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- Prerequisites:** None.
- Description:** An introduction to the 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:** Campbell, N.A. & J.B. Reece (2005). *Biology*, 7<sup>th</sup> Edition. Benjamin Cummings, San Francisco.
- Lab Manual:** Biological Principles I: Biology 1510/1511 Biology Lab Manual (available for download on the course WebCT site).
- PRS:** A PRS is required and will be used for quizzes and interactive lecture sessions, which will constitute the "participation" portion of your course grade.
- Organization:** The course is organized into five modules, each of which deals with a major area of modern biology. Each module will end with an exam and a group activity.
- Honor Code:** All students are expected to abide by the Academic Honor Code, which can be viewed online at <http://www.registrar.gatech.edu/rules/18.php>.
- Lectures:** Attendance in lecture correlates strongly with performance in Biology 1510. Please complete each reading assignment before class. We will make our lectures available via WebCT and urge you to download and print them for use in taking notes during lecture. The lectures and readings are complementary and some materials will be presented only in lecture. Lecture exams will be based on topics, materials, and discussions presented in class and in the assigned readings.
- Lecture Exams:** Four midterm exams and the final exam. All lecture exams will be held in the evening, are closed-book and will be made up of multiple-choice questions. Exams and quizzes will be given in the laboratory as well.
- 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 makeup exam within 24 h of the start of the missed exam, and we approve your petition. Your petition must be submitted in writing 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, you will have the option of either taking a makeup exam or simply having the missed exam removed from our calculation of your grade. If you choose the first option, we will administer a makeup exam before the end of the term. If you choose the second option, we will use 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 on the course WebCT site.

**Group Activities:** For each module, 8-10 groups (5 students each) will each research an issue of current interest related to the topic of the module. Each group will prepare a formal scientific poster, 2 potential exam questions, and a brief (a single powerpoint slide) overview to be presented in class.

**Labs:** Laboratory attendance is mandatory and each unexcused absence will lower your final grade by 5%. We cannot accommodate makeup labs and will consider requests for excused absences from lab on a case-by-case basis. Legitimate reasons to miss a lab include illness, illness or death in the immediate family, and participation in official university activities. All such requests must be submitted in writing with appropriate documentation (e.g., a letter from a physician or the athletic department) no later than the day after the missed lab.

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

In-class exams:	40%
Final exam:	25%
Group activities:	10%
Participation:	5%
Laboratory:	25%

Note that these components total 105%, though the maximum overall score we will allow in this course is 100%. This means that participation is effectively a source of extra credit toward the final grade.

We will use the following procedure in calculating your final grade:

1. We will combine your exam, lab, and group activity scores into a raw composite score (0 – 100%) using the weights shown above.
2. We will use the mean score earned by the top 5% of the class as a gauge of real student performance in the class.
3. We will normalize your score to actual student performance by dividing your raw composite score by the mean score earned by the top 5% of the class. If you're in the top 2.5% of the class, your score will be 100%.
4. We will assign final letter grades based on normalized scores using the following scale:

A:	$\geq 90\%$
B:	$\geq 80\%$ and $< 90\%$
C:	$\geq 70\%$ and $< 80\%$
D:	$\geq 60\%$ and $< 70\%$
F:	$< 60\%$

Date	Lecture Topics	Readings <sup>1</sup>	Lecturer
Jan. 8	Course overview Introduction to instructors		All
<b>=&gt; M1</b>	<b>Start Module 1</b>		
Jan. 10	What is science? What is the scientific method?	Platt (1964) 1.5: 19-26	RMT
Jan. 12	What is life? What is evolution? An evolutionary framework for biology	1: 2-27	LR
Jan. 15	Holiday: Martin Luther King, Jr. Day		
Jan. 17	Earth history	26.2: 516-521	LR
Jan. 19	Origin of life RNA world, Miller & Urey experiment	26.1: 512-516	LR
Jan. 22	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	26.3-26.6: 521-531 25.1-25.2: 492-497	LR
Jan. 24	Evolution and life on Earth Gradualism Descent with modification Historical biogeography	22: 438-452	LR
Jan. 26 Jan. 29	Mechanisms of evolution Genetic variation Hardy-Weinberg equilibrium Mutation, drift, selection Case study: HIV drug resistance, human resistance to HIV	22: 438-452 23: 454-464	MMB
Jan. 31	Species and speciation What is a species Mechanisms of speciation Adaptive radiation	24: 472-481	MMB
Feb. 1	<b>Exam 1</b> (evening)	Module 1	
<b>=&gt; M2</b>	<b>Start Module 2</b>		
Feb. 2	Intro to Ecology Physical Environment	50: 1080-1092	LR
Feb. 5	Behavioral ecology Foraging and defense against predation Mate choice and sexual selection Kin selection and altruism	51: 1106-1107, 1110-1111, 1121-1131	LR
Feb. 7	Group activity 1		LR

<sup>1</sup> Textbook readings given as Chapter #: page range in Campbell & Reese, 7<sup>th</sup> ed.

<b>Date</b>	<b>Lecture Topics</b>	<b>Readings<sup>1</sup></b>	<b>Lecturer</b>
Feb. 9 Feb. 12	Population ecology Structure, dynamics, & regulation of populations Life histories Human populations through history Population management	52: 1136-1156	LR
Feb. 14 Feb. 16	Community ecology Competition, Predation, parasitism, mutualism Keystone species Island Biogeography	53: 1159-1178	LR
Feb. 19 Feb. 21	Ecosystems Energy and material flow through ecosystems Biogeochemical cycles Human impact on ecosystems	54: 1184-1206	LR
Feb. 22	<b>Exam 2</b> (evening)	Module 2	
Feb. 23	Group activity 2		LR
<b>=&gt; M3</b>	<b>Start Module3</b>		
Feb. 26 Feb. 28	Building membranes and cells Macromolecules Cell structures Cell membranes	5: 68-89 6: 94, 98-108, 112-121 7: 124-138	RMT
Mar. 2	Energy and metabolism Thermodynamic principles ATP, enzymes, and catalysis Chloroplasts and mitochondria	6: 109-111 8: 141-157	RMT
Mar. 5 Mar. 7	Cellular respiration Glycolysis and pyruvate oxidation Citric acid cycle Respiration Chemiosmotic generation of ATP Fatty acid and amino acid metabolism	9: 160-178	RMT
Mar. 9 Mar. 12	Photosynthesis Pigments and the photosynthetic spectrum Photosystems I and II C3 and C4 photosynthesis	10: 181-198	RMT
Mar. 14	Chemoautotrophic bacteria Nitrification and denitrification Sulfur oxidation and sulfate respiration Evolution of energy metabolism	27.2: 538-540 54.4: 1196-1197	RMT
Mar. 15	<b>Exam 3</b> (evening)	Module 3	
Mar. 16	Group activity 3		RMT
Mar. 19-23	<b>Spring Break</b>		
<b>=&gt; M4</b>	<b>Start Module 4</b>		
Mar. 26	Chromosomes Cell division Cancer	12: 218-233 13: 238-249	MMB

<b>Date</b>	<b>Lecture Topics</b>	<b>Readings<sup>1</sup></b>	<b>Lecturer</b>
Mar. 28	Mendelian genetics	14: 250-262	MMB
Mar. 30	Mendel's model genetic system Monohybrid and dihybrid crosses Sex-linkage and pedigree analysis Probabilities of genetic outcomes	15: 274-275 282-284	
Apr. 2	DNA as the basis of inheritance Experimental evidence for role of DNA DNA structure Semi-conservative replication of DNA	16: 293-307	RMT
Apr. 4	Gene expression: DNA to protein Basics of transcription and translation	17: 309-315 320-326	RMT
Apr. 6	Prokaryotic and eukaryotic genomics Genome size and organization Mammalian genomes Genome evolution	18: 334-335 346-351 19: 359-370 378-381	MMB
Apr. 9	Recombinant DNA, biotechnology, and disease Genetically modified organisms Genetic diagnosis and gene therapy	20: 384-409	MMB
<b>=&gt; M5</b>	<b>Start Module 5</b>		
Apr. 11	Cell signaling Enzyme regulation		RMT
Apr. 12	<b>Exam 4</b> (evening)	Module 4	
Apr. 13	Group activity 4	11: 201-214 8: 156-158	RMT
Apr. 16	Cystic fibrosis as a model disease (begin) Membrane transport processes Homeostasis Membrane biogenesis Genetic diseases Testing for genetic diseases	14: 265-268 Reading on WebCT	MMB
Apr. 18 Apr. 20	Cystic fibrosis as a model disease (contd.)	20: 403-405	MMB
Apr. 23	Immunology and infectious diseases	43: 898- 914	MMB
Apr. 25	Bioethics Stem cells and cloning	21: 412-418 Reading on WebCT	MMB
Apr. 27	Group activity 5		MMB
Apr. 30- May 4	Final Exams (see exam schedule for dates and times)	Comprehensive	

1. The Biology 1510 lab manual will be made available on-line. It is your responsibility to retrieve it well before lab to show up prepared. There will not be an elaborate introduction to each lab experiment, so you will need to read the protocols in advance of the labs.
2. NO FOOD OR DRINK IN THE LAB!!! This is not a request; it is against institutional rules. Failure to comply will result in the submission of "F" as your lab grade for the semester.
3. BE CONSIDERATE OF OTHER LAB SECTIONS. Clean up your lab station after each lab and report any messes left behind previous lab sections to your TA.
4. THERE ARE NO MAKE-UP LABS FOR UNEXCUSED ABSENCES!!! An unexcused lab will cost you 5% of your grade plus the lost 2% for a missed quiz, and since you have a quiz every time you are in lab it is to your advantage to (a) attend, (b) document your absence, (c) make arrangements in advance of any known absences for school or personal activities to make up the lab in another section. Documented absences can include: an illness of your own or within your family, schedule conflict with an obligation to an official organization, auto accident, etc. [FYI: Full-time students can be exempt from/rescheduled for jury duty with proof of full-time enrollment.]

In the event that you miss a lab, or will need to be excused from a lab in advance of it, the lab coordinator (Dr. Steven Kudravi) should be contacted at [steven.kudravi@biology.gatech.edu](mailto:steven.kudravi@biology.gatech.edu), or in Cherry Emerson Room 313 during office hours; or you may leave a message at the Biology main office: (404)-894-3700; 201 Cherry Emerson Building. There is no penalty for an excused absence.

5. THERE IS ONLY ONE MAKE-UP QUIZ!!! If you miss a quiz due to an excused absence, then you will take a comprehensive make-up quiz during the week prior to the lab final, irrespective of the quiz you missed. This may sound unfair, but it will be an option available to everyone to prepare for the final exam and is no more difficult than any other quiz. This is the only way to ensure uniformity of grading and testing.
6. Be on time for lab. THERE WILL BE A QUIZ IN LAB EVERY TIME YOU ATTEND, BEGINNING WITH THE "**Fire-ant behavior- Part 1**" LAB. The quiz is handed out exactly when class begins (at 5 minutes past the hour), and ends 10 minutes later. Showing up 5 minutes late means you have only 5 minutes to take that quiz. Also, leaving lab early without the instructor's prior permission (the TA's) will result in a zero (0) grade for that lab's quiz.
7. Proper attire needs to be worn in lab. No open-toed shoes.
8. All injuries or accidents must be reported to the lab TA IMMEDIATELY.
9. The distribution of grades and the modes of assessment have been determined to provide you with a diverse set of opportunities to demonstrate your command of the course content and the scientific method including public speaking, scientific writing, etc.
  - You will have 8 quizzes during the semester. Each is worth 2% of your overall grade. Your lowest quiz grade will be dropped, and the remaining quizzes will account for **14%** of your total grade.
  - The lab final is worth **7%** of your total grade and is comprehensive.
  - You will have to write two lab reports as indicated in the syllabus. Each report is worth 2%, for a total of **4%** of your total grade.

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| <p>10. <b>Plagiarism will not be tolerated.</b> Anything written in your lab reports that is not an original idea of yours must be referenced. Direct copying from the lab manual will result in a grade of "0" for that assignment. Your conduct in this class is expected to conform to the Georgia Tech Honor Code (<a href="http://www.honor.gatech.edu">http://www.honor.gatech.edu</a>). Please familiarize yourself with its expectations and responsibilities.</p> |
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## QUIZZES

You will have a quiz each week in lab, and these are done to provide you with lots of feedback about your performance, and to minimize the length of introductory lectures during the lab period. These will require a significant amount of independent preparation before lab, but you will be given several examples of quizzes to guide you with your preparations. You will need to be conversant in the basic modes of experimental design since Biology is an experimental science.

**TENTATIVE SCHEDULE FOR LABS**

<b>Week</b>	<b>Lab</b>	<b>Exams</b>
1 (Jan. 8-12)	Introduction	
2 (Jan. 15-19)	NO LABS (MLK day)	
3 (Jan. 22-26)	<b>Lab 1:</b> Understanding the Scientific Method "What's in the box?"  <b>Lab 2:</b> Data analysis: Stroop test	
4 (Jan. 29 – Feb. 2)	<b>Lab 3:</b> Microscopy <b>Lab 4:</b> Salts, cells and primordial soup	<b>Quiz 1</b>
5 (Feb. 5-9)	<b>Lab 5:</b> Predator-prey <b>OR</b> <b>Lab 6:</b> Pond Ecosystems (dependent upon weather)	<b>Quiz 2</b>
6 (Feb. 12-16)	<b>Lab 5:</b> Predator-prey lab <b>OR</b> <b>Lab 6:</b> Pond Ecosystem (dependent upon weather)  <b>Turn in lab notebooks for lab notebook check</b>	<b>Quiz 3</b>
7 (Feb. 19-23)	<b>Lab 7:</b> Biomolecules	<b>Quiz 4</b>
8 (Feb. 26 – Mar. 2)	<b>Lab 8:</b> Enzymes	<b>Quiz 5</b>
9 (Mar. 5-9)	<b>Lab 9:</b> Molecular cloning: Bacterial Transformation	<b>Quiz 6</b>
10 (Mar. 12-16)	<b>Lab10:</b> Plasmid Isolation and Restriction Enzyme Digestion	<b>Quiz 7</b>
11 (Mar. 19-23)	NO LABS (Spring Break)	
12 (Mar. 26-30)	<b>Lab11:</b> PCR <b>Lab 12:</b> Restriction Enzymes continued	<b>Make-up quiz</b>
13 (Apr. 2-6)	<b>Lab 12:</b> PCR continued	
14 (Apr. 9-13)	<b>Lab review</b>	
15 (Apr. 16-20)	<b>Lab Final Exam; Lab notebook due at end of exam</b>	
16 (Apr. 23-27)	<b>Course Review</b>	