BIOLOGY 1521  Honors Intro to Organismal Biology  Spring 2016

**Biol 1521 Course Essentials:**
Lecture meets MWF 9:05-9:55 am and Thurs 6:05-6:55 pm in Klaus 1447
Lab meets 12-3 or 3-6 pm in CULC 475 on Mon or Tues

**Instructors:**
Dr. Linda Green, CULC 474C, 404-385-6517, linda.green@biology.gatech.edu
Office hours: Wed & Thurs 1-3
Dr. Patrick Bardill, CULC 385A, 404-385-1713, Patrick.bardill@gatech.edu
Office hours by appointment
Bonnie Shoai, bshoai922@gatech.edu, CULC 365, Office hours: TBD

**Required Textbooks:**
Mastering Biology with Learning Catalytics, from [www.masteringbiology.com](http://www.masteringbiology.com). Mastering Biology offers animations, videos, interactive tutorials, as well as practice quizzes and an online version of the textbook. Access codes for Mastering Biology and Learning Catalytics are included in the bookstore text bundle, or can be purchased directly from the website. Our class ID is MB1521S16. Weekly homework assignments in Mastering Biology will be due each Friday at 5pm.

**Course Description & Goals:**
This course provides an introduction to biology at the organ and organismal levels, with an emphasis on physiological processes and integration of growth and development. This section of Intro to Organismal Biology is intended for Biology majors and will explore the curriculum more deeply due to the smaller class size (compared to Biol 1520). This course will also foster the development of your scientific skills including hypothesis testing, experimental design, data analysis and interpretation, and scientific communication. By the end of this course, you will be able to

(a) Explain principles of organismal biology and apply knowledge of mathematics to biological principles
(b) Design and conduct biological experiments, as well as to analyze and interpret biological data
(c) Make connections and identify patterns in biological problems
(d) Compose effective communication by using appropriate technical language in class settings

This course will foster your learning by using reflective practice, accentuating your critical thinking skills, and develop your confidence in soliciting guidance when problem-solving.

**Course Mechanics & Expectations:**
Class time will consist of a variety of group-based activities designed to discuss, clarify, and apply new ideas by answering questions, drawing diagrams, analyzing primary literature, and explaining medical or ecological phenomena in the context of biological principles. We will spend class time on building your comprehension on the material you find the most difficult, based on pre-class assessments. You will play a prominent role in determining what is the focus of each day’s effort.

**What is our role as instructors?** Our goal is to increase your engagement and comprehension of course material during the class period. We will encourage you to be fearless in attempting class activities, and we will help you exploit class as an opportunity for you to make mistakes and be corrected in real-time. Mini-lecture tutorials will be offered when you can articulate what you want to know and why. We will strive to balance your desire to hear from us as “experts” with our goal for you to become an expert yourself.

**What is your role?** Before class, read/watch/listen to the assigned preparatory material, attempt each pre-lecture assessment (incoming knowledge evaluation, or IKE), and formulate any questions you want to ask. During class, you can expect to build your understanding through team activities (team in-class activity, or TICA) and periodically contribute to class discussions and display your notes on the projection screen. Following class,
there will be short homework assignments in Mastering Biology to give you an additional opportunity to ensure you’ve mastered the material. This course format will ask you to develop skills in identifying what information you need, and learning how to break down a problem into achievable parts. Key attributes of A-level class participation include:

- Actively looking for and recognizing inadequacies of your existing knowledge,
- Consistently seeking and asking probing questions,
- Using advanced and persistent search strategies,
- Evaluating solutions by assessing reliability and appropriateness of sources.

(based on rubric by Filipe and Pritchett 2013)

We expect you to demonstrate persistent learning by attending every class period, reading ahead, bringing appropriate notes that support quality participation during class, and taking personal responsibility for the success of both yourself and your team. Team-based learning combines the benefit of individually mastering a concept and reinforcing that understanding by sharing and teaching to peers. Learning Catalytics questions and large-group discussions during class will be used to identify problem areas and establish content mastery. All students are expected to abide by the Academic Honor Code, which can be viewed online at www.honor.gatech.edu. We take the Honor Code very seriously and are required to report any potential violations. Some specific examples of Honor Code violations include: copying during exams, falsifying attendance in class, including logging into Learning Catalytics class sessions when you are not in the classroom, and plagiarism in written work, including copy-paste submissions in Mastering Biology homework. Phone and computer use is restricted to class-related material during class, and off-task use may result in dismissal from class for that day.

**Laboratory Information:**
Labs are held in CULC 475. Lab attendance is mandatory and each unexcused absence will lower your final grade by 5%. Labs will begin the week of Jan 11. For the first lab, you will need a 100% cotton lab coat, long pants, and closed toe shoes that cover the entire foot. Communication regarding lab should be directed to your lab TAs or Dr. Bardill. Most FAQ about labs are answered on the lab Tsquare site and lab syllabus.

**Extra Credit Opportunities:**
The Video Project involves watching and rating videos created by your peers, and there will be an opportunity to watch additional videos for extra participation points. For each of Modules 1-4, you may also attempt to earn up to 4 bonus points that will be added to your midterm exam grade by completing an activity described below. There may not bonus point opportunities for the final exam. **Podcasts:** We will post several podcasts on Tsquare that are relevant to each module. You may select one (or more, if the relevant portion of the podcast is brief), listen to it, and write a one-page paper according to one of the following formats:

- Opinion piece: describe and justify whether you agree with the podcast
- Critical review: critique the podcast with factual support

Spelling, grammar, punctuation, and style all count toward the determination of points earned.

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

- In-class exams (approx 10% each, see below): 40%
- Final exam (Module 5 and cumulative): 15%
- Video project: 10%
- Participation (pre- & in-class activities, Mastering Bio): 15%
- Laboratory: 25%
Note that these components total 105%. The maximum overall score will be calculated based on 100%, so this scheme includes 5% of extra credit.

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

1. We will weigh 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 weightings 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: $< 60.0\%$

**Exams:** Midterm exams will be Thursday evenings in Klaus 1447. Exams will be a mix of multiple choice and short answer. If you miss an exam for any reason, you will receive a grade of 0 (zero) on that exam unless you petition me for a makeup exam within 24 h of the start of the missed exam, and I approve your petition. Your petition must be submitted in writing and must include documentation of a legitimate reason for missing the exam. You may submit your petition before the exam if you know of your scheduling conflict in advance. Examples of legitimate reasons to miss an exam include illness, illness or death in your immediate family, and participation in official university activities. If I approve a makeup exam, I will administer the makeup exam before the end of the term, and typically within one week of the scheduled exam. If I approve your petition but circumstances prevent a makeup exam, I will remove the missed exam from your grade calculation by using the mean of your other exam scores as your grade for the missed exam, weighted by the class average on the missed exam.

**Video Project:** Every student will take part in one video project during the semester. You may organize yourselves into groups of five students, and students not belonging to such a group will be assigned at random. Your project involves the production of an 8-min video presentation on a scientific topic. Additional details will be provided on Tsquare. You will also be required to view and rate peer videos, and complete a peer evaluation of your group members’ efforts in the production of your video.

**Participation:** Your participation grade has multiple components. I will collect all points earned and divide by the total points possible. You can earn points by completing the pre-class assessments, earning points during class activities, and completing the Mastering Biology homework assignments. Extra credit opportunities may be presented during the semester to add to your points earned.

**Recitation** will be led by the TA on Thursday 6:05-6:55 pm in the week preceding each exam. This is an opportunity for you to discuss class material in further detail. Recitation attendance is not mandatory, but it is correlated with exam performance and should be a component of your study habits should you desire an A.

**Learning Accommodations:**
If needed, we will make classroom accommodations for students with disabilities. These accommodations should be arranged in advance and in accordance with the Office of Disability Services (http://www.disabilityservices.gatech.edu).

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<th>Spring 2016</th>
<th>Lecture Topics</th>
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<td>11-Jan</td>
<td>Course overview</td>
<td>Review Bioskills 1-4, 7; p 506-510</td>
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<td>⇒ M1</td>
<td>Start Module 1: Biodiversity</td>
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<td>13 Jan &amp; 15 Jan</td>
<td>Beginnings of Life on Earth</td>
<td>Ch 28: 511-520</td>
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<td>Milestones in biological history</td>
<td>Ch 29: 529-533</td>
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<td>Biological and geological interactions</td>
<td>Ch 30: 552-557, 559-562</td>
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<td>20-Jan</td>
<td>Plant and Fungal Colonization of Land</td>
<td>Ch 31</td>
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<td>Evolution of early land plants, fungi</td>
<td>32: 613-621</td>
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<td>Evolutionary innovations in fishes</td>
<td>34: 657-660, 660-664, 670-673</td>
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<td>Ancestry of tetrapods</td>
<td>35: 681-703</td>
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<td>Rise of reptiles, mammals</td>
<td>22: 410-416</td>
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<td>27-Jan</td>
<td>Mass Extinctions and Climate Variability</td>
<td>28: 520-523</td>
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<td>Causes and evidence for mass extinctions</td>
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<td>Climate variability</td>
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<td>29-Jan</td>
<td>Modern Bacteria &amp; Archaea</td>
<td>29: 529-544</td>
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<td>Breadth of morphology, metabolism, habitats, roles in medicine &amp; bioremediation</td>
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<td>Lineage diversity</td>
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<td>1-Feb</td>
<td>Modern Eukarya</td>
<td>30: 557-566</td>
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<td>Animal phylogeny</td>
<td>31: 597-599</td>
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<td>Morphological and metabolic innov.</td>
<td>33: 646-651</td>
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<td>Ecosystem services by plants &amp; fungi</td>
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<td>Case Study</td>
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<td>4-Feb</td>
<td>Exam 1</td>
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⇒ M2 Start Module 2: Growth and Reproduction

<p>| 5-Feb      | Intro to form, function, and Adaptation | Ch 42 |
|           | Intro to reproduction and development | 22:405-409 |
|           | Diversity in life cycles | 566-568, 624-627 |
|           | Differentiation, colony formation, growth | |
| 8-Feb      | Plant Reproduction | Ch 41 |
|           | Double fertilization, seeds, fruits | 24: 438-440 |
|           | Flowering cues | 40: 800-803 |</p>
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<th>Date</th>
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| 10 Feb & 12 Feb | **Plant Development**  
Alternation of generations  
Tissue development, differentiation and function  
Role of meristems, secondary growth | 24: 432-438  
Ch 37 |
| 15 Feb & 17 Feb | **Animal Reproduction**  
Asexual reproduction  
Sexual reproductive strategies  
Gametogenesis, hermaphroditism | 50: 1013-1020  
13: 251-253 |
| 19-Feb | **Human Reproduction**  
Spermatogenesis, oogenesis  
Ovarian and uterine cycles | 50: 1021-1026 |
| 22 Feb & 24 Feb | **Animal Development**  
Cleavage patterns, polarity, differentiation | Ch 23 |
| **25-Feb** | **Exam 2** | |
| => M3 | **Start Module 3: Chemical and Electrical Signals** | |
| 26 Feb & 29 Feb | **Intro to chem signaling and signal transduction**  
Quorum sensing, biofilms in microbes | 11: 204-216  
40: 793-795  
49: 991-997 |
| 2-Mar | **Plant Hormones**  
Hormones controlling growth, dormancy, germination | 40: 794-800, 806-814 |
| 4 Mar & 7 Mar | **Animal Hormones**  
Hormone effects, production, distribution  
5 case study systems | 49: 997-1010  
44: 897-899  
50: 1025-1030 |
| 9 Mar & 11 Mar | **Neurons and Nervous System**  
Ion channels, synapses, neurotransmitters, integration  
Memory and learning | Ch 46 |
| 14 Mar & 16 Mar | **Sensory Systems**  
Sensory cells & organs, specificity  
Mechano- and photoreception | Ch 47 |
| **17-Mar** | **Exam 3** | |
| 18-Mar | | |
| => M4 | **Start Module 4: Nutrition and Transport** | |
| 28-Mar | **Movement**  
Cilia, flagella, muscles, skeletons | 7: 127-132  
48: 972-983 |
| 30 Mar & 1 Apr | **Nutrition - Adaptations & needs**  
Microbial role in nutrition | 39: 775-782, 789-790  
44: 882-885 |
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| 4 Apr & 6 Apr | Nutrition - Acquisition of nutrients  
Soil processes, N2-fixation  
Plant defenses to the environment  
Digestive organs: structure and function | 39: 782-788  
44: 886-896  
40: 815-819 |
| 8 Apr & 11 Apr | Plant transport processes  
Uptake of water and minerals  
Xylem and evapotranspiration  
Phloem, sieve tubes, and translocation  
Photosynthetic strategies and water conservation | Ch 38  
10: 190-195 |
| 13-Apr | Animal circulation I  
Evolution of circulatory systems | provided on Tsq |
| 14-Apr | Exam 4 | |
| => M5 | Start Module 5: Materials Balance | |
| 15-Apr | Animal circulation II  
Human cardiovascular system | 45: 916-924 |
| 18-Apr | Gas Exchange and Transport  
Lungs and gills  
Mechanisms for transporting O₂ and CO₂ | 45: 902-915 |
| 20 Apr & 22 Apr | Ion and water balance in animals  
Excretory mechanisms and systems  
Adaptations to different environments | Ch 43 |
| 25-Apr | Case Study | |
| 29-Apr | Final Exam, 11:30 - 2:20 pm |