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- Prerequisites:** A score of 4 or 5 on the AP Biology test or permission of the instructors.
- Description:** An advanced 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. This course is intended for students with a strong background and interest in biology and includes a greater emphasis on current research and recent advances in biology than Biology 1510.
- Textbook:** Campbell, N.A. & J.B. Reece (2005). *Biology*, 7th 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 1511. 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:** Two midterm exams and the final exam. The midterm exams will be held in the evening, are closed-book and will be made up of multiple-choice and short-essay 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:

During modules 2 and 4, groups of 4-5 students will work together to research an issue of current interest related to the course. Each group will prepare a formal 5-7 minute presentation and deliver it either in class or during a special evening session.

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:	35%
Final exam:	25%
Group activities:	10%
Participation:	5%
Laboratory:	30%

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:	≥ 90%
B:	≥ 80% and < 90%
C:	≥ 70% and < 80%
D:	≥ 60% and < 70%
F:	< 60%

Date	Lecture Topics	Readings¹
21 Aug	Course overview Introduction to instructors	
=> M1	Start Module 1	
23 Aug	What is science? What is the scientific method?	Platt (1964) 1.5: 19-26
25 Aug	What is life? What is evolution? An evolutionary framework for biology	1: 2-27
28 Aug	Earth history	26.2: 516-521
30 Aug	Origin of life RNA world, Miller & Urey experiment	26.1: 512-516
1 Sep	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
4 Sep	Holiday: Labor Day	
6 Sep	Evolution and life on Earth Gradualism Descent with modification Historical biogeography	22: 438-452
8 Sep 11 Sep	Mechanisms of evolution Genetic variation Hardy-Weinberg equilibrium Mutation, drift, selection	22: 438-452 23: 454-464
	Case study: HIV drug resistance, human resistance to HIV	
13 Sep	Species and speciation What is a species Mechanisms of speciation Adaptive radiation	24: 472-481
14 Sep	Exam 1 (evening)	Module 1
=> M2	Start Module 2	
15 Sep	Intro to Ecology Physical Environment	50: 1080-1092
18 Sep	Behavioral ecology Foraging and defense against predation Mate choice and sexual selection Kin selection and altruism	51: 1106-1107, 1110-1111, 1121-1131
20 Sep	Guest Lecture (TBD)	
22 Sep 25 Sep	Population ecology Structure, dynamics, & regulation of populations Life histories Human populations through history Population management	52: 1136-1156

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

Date	Lecture Topics	Readings¹
27 Sep 29 Sep	Community ecology Competition, Predation, parasitism, mutualism Keystone species Island Biogeography	53: 1159-1178
2 Oct 4 Oct	Ecosystems Energy and material flow through ecosystems Biogeochemical cycles Human impact on ecosystems	54: 1184-1206
6 Oct	Group Presentations	
=> M3	Start Module3	
9 Oct 11 Oct	Building membranes and cells Macromolecules Cell structures Cell membranes	5: 68-89 6: 94, 98-108, 112-121 7: 124-138
13 Oct	Energy and metabolism Thermodynamic principles ATP, enzymes, and catalysis Chloroplasts and mitochondria	6: 109-111 8: 141-157
16 Oct	Holiday: Fall break	
18 Oct 20 Oct	Cellular respiration Glycolysis and pyruvate oxidation Citric acid cycle Respiration Chemiosmotic generation of ATP Fatty acid and amino acid metabolism	9: 160-178
23 Oct 25 Oct	Photosynthesis Pigments and the photosynthetic spectrum Photosystems I and II C3 and C4 photosynthesis	10: 181-198
27 Oct	Chemoautotrophic bacteria Nitrification and denitrification Sulfur oxidation and sulfate respiration Evolution of energy metabolism	27.2: 538-540 54.4: 1196-1197
30 Oct	Guest Lecture (TBD)	
=> M4	Start Module 4	
1 Nov	Chromosomes Cell division Cancer	12: 218-233 13: 238-249
2 Nov	Exam 2 (evening)	Modules 2 & 3
3 Nov 6 Nov	Mendelian genetics Mendel's model genetic system Monohybrid and dihybrid crosses Sex-linkage and pedigree analysis Probabilities of genetic outcomes	14: 250-262 15: 274-275 282-284
8 Nov	DNA as the basis of inheritance Experimental evidence for role of DNA DNA structure Semi-conservative replication of DNA	16: 293-307

Date	Lecture Topics	Readings¹
10 Nov	Gene expression: DNA to protein Basics of transcription and translation	17: 309-315 320-326
13 Nov	Prokaryotic and eukaryotic genomics Genome size and organization Mammalian genomes Genome evolution	18: 334-335 346-351 19: 359-370 378-381
15 Nov	Recombinant DNA, biotechnology, and disease Genetically modified organisms Genetic diagnosis and gene therapy	20: 384-409
17 Nov	Group Presentations	
=> M5	Start Module 5	
20 Nov	Cell signaling Enzyme regulation	11: 201-214 8: 156-158
22 Nov	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
24 Nov	Thanksgiving Holiday	
27 Nov 29 Nov	Cystic fibrosis as a model disease (contd.)	20: 403-405
1 Dec	Immunology and infectious diseases	43: 898-914
4 Dec	Bioethics Stem cells and cloning	21: 412-418 Reading on WebCT
6 Dec	Guest Lecture (TBD)	
8 Dec	Course wrap-up and review	
11 Dec 15 Dec	Final Exams	Comprehensive