**Essential Course Details:**

Lecture meets MWF 11:15am -12:05 pm Molecular Sciences & Engr G011

Recitation and Testing Period meets W 6:00 to 6:50 pm Molecular Sciences & Engr G011.

Lab meets 12:05 to 2:40 pm, 12:10-2:50, or 3:00 to 5:40 pm MTW or R in CULC 473 (1520)

**Course Instructors:**

Lecture Instructors: Dr. Shana Kerr, Cherry Emerson A114, 404.385.0065, [shana.kerr@biosci.gatech.edu](mailto:shana.kerr@biosci.gatech.edu?subject=BIOL%201520:%20)

Office Hours: Thursday 2-4pm & by appointment

Dr. Emily Weigel, Clough Commons 474E, 404.385.1713, [emily.weigel@biosci.gatech.edu](mailto:emily.weigel@biosci.gatech.edu?subject=BIOL%201520:%20)

Office Hours: Tuesday 9-11am & by appointment

Recitation TA: David Fogg, [dfogg3@gatech.edu](mailto:dfogg3@gatech.edu?subject=BIOL%201520:%20) (1520)

Office Hours: Wednesday and Friday 1-2pm; CULC 365

**Co-requisite:** BIOS 1108L (non-majors) or BIOS 1208L (Biology majors)

**Note: This Syllabus and Schedule are subject to change.**

**Required Readings and Websites:** This course is taught using the flipped classroom model, meaning that you will need to complete the assigned readings before each lecture. This course is taught without a traditional textbook, and all course readings and videos are on the course website, [bio1520.biology.gatech.edu](http://bio1520.biology.gatech.edu/). The day-by-day schedule below contains links to each required reading and videos. Required pre-class, in-class, and homework activities will be conducted through Learning Catalytics ([learningcatalytics.com](https://learningcatalytics.com/sign_in?login=true)). Piazza ([piazza.com](https://piazza.com/)), a free online forum, will be used for online discussions and Q&A outside of class. For labs, you will need the combined lab manual/notebook (ISBN 978-0-7380-8996-6)

**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 course will foster the development of 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

1. Explain principles of organismal biology and apply knowledge of mathematics to biological principles
2. Make connections and identify patterns in biological problems
3. Communicate effectively using appropriate scientific 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.

**Class time** will consist of a variety of team-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.

This is not a lecture course! 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 as a student?** Before class, read/watch/listen to the assigned preparatory material, complete each pre-class 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 activities, or TICAs) and periodically contribute to class discussions and display your notes on the projection screen. Following class, there will be weekly homework assignments in Learning Catalytics to give you an additional opportunity to practice mastery of 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 (based on rubric by Filipe and Pritchett 2013):

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

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 promotes the benefits of combining the effect 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 areas of content mastery.

**Participation and Homework:** To complete your pre-class incoming knowledge evaluation (IKEs), team in- class activities (TICAs), and your weekly homework assignments, students are required to have a [Learning Catalytics](https://learningcatalytics.com/sign_in?login=true) account. Points earned in Learning Catalytics will contribute to the "participation" portion of your course grade. Learning Catalytics can be purchased directly at <https://learningcatalytics.com/users/sign_up> or from the Georgia Tech Bookstore in Tech Square. To participate in class, you will need to bring an internet-ready smartphone, tablet, or laptop to class to earn 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. Your entire Learning Catalytics contribution of IKEs, TICAs, and Homeworks tallies to 10% of the final course grade.

**Incoming Knowledge Evaluations (IKEs)**: Before each class, we’ll expect you to complete the pre-class readings on the website. Once you’ve reviewed the material, log in to Learning Catalytics to complete that day’s Incoming Knowledge Evaluation (IKE). IKE sessions generally close an hour before the start of class and will not be reopened for credit, but you can review closed sessions for study purposes. We’ll use your responses to guide what we do in class. IKE questions are often not at the same level as you can expect to see on an exam; instead, they ensure that you come to class with effective baseline knowledge to work up to exam-level questions in class.

**Lectures and Team In-class Activities (TICAs)**: Attendance and participation in lecture correlate strongly with performance in this course. We will make our lecture materials available and urge you to download and print them for use in active note-taking during class. Much of the material and application of ideas needed for success in this course will be presented only in lecture and assessed via Learning Catalytics. Questions presented in class are usually at the same level as exam questions. TICA sessions in Learning Catalytics close at the end of class, with a few exceptions, and will not be reopened for credit, but you can review closed sessions for study purposes.

**Homeworks**: Homework assignments will be made available each weekend in Learning Catalytics and are due on Sunday nights at midnight. Homeworks will not be reopened for credit, but you can review closed sessions for study purposes.

**Exams and Quizzes**: This course has four midterm exams and the cumulative final exam. The midterm exams will be held during class time, are “closed-book,” and will be made up of multiple-choice questions based on topics, materials, and discussions presented in class, assigned readings, TICAs, and Homeworks. Quizzes may be administered in lecture, lab, and online.

**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 (by e-mail) and must include documentation of a legitimate reason for missing the exam. You are encouraged to 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 either administer a makeup exam or remove the missed exam from your grade calculation by using the weighted average of your other exam scores as your grade for the missed exam, making it completely neutral in your final point total.

**Recitation** will be led by the TAs every Wednesday 6:00-6:50 pm in Molecular Sciences & Engr G011. This is an opportunity for you to discuss class material in further detail. Recitation attendance is strongly encouraged and is correlated with exam performance and should be a regular component of your study habits should you desire an A in this course.

**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 building and 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 is the unattributed use of the words of ideas of others; 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 consult with any of us before you submit the assignment. Cell phones must be turned off during exams, and any student found with a cell phone that is not off during an exam may be referred to the Honor Council.

**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>).

With the exception of third-party material, course materials provided in by the instructors are licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

**Grading**

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

In-class exams (approximately 15% each, see below) 60%

Final exam (cumulative): 25%

Participation (equally weighted between HWs, IKEs, and TICAs): 15%

1. We will weight your 4 midterms 10%, 15%, 15%, and 20%, where your lowest midterm score will count 10% and your highest midterm score will count 20% of your final grade.
2. We will score all participation credit (IKEs, TICAs, and HWs) based on participation rather than accuracy.
3. We will combine your exam, lab, and group activity, and other scores into a final score using the weightings shown above to calculate a final course score of 0%-100%.
4. We will assign final letter grades using the following scale:

A: ≥ 90.0%

B: ≥ 80.0% and < 90.0%

C: ≥ 70.0% and < 80.0%

D: ≥ 60.0% and < 70.0%

F: < 60.0%

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| **Date** | **Lecture Topics** | **Instructor** | **Required Reading & Videos** |
| ~~8 Jan~~ | ~~Course Overview~~  *Campus closed due to weather* | ~~Both~~ |  |
| **=> M1** | **Start Module 1: Biodiversity** |  |  |
| 10 Jan | Course Overview and Phylogenetic Trees\*  Recognizing relationships between life on Earth  \*Phylogenetic trees will be covered in depth during Recitation on Jan 10th | EW | [Phylogenetic trees](http://bio1520.biology.gatech.edu/biodiversity/phylogenetic-trees/) |
| 12 Jan | Prokaryotes: Bacteria and Archaea  Earliest signs of life  Prokaryotes as ancient architects  Roles in medicine & bioremediation | EW | [Prokaryotes: bacteria and archaea](http://bio1520.biology.gatech.edu/biodiversity/prokaryotes-bacteria-archaea/) |
| *15 Jan* | *MLK day: Official School Holiday* |  |  |
| 17 Jan | Protista  Origins of the Eukaryotes  Diversity in life cycles, morphology, and metabolism | EW | [Protista](http://bio1520.biology.gatech.edu/biodiversity/protista-and-origins-of-eukaryotes/) |
| 19 Jan | Fungi  Ascomycetes & Basidiomycetes  Ecosystem services | EW | [Fungi](http://bio1520.biology.gatech.edu/biodiversity/fungi/) |
| 22 Jan | Plants  Seedless and seed plants  Origins and ecological importance | EW | [Plants](http://bio1520.biology.gatech.edu/biodiversity/plants/) |
| 24 Jan | Animal Diversity  Origins of major animal groups | EW | [Animal diversity](http://bio1520.biology.gatech.edu/biodiversity/animal-diversity/) |
| 26 Jan | Animals: Invertebrates  Annelids, cephalopods, and insects | EW | [Animals: invertebrates](http://bio1520.biology.gatech.edu/biodiversity/animals-invertebrates/) |
| 29 Jan | Animals: Vertebrates  Fish, reptiles, birds, and mammals | EW | [Animals: vertebrates](http://bio1520.biology.gatech.edu/biodiversity/animals-vertebrates/) |
| 31 Jan | Mass Extinctions & Climate Variability  Causes and evidence for mass extinctions  Climate variability | EW | [Mass extinctions and climate variability](http://bio1520.biology.gatech.edu/biodiversity/mass-extinctions-and-climate-variability/) |
| **2 Feb** | **Module 1 Exam** |  |  |
| **=> M2** | **Start Module 2: Growth and Reproduction** |  |  |
| 5 Feb | Multicellularity, Development, and Reproduction  Differentiation and growth | SK | [Multicellularity,](http://bio1520.biology.gatech.edu/growth-and-reproduction/introduction-to-growth-and-reproduction/) Development, and Reproduction |
| 7 Feb | Animal Reproduction I  Mating systems and reproductive strategies | SK | [Animal reproductive strategies](http://bio1520.biology.gatech.edu/growth-and-reproduction/animal-reproduction-i-mating-systems/) |
| 9 Feb | Animal Reproduction II  Reproductive structures and functions | SK | [Animal reproductive structures and functions](http://bio1520.biology.gatech.edu/growth-and-reproduction/animal-reproduction-ii-reproductive-structure-and-function/) |
| 12 Feb | Animal Development I  Fertilization, polarity, cleavage | SK | [Animal development I](http://bio1520.biology.gatech.edu/growth-and-reproduction/animal-development-i/): fertilization and cleavage |
| 14 Feb | Animal Development II  Gastrulation, differentiation, amniotic membranes | SK | [Animal development II](http://bio1520.biology.gatech.edu/growth-and-reproduction/animal-development-ii/): gastrulation and organogenesis |
| 16 Feb | Plant Reproduction  Double fertilization, seeds, fruit  Alternation of generations | SK | [Plant reproduction](http://bio1520.biology.gatech.edu/growth-and-reproduction/plant-reproduction/) |
| 19 Feb | Plant Development I  Tissue development, differentiation, and function | SK | [Plant development I](http://bio1520.biology.gatech.edu/growth-and-reproduction/plant-development-i-tissue-differentiation-and-function/): Tissue differentiation and structure |
| 21 Feb | Plant Development II  Role of meristems  Primary and secondary growth | SK | [Plant development II](http://bio1520.biology.gatech.edu/growth-and-reproduction/plant-development-ii-primary-and-secondary-growth/): Primary and secondary growth |
| **23 Feb** | **Module 2 Exam** |  |  |
| **=> M3** | **Start Module 3: Chemical and Electrical Signals** |  |  |
| 26 Feb | Principles of chemical signaling, and communication by microbes  Quorum sensing, biofilm formation in microbes | SK | [Principles](http://bio1520.biology.gatech.edu/chemical-and-electrical-signals/intro-to-chemical-signaling-and-signal-transduction/) of chemical signaling, and communication by microbes |
| 28 Feb | Animal Hormones  Hormone effects, production, distribution  Case study systems | EW | [Animal hormones](http://bio1520.biology.gatech.edu/chemical-and-electrical-signals/animal-hormones/) |
| 2 Mar | Plant Hormones and Sensory Systems  Growth, dormancy, germination  Responses to injury, chemical defenses | SK | [Plant hormones and sensory systems](http://bio1520.biology.gatech.edu/chemical-and-electrical-signals/plant-hormones-and-sensory-systems/) |
| 5 Mar | Neurons  Ion channels, action potentials, synapses, neurotransmitters | SK | [Neurons](http://bio1520.biology.gatech.edu/chemical-and-electrical-signals/neurons/) |
| 7 Mar | Nervous Systems  Integration, learning & memory | SK | [Nervous systems](http://bio1520.biology.gatech.edu/chemical-and-electrical-signals/nervous-systems/) |
| 9 Mar | Animal Sensory Systems  Sensory cells & organs, specificity  Case study systems: mechanoreceptors and nociceptors | SK | [Animal](http://bio1520.biology.gatech.edu/chemical-and-electrical-signals/sensory-systems-i/) sensory systems |
| 12 Mar | Motor proteins and muscles  Cilia, flagella, muscles | SK | [Motor](http://bio1520.biology.gatech.edu/chemical-and-electrical-signals/effectors-and-movement/) proteins and muscles |
| 14 Mar | Motor units and skeletal systems  Control of contraction strength  Types of skeletal systems | SK | [Motor units and skeletal systems](http://bio1520.biology.gatech.edu/chemical-and-electrical-signals/motor-units-and-skeletal-systems/) |
| **16 Mar** | **Module 3 Exam** |  |  |
| *19-23 Mar* | *Spring Break: Official School Holiday* |  |  |
| **=> M4** | **Start Module 4: Nutrition, Transport, and Homeostasis** |  |  |
| 26 Mar | Nutritional Needs & Adaptations  Autotrophy, heterotrophy, mixotrophy | EW | [Nutrition:](http://bio1520.biology.gatech.edu/nutrition-transport-and-homeostasis/nutrition-needs-and-adaptations/) what plants and animals need to survive |
| 28 Mar | Acquisition of Nutrients in Animals  Structure and function of digestive organs  Microbial roles in nutrition | EW | [Nutrient](http://bio1520.biology.gatech.edu/nutrition-transport-and-homeostasis/acquisition-of-nutrients-in-animals/) acquisition by animals |
| 30 Mar | Animal Gas Exchange and Transport  Principles of diffusion  Lungs and gills  Mechanisms for transporting O2 and CO2 | EW | [Animal gas exchange and transport](http://bio1520.biology.gatech.edu/nutrition-transport-and-homeostasis/gas-exchange-in-animals/) |
| 2 Apr | Acquisition of Nutrients in Plants  Soil processes, N2-fixation | SK | [Nutrient](http://bio1520.biology.gatech.edu/nutrition-transport-and-homeostasis/acquisition-of-nutrients-in-plants/) acquisition by plants |
| 4 Apr | Plant Transport Processes I  Uptake of water and minerals  Xylem and evapotranspiration | SK | [Water](http://bio1520.biology.gatech.edu/nutrition-transport-and-homeostasis/plant-transport-processes-i/) transport in plants: xylem |
| 6 Apr | Plant Transport Processes II  Phloem, sieve tubes, and translocation | SK | [Sugar](http://bio1520.biology.gatech.edu/nutrition-transport-and-homeostasis/plant-transport-processes-ii/) transport in plants: phloem |
| 9 Apr | Animal Circulatory Systems  Evolution of circulatory systems, heart structure, blood vessel structure and function | EW | [Animal circulatory systems](http://bio1520.biology.gatech.edu/nutrition-transport-and-homeostasis/animal-circulatory-systems/) |
| 11 Apr | Mammalian Cardiac Cycle  Human cardiac cycle, hormonal regulation | EW | [Mammalian cardiac cycle](http://bio1520.biology.gatech.edu/nutrition-transport-and-homeostasis/the-mammalian-cardiac-cycle/) |
| 13 Apr | Animal Ion and Water Regulation  Excretory mechanisms and systems  Adaptations in different environments | EW | [Animal ion and water regulation](http://bio1520.biology.gatech.edu/nutrition-transport-and-homeostasis/animal-ion-and-water-regulation-i/) |
| 16 Apr | Mammalian Kidney  Mammalian kidney function and hormonal regulation | EW | [Mammalian kidney](http://bio1520.biology.gatech.edu/nutrition-transport-and-homeostasis/animal-ion-and-water-regulation-ii/) |
| 18 Apr | Plant and Animal Environmental Responses  Photosynthetic strategies & water conservation  Thermoregulation | EW | [Plant and animal responses to the environment](http://bio1520.biology.gatech.edu/nutrition-transport-and-homeostasis/plant-and-animal-responses-to-the-environment/) |
| **20 Apr** | **Module 4 Exam** |  |  |
| 23 Apr | Class synthesis | Both |  |
| **27 Apr** | **Final Exam, 11:30-2:20pm** | **Comprehensive** |  |