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Schedule and Classroom:

Section A	Location	Time
Lecture	CULC 144	9:05–9:55 am MWF
Recitation	CULC 144	6:05–6:55 pm R (if no test)
Midterm exams	CULC 144	6:05–6:55 pm R
Final Exam Day/Time	CULC 144	F 5/1 8:00–10:30 am
Mastering Bio Code	BIOL1510AS2015	

Prerequisites:

Good background in high school biology and chemistry.

Description:

This is an **active-learning** class that introduces students to basic principles of modern biology, including biomacromolecules, bioenergetics, cell structure, genetics, homeostasis, evolution, and ecological relationships. This course will foster the development of critical scientific skills including hypothesis testing, experimental design, data analysis and interpretation, and scientific communication.

Textbook:

Scott Freeman (2011) *Biological Science*, 5th Edition. Benjamin Cummings, San Francisco.

We have arranged special pricing through the bookstore for hardcover, looseleaf-bound and e-book versions of the textbook bundled with learning catalytics and access to the Mastering Biology website (required as part of course homework assignments). **If you previously took BIOL 1510 or 1520 at Georgia Tech** using Campbell & Reece's Biology (8th ed), please e-mail Dr. Spencer to discuss the best course of action regarding the textbook and Mastering Biology.

Participation:

Students are required to have a Learning Catalytics account for quizzes and interactive lecture sessions; points earned in learning catalytics will contribute to the "participation" portion of your course grade. Learning Catalytics can be purchased in one of three ways: as part of the bookstore textbook option bundles, bundled with Mastering Biology with e-text, or directly from learningcatalytics.com. You will need to bring an internet-ready smartphone, tablet, or laptop to class to earn these participation points. **Phone and computer use is restricted to class-related material, and off-task use may result in loss of participation points for that day.**

Websites:

t2.gatech.edu for official course communication (through your @gatech.edu email), grades, lecture materials
masteringbio.com for homework assignments and learning catalytics
piazza.com is a forum for questions on course content and general how-tos
bio1510.biology.gatech.edu for project uploads & evaluations, & extra on-line materials

Organization:

The course is organized into five modules, each of which deals with a major area of modern biology.

Lectures:

Attendance in lecture correlates strongly with performance in Biology 1510. We will make our lecture slides available via T-Square and urge you to download and print them for use in taking notes during lecture. The lectures and readings are complementary and some material will be presented only in lecture. Please complete each reading assignment before class.

Lecture Exams:

This course has four midterm exams and the cumulative final exam. The midterm exams will be held in the evening, are closed-book, and will be made up of multiple-choice questions based on topics, materials, and discussions presented in class, in the assigned readings, and in the Mastering Biology assignments. Exams and quizzes may also be given in the laboratory and on-line on Mastering Biology and/or T-square.

Missed Exams:

If you miss an exam for any reason, you will receive a grade of 0 (zero) on that exam unless you **petition us for a make-up exam within 24 h of the start of the missed exam**, and we approve your petition. Your petition must be submitted in writing (by e-mail) and must include documentation of a legitimate reason for missing the exam. You can, of course, submit your petition before the exam if you know of your scheduling conflict in advance. We will consider each petition individually. Examples of legitimate reasons to miss an exam include illness, illness or death in your immediate family, and participation in official university activities. If we approve your petition, we will remove the missed exam from your grade calculation by using the weighted mean of your other exam scores as your grade for the missed exam, making it completely neutral in your final point total.

Quizzes:

Short quizzes may be administered in lecture, lab, and online.

Homework:

Individual access codes for Mastering Biology are included with each new textbook, or may be purchased separately from the publisher at masteringbio.com. Throughout the semester you will have assignments in Mastering Biology. **Homework assignments are due at 9 am on the due dates** listed on the schedule below and on Mastering Biology's website. Please note that an assignment is due during Dead Week and plan accordingly. The Mastering Biology assignment scores are recorded and will comprise 5% of the overall course grade. We encourage you to complete your assignments on time; however, if you miss a due date you should still complete the assignment and accept a late penalty. **Late assignments will be accepted until 5 pm on the last day of classes.** Hints are available with no point penalty in Mastering. Mastering Biology offers animations, videos, interactive tutorials and simulations, as well as practice quizzes and an on-line version of the textbook (see Mastering's "Study Area" for access to these resources). **Adaptive Follow-up Assignments** become available after each assignment is due and can be used for additional review of material and to top up missed points on the related homework assignment. Students who score lower than 95% on a given assignment can earn points on the adaptive follow-up to raise their grade on the parent Mastering Bio assignment up to 95%. This grade adjustment will occur at the end of the semester and will not be reflected in the mastering bio online gradebook.

Group Projects:

For each module, 8–12 groups of 4 students each will each research an issue of current interest related to the topic of the module. Each student will be assigned to a group and a topic, and each group will complete only one group project during the semester. **Group assignments, details and deadlines will be provided once drop/add ends.** Grades will be based on instructors' grades and peer evaluations. The same group project grade will be assigned to all members of a group; each

group member is fully responsible for all submitted project work. Some groups may have the opportunity to present their projects in class. Please note that in-class presentations and project-related activities may occur during the last week of classes and plan accordingly.

Recitations:

Lecture recitations occur weekly on Thursdays from 6:05–6:55 pm and are led by the recitation Teaching Assistant. Attendance is optional but strongly encouraged, as it is designed to improve your understanding of the lecture material. Bring your wifi enabled device to access Learning Catalytics during recitation to receive participation credit for your recitation attendance, which can add points to the Participation portion of your grade.

Labs:

Labs will begin the week of January 12. That week, you'll need the combined lab manual/notebook (ISBN 978-0-7380-6042-2), a 100% cotton lab coat, and you must wear closed-toe shoes that cover your entire foot. Note that while **no labs meet during the first week of classes**, you will have a **Pre-lab assignment due before you meet for lab: part 1 is due on January 8th, part 2 is due before your lab section meets (see lab T-square announcement for details)**. Labs are held in Clough Commons and taught by Teaching Assistants (TAs); your TA contact information is available on the BIOL 1510 lab T-square site. All communications regarding lab should be directed to your lab TAs. Most FAQ about labs are answered on the lab T-square site and lab syllabus. **Laboratory attendance is mandatory and each unexcused absence will lower your final course grade (not just your lab grade) by 5%.** Details of the absence policy are in the BIOL 1510 lab syllabus.

Tutoring:

Georgia Tech offers a variety of free learning and communications support options. Learn about free tutoring resources at www.success.gatech.edu or at the Center for Academic Success's tutoring desk in Clough Commons 273. For assistance with revising lab reports or polishing a group project presentation, consult the Communications Center (Clough Commons 447 or commlab.gatech.edu).

Honor Code:

All students are expected to abide by the Academic Honor Code, which can be viewed online at www.honor.gatech.edu. Plagiarism on any assignment, including laboratory reports and the group project, will be referred to the Office of Student Integrity for adjudication. If you have any questions regarding your assignments and plagiarism, we encourage you to come consult with any of us before you submit the assignment.

Grading:

Your final grade will depend on the following combination of grades:

In-class exams (~ 10% each, see below)	40%
Final exam (Module 5 and cumulative)	20%
Group project (1)	10%
Participation (in-class & Mastering Bio)	10%
Laboratory	25%

Note that these components total 105%. The maximum overall score we will allow in this course is 100%, so this scheme includes 5% of extra credit. We will use the following procedure in calculating your final grade:

1. We will weight your 4 midterms 6%, 10%, 10%, and 14%, where your lowest midterm score will count 6% and your highest midterm score will count 14% of your final grade.
2. We will combine your exam, lab, and group activity and other scores into a raw composite score (0 – 100%) using the weights shown above.
3. We will assign final letter grades using the following scale:

A: $\geq 90.0\%$
B: $\geq 80.0\%$ and $< 90.0\%$
C: $\geq 70.0\%$ and $< 80.0\%$
D: $\geq 60.0\%$ and $< 70.0\%$
F: < 60.0

Module	Major theme	Teaching Goals
Intro	• Course intro	• Scientific method
1	• Evolution	• Earth history • History of life on Earth • Mechanism of evolution
2	• Ecology	• Behavior and evolution • Simple population models • Community structure • Mass and energy flow through ecosystems
3	• Molecules, Membranes, and Metabolism	• Overview of biomolecules • Introduction to bioenergetics: respiration and photosynthesis. • Chemiosmosis in respiration and photosynthesis • Diversity of metabolic pathways
4	• Genetics	• Mendelian genetics • DNA and genomics • Gene regulation in prokaryotes and eukaryotes
5	• Biomedicine	• Recombinant DNA technology & bioethics • Genetic diseases as model biological systems • Immunology • Course synthesis

The schedule below is subject to change.

Spring 2015	Lecture	Lecture Topics	Who	Freeman 5th	Mastering Biology (due by 9 am)
5-Jan	1	Course overview Intro to Instructors	All		0.01 Intro to Mastering Biology (ungraded, for practice only)
	M 1	Start Module 1: Evolution			
7-Jan	1.1	What is science? What is the scientific method? What is data?	EG	1.5: 9-14	
9-Jan	1.2	What is life? What is evolution? An evolutionary framework for biology	EG	1: 1-9	1.01 Scientific method
12-Jan	1.3	Evolution of evolutionary thought Evidence for evolution Evolution by natural selection Common misconceptions	EG	25: 444-464	
14-Jan	1.4	Mechanisms of evolution	EG	26: 465-488	1.02 Mechanisms of evolution
16-Jan	1.5	Genetic variation Hardy-Weinberg equilibrium Mutation, drift, selection	EG		
19-Jan		<i>HOLIDAY</i>			
21-Jan	1.6	Species and speciation What is a species Mechanisms of speciation Reinforcement & hybridization Allopatric & Sympatric speciation	EG	27:489-504	1.03 Speciation
23-Jan	1.7	Earth history Fossil record & radiometric dating Key events in the history of life	EG	28.1-2: 506-516 Radiometric Dating.pdf	
26-Jan	1.8	Origin of life RNA world Miller-Urey experiment	EG	2.4: 32-36 4.3-4: 65-69 6.3: 91-94 30.3: 559-563	1.04 Earth history
28-Jan	1.9	History of life on Earth Life in the remote past Patterns of biological diversity over time Life and changes in the physical environment Biological classification	EG	28.3-4: 516-523	1.05 History of life on earth
	M 2	Start Module 2: Ecology			
30-Jan	2.1	Intro to Ecology Physical Environment	CS	52: 1059-1080	2.01 Ecology Intro
2-Feb	2.2	Behavioral ecology Foraging and defense against predation Mate choice and sexual selection Kin selection and altruism	CS	53: 1082-1098	2.02 Behaviour
4-Feb	1.Synthesis	Module 1 Group Activity	EG		
5-Feb		Module 1 Exam (6 pm) covers Module 1 content only.			
6-Feb	2.3	Population ecology	CS	54: 1101-1120	

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9-Feb	2.4	Structure, dynamics, & regulation of populations Life histories Human populations through history Population management	CS		2.03 Population Ecology
11-Feb	2.5	Community ecology	CS	55: 1123–1146	2.04 Community Ecology
13-Feb	2.6	Competition, Predation, parasitism, mutualism Keystone species Island Biogeography	CS		
16-Feb	2.7	Ecosystems	CS	56: 1148–1170	2.05 Ecosystems
18-Feb	2.8	Energy and material flow through ecosystems Biogeochemical cycles Human impact on ecosystems	CS		
20-Feb		<i>Group A – project videos due (6 am)</i>			
20-Feb	2.Synthesis	Module 2 Group Activity	CS		
	M 3	Start Module 3: Molecules, Membranes, Metabolism			
23-Feb	3.1	Biomolecules Small molecules Major classes of macromolecule	EG	Ch 3 Ch 5	3.01 Biomolecules (due 2/24)
25-Feb	3.2	Cellular Structure Lipid bilayer membranes Archaeal membranes Serial endosymbiosis and eukaryote evolution	EG	6.1-6.2: 85-91	3.02 Cell Biology
26-Feb		Module 2 Exam (6 pm) covers Module 2 content only.			
27-Feb	3.3	Membrane function and transport systems Membrane composition and adaptation Membrane proteins Transport: passive diffusion, osmosis, facilitated diffusion, active transport	EG	6.3-6.4: 91-101	
2-Mar	3.4	Energetics and enzymes Thermodynamics and free energy Catalysis and kinetics, and enzymes feedback regulation Redox reactions Membrane potential	EG	Ch 8	3.03 Energetics
4-Mar	3.5	Cellular respiration Oxidation of food and reduction of an e-acceptor Electron transport chain Chemiosmotic generation of ATP Aerobic vs anaerobic respiration	EG	9.5: 166-172	3.04 Respiration and Ox Phos

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6-Mar	3.6	oxidative pathways glycolysis, substrate-level phosphorylation pyruvate oxidation citric acid cycle regeneration of NADH, fermentation	EG	9.1-9.4: 155-165	
9-Mar	3.7	Evolution of mitochondria and eukaryotes Amino acid and lipid breakdown Consequences of defects in metabolism	EG	Smith and Baco 2003 9.6: 172	
11-Mar	3.8	Photosynthesis Overview: reduce CO ₂ to organic C Pigments and light absorption Origin of photosynthesis: single PS, cyclic photophosphorylation	EG	10: 177-189	3.05 Fermentation
13-Mar		<i>Group B – project videos due (6 am)</i>			
13-Mar	3.9	Carbon fixation	EG	10:190-192	3.06 Photosynthesis
16-20 Mar		<i>Spring Break</i>			
23-Mar	3.10	Photosynthetic strategies C3 and C4 photosynthesis Recap: compare and contrast respiration & photosynthesis, mitochondria & chloroplasts.	EG	10:193-195	
25-Mar	3.Synthesis	Module 3 Group Activity	EG		
26-Mar		Module 3 Exam (6 pm) covers Module 3 content only.			
	M 4	Start Module 4: Genetics			
27-Mar	4.1	Chromosomes and Cell Division Mitosis Meiosis	JC	12.1-12.2: 220-228 13.1-13.2: 238-248	4.01 Meiosis
30-Mar	4.2	Mendelian genetics	JC	14: 256-280	
1-Apr	4.3	Mendel's model genetic system Monohybrid and dihybrid crosses	JC		4.02 Mendelian Genetics
3-Apr	4.4	Sex-linkage and pedigree analysis Probabilities of genetic outcomes Genetics of human disease	JC		
6-Apr	4.5	DNA as the basis of inheritance Experimental evidence for role of DNA DNA structure Semi-conservative replication of DNA	JC	15.1-15.3: 285-294 4.1-4.2: 58-65	4.03 DNA
8-Apr	4.6	Gene expression: DNA to protein Basics of transcription and translation	JC	Ch 16 Ch 17	4.04 Gene Expression
10-Apr		<i>Group C – project videos due (6 am)</i>			
10-Apr	4.7	Prokaryotic and eukaryotic genomics Genome size and organization Mammalian genomes Genome evolution	JC	21: 390-400	4.05 Genomics
	M 5	Start Module 5: Integrative Biology			
13-Apr	5.1	Recombinant DNA	CS	20.1-20.2: 368-376 5.1 Recombinant DNA	5.01 Recombinant DNA
15-Apr	40	Module 4 Group Activity	CS		
16-Apr		Module 4 Exam (6 pm) covers Module 4 content only.			

Spring 2015	Lecture	Lecture Topics	Who	Freeman 5th	Mastering Biology (due by 9 am)
17-Apr	5.2	Stem cells, cloning and bioethics	CS	20.5: 383-385 22.2: 408-410 5.2 Cloning and stem cells	
20-Apr	5.3	Immunology and infectious diseases	CS	51.1-51.4: 1037-1055 5.3 Adaptive Immunity	5.02 Immunology
22-Apr	5.4	Human health and evolution Balancing selection Sickle cell, Thalassemia, Cystic Fibrosis	CS	5.4 Human health and evolution	
24-Apr	5.Synthesis	Synthesis	All		
8:00-10:30 am Wed 30 Final Exam in CULC 144 is cumulative, with an emphasis on Module 5 content.					

* Mastering Biology assignments due by 9 am.