Students should be able to identify and apply the themes of behavioral ecology.

Students should understand the basic nature of kin selection.

Students should be able to identify the basic mechanisms of reproductive isolation, and speciation.

Students should understand the basic principles of systematics, and how they are used in taxonomy and create testable models of the tree of life.

Students should understand the fundamental nature of mass extinction, and be able to identify at least three major mass extinctions, including the current biodiversity crisis.

Students should be able to distinguish between ecology, conservation biology, and environmentalism.

Students should understand a few of the key factors influencing conservation, including the inevitable economic compromises and potential human impact of conservation.

Students should be able to contrast several of the reasons for conservation.

Students should be able to research the primary literature and develop strategies for reading papers relevant to topics that interest them.

**A few additional learning objectives** (more specific expectations that reflect on the above goals).

I give many natural history examples in lecture. For each one, you should be able to remember the example, and identify the biological process it demonstrates.

You should be able to read a scientific paper and be able to discuss some elements of its experimental design.

You should be able to produce figures, and tables, of your own data, and in writing, tell whether they met your expectations or supported your hypothesis.

Given fictional experimental design, and data, you should be able to interpret these experiments in the context of the theories I present in class.

You should be able to read through a hypothetical genetics cross and interpret the data to show how many loci, and alleles are involved. Also, you should recognize sex linkage, codominance, and two-locus epistasis.

You should be able to use a dissecting scope to count small, photosynthetic organisms.

You should be able to use a chi-square test of goodness of fit to compare observed and expected values.