

Course Mode Information:

This course is an in-person course with both synchronous and asynchronous options for connection. We encourage your active engagement in class, as your health and schedule allows, and for you to make weekly surveillance testing a part of your regular routine, regardless of vaccination status. Details are here: <https://health.gatech.edu/coronavirus/testing>

Essential Course Details:

Component	Time
Lecture and Exams	8:25 am – 9:15 am MWF Howey L1
Recitation/Help	6:30 pm - 7:20 pm T Kendeda 152
Final Exam Day/Time	Wednesday, Dec 15 8:00 AM - 10:30 AM

Instructional Team:**Instructors**

Dr. Emily Weigel (she/her)

Emailemily.weigel@biosci.gatech.edu**Drop-in Office Hours (in EST)**

Wednesdays 9:30-11am (right after class!) and by appointment; link on Canvas

Dr. Onur Birol (he/his)

onur.birol@biosci.gatech.edu
(currently inactive)

TBD

Lab Course Instructor

Dr. Colin Harrison (he/his)

Emailcolin.harrison@biosci.gatech.edu

By appointment; See lab syllabus

Teaching Assistants

Name	Email	Office Hours (ALL IN EST; Links on Canvas)
Nabo (Nabojeet) Das (he/him)	ndas37@gatech.edu	Mondays 12:30-1:30pm
Elizabeth Beveridge (she/her)	ebeveridge3@gatech.edu	Tuesdays 2-3pm
Evangeline Raulston (pronounced like 'Caroline') (she/her)	eraulston3@gatech.edu	Wednesdays 2-3pm
Michael Nguyen (he/him)	mnguyen332@gatech.edu	Wednesdays 11am-12pm
Irene Jerish (she/her)	ijerish3@gatech.edu	Thursdays 7-8pm

When emailing, please include the course number (BIOS 1108) in the subject of your email.

Email Policy: Emails can be an appropriate forum to exchange ideas, particularly when addressing individual concerns (e.g., your grade, an institute absence, etc.). **When you email, please put BIOS1108 in the subject line so we see and prioritize the message.** Please also use your GT email; we can respond most thoroughly (and rapidly) when we can simply hit reply vs. needing to search for your verified GT email to respond. **Please also do NOT use Canvas or Learning Catalytics messaging; they are not reliable.** We will generally reply well within 24 hrs and be most responsive M-F 8am-5pm, but if we reply outside of those hours, unless the concern is urgent (e.g., we're troubleshooting your access to LC, an exam, etc.), please don't feel the need to immediately respond. We understand we all need balance. Please pay us this same respect.

Course Description & Learning Objectives: 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

- (a) Explain principles of organismal biology and apply knowledge of mathematics to biological principles
- (b) Explain and interpret biological experiments, and analyze and interpret biological data
- (c) Make connections and identify patterns in biological problems
- (d) 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 developing your confidence in soliciting guidance when problem-solving.

Required Resources:

1. Subscription to Learning Catalytics, purchased at lcatalytics.com
2. Webcam/video-streaming and microphone/audio-streaming device(s) to facilitate class participation if remote

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, <http://organismalbio.biosci.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). Piazza (piazza.com), a free online forum (accessible via Canvas), will be used for online discussions and Q&A outside of class.

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 building your comprehension on the material you find the most difficult, based on pre-class assessments.

Class platform: We are scheduled as an in-person course, but we will be using the BlueJeans web conferencing platform for class as an option so that you can connect remotely when needed. Should we encounter difficulties, backup sessions are pre-scheduled using Cisco WebEx to allow us to pivot over. If this is necessary, you will receive notification in class and/or through a Canvas announcement. Just navigate to Canvas and click the alternative link. Recordings from class will be posted after the session.

Piazza and In-Class Chat Policy: We encourage asking questions and working together, both in and outside of class. To this end, we will set up Piazza, an online platform for you to ask us and your fellow students questions, and we will use the chat feature of the web conference software during class. A challenge with such online communication can be in interpreting text without the visual and auditory clues from speech. Please remember that this is an academic course with connection opportunities online, so we are asking that you treat your fellow students and instructors with the same respect you would in a face-to-face environment. Please grant each other grace and the benefit of the doubt in potential miscommunications by asking for clarification when needed, and please respond to requests in good faith. We will strive to keep our learning environment as a place where we can seek knowledge openly, and we will keep Piazza and the chat available as long as this goal is met. Please remember that conversations on Piazza and in the chat are not private and are visible to the class, so it is most appropriate to please email if your concern is personal (a grade, illness, etc.)

What is my role as instructor? What is the role of your TAs? 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 optimize class time as an opportunity for practice, safe mistakes, and correcting your knowledge in real-time.

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 to the class. 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 with and teaching 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 account. Learning Catalytics can be purchased directly at https://learningcatalytics.com/users/sign_up or from the Georgia Tech Bookstore in Tech Square. **Please use your GT email as your username when you sign up to help us assign credit correctly.** Points earned in Learning Catalytics will contribute to the "participation" portion of your course grade. To participate in class, you will need to have an internet-ready smartphone, tablet, or laptop in class. Phone and computer use should be restricted to class-related material, and off-task use may result in loss of participation points for that day.

"Stuff Happens" Clause: We know, in a time that is so tumultuous, that things can happen. In recognition of this, we will drop your 14 lowest LC scores (of typically about ~90-ish sessions, so about 15%) to account for days when you cannot arrive, think with optimum clarity, or just need a break. There is no need to email us if you miss a session, just note that accounting for missing/suboptimal days will happen at the end of term. Each assignment is worth a small amount, especially relative to all of the challenges of life. If you find this generous policy to still fall short of what you need, please come talk with us, and please do not be surprised if we email just to check in with you on how you're doing—we care!

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 are designed to be done in class, but we will aim to leave them open slightly longer, until 5pm, to encourage meaningful participation and to allow limited missed class make-up. Once they are closed, they will not be reopened for credit, and the answers will be released for your 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.

Scientist Spotlights For each course module, you will read and compose a written response to information about the life and work of a compelling scientist whose work is related to some aspect of the course content. These 4 written assignments, along with a preparatory assignment on plagiarism, will be posted on Canvas and will be due by 11:59 PM each posted deadline. These assignments will be subject to plagiarism review by Turnitin. You must complete the plagiarism assignment, but you may drop the lowest spotlight of the 4 you are asked to complete. The three remaining spotlights together with the plagiarism assignment contribute equally to 20% of your grade (5% each).

Assignment Submissions:

All assignments are to be submitted directly to Canvas or Learning Catalytics. You are responsible for ensuring the timely submission of appropriately formatted, applicable, openable files; therefore, please check each submission to be sure it appears as you intend. Assignments submitted via email or as linked documents (e.g., google docs) will not be accepted. Scientist Spotlights are the only assignments that can be submitted late and are accepted with a 5% penalty per 12 hours late (5% for 12 hours late, 10% for 24 hours late, etc). IKEs, TICAs, and HWs are not accepted late, as assignments will close to allow review after the deadline. We encourage you to reach out well BEFORE an assignment is due, should you need to request an extension.

Exams: This course has four midterm exams and a cumulative final exam. Exams are open-note (but NOT collaborative) and will be held synchronously during class time to allow for students to ask questions for clarification and receive answers from the instructional team in real time. You do not have to be present in the classroom to take the exam during the testing window, and we will not use proctoring software, but we do ask that you do not communicate (e.g. post, call, text, etc.) with other students for any reason during the exam window so that everyone has a fair shot to do their best on the exam without distraction. Exams will consist of multiple-choice questions (~70%) and short answer questions (~30%) based on the Learning Objectives. *The best way to study for exams is to practice the Learning Objectives.* We reserve the right to adjust exams based on student performance and other mitigating factors.

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) with a legitimate reason for missing the exam. **Documentation is required for any exam to be considered excused;** for your privacy, any medical documentation should be submitted through the confidential platform provided by the Dean of Students (https://gatech-advocate.symplicity.com/care_report/index.php/pid201106) and not to your course instructors. **If submitting documentation is an impediment, please just reach out and let us know what is going on and we can discuss. Your safety and wellbeing matter more than your grade on a course, so please just communicate.** 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.

Grade Change: Grades are not negotiable commodities. However, mistakes can and do occur. If you feel a writing assignment or exam has been incorrectly scored, notify us by email as soon as possible. Any requests for adjustment of grades must be submitted in writing no more than 48 hrs after the work has been returned and should include a detailed explanation as to what you would like us to review. In all cases, the entire assignment will be reevaluated, and a final, revised grade (higher or lower) will be assigned if warranted. Be aware that regrading takes time, so be patient.

Recitation will be led by the TAs every Tuesday, 6:30-7:20. Recitation 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. Note that, to encourage asking questions, recitations will **not** be recorded, but materials from the sessions will be posted CANVAS after the session.

'Pivot and Patience' Policy: We, as an instructional team, are going to do our best to continue to limit our own personal risks in the pandemic, both to keep ourselves and community healthy, and to preserve your educational experience. That said, by coming into contact with many students to teach, we are taking on an increased risk and may need to quarantine if exposed, or isolate if positive/ill. We will communicate with you as soon as we can, should any change arise in how the course may need to be delivered or in work which you are expecting to submit or have returned (Note: Should it be a concern, the campus contact tracing will contact you if exposed in this course. Please do not assume an absence of a student, TA, or instructor means a positive case). Please have patience, as the health of everyone in our community matters and must be held in priority for good educational outcomes. We thank you in advance for understanding this and helping to support this goal.

Expectations: This is an unprecedented time. You have a definite stake in your personal health and the community's health. Our expectation is that **everyone who is eligible will be vaccinated**; vaccination significantly reduces likelihood of severe disease, including from the Delta Variant of SARS-CoV-2. Because the delta variant can be spread by vaccinated individuals, we also expect that **everyone who is able to, should wear a mask**, correctly covering mouth and nose, when indoors. Both of these expectations are based on current CDC guidance. As that guidance is updated, we will communicate any new expectations. As the Delta Variant of Covid-19 spreads and the reality of breakthrough cases becomes clear, we cannot help but think of those who are unvaccinated or immunocompromised. Until we have a better sense of if, and how, vaccinated individuals can carry or be infected by the Delta variant, we plan to wear our masks in class. We invite you to do the same.

Symptoms: If you are sick, or may have been around folks who now are, particularly with any symptoms of COVID-19, **do not attend class in-person**. We will work with you to make sure you have the opportunity to learn the material you miss AND have crafted the course to allow you to prioritize the health and safety without impacting your grade. **All students are expected to follow the guidance provided by the University regarding COVID-19 precautions, masks, and vaccinations.**

As we write this syllabus, the COVID crisis is worsening. We are a community and are thus dependent on, and affected by, the actions, precautions, and protections each of us takes to mitigate the spread of COVID-19. COVID-19 poses a real risks to others, including those to whom we are connected and support at home. As such, we ask that you take reasonable efforts to protect yourselves, our campus, and our broader community from the spread of COVID-19.

WE are living through a pandemic. Health and safety must come first, as you will grow to more fully understand through the content in this course. While in the 'Before Times' class attendance was very highly correlated with student success in this course, we trust each of you to use your best judgment to keep yourself and those around you safe. Remember that the virtual options exist (both simultaneously and asynchronously) to help you stay connected to our class, where we are so invested in your successes as human beings.

As the pandemic continues, we want to share our thoughts about our collective experiences:

- Some of our lives may be relatively unaffected by the pandemic, while others have experienced profound tragedies. *We cannot* make assumptions about others' experiences with the virus.
- We ought to be more compassionate with each other and with ourselves - now, perhaps more than ever, is the time to give the gift of grace freely and lovingly.
- Together, we will make this semester as safe, thoughtful, rigorous, and insightful as we can. This applies both to our intellectual efforts and adherence to COVID-19 safety protocols.

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 commmlab.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 or 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.

Class Content Intellectual Property Policy:

There are tons of very smart people in this course that will be looking to grow intellectually. This means we will all be sharing ideas, some fully formed, some in process, as we grow. Any work and/or communication that you are privy to as a member of this course should be treated as the intellectual property of the speaker/creator, and is not to be shared without their permission. Specifically, students may not make or distribute screen captures, audio/video recordings of, or livestream, any class-related activity, including lectures and presentations, without official GT accommodations. We have taken care to prepare class recordings that should meet the needs of members of this course, with or without official accommodation, but we invite you to share if there are ways we can make class more inclusive. If your accommodations do stretch beyond what we are able to offer broadly to the course, we ask that any recordings you have not be shared with any other student, whether in this course or not, or with any other person or on any other platform, to not run afoul of applicable privacy laws. Failure to follow this policy on recording or distributing class-related activities may subject you to discipline under the Student Code of Conduct.

All course materials, including In-Class Materials, Exams, 'How To' Guides and Tutorials, Sample Assignments, Student Support materials, and the like are protected by copyright law. Students may take notes and make copies of course materials for their own personal use only. However, students may NOT reproduce, distribute or display (post/upload/screenshot/take photos of) lectures or course materials in any other way without the instructor's prior written consent (this includes uploading course materials to "study websites" such as Chegg, Course Hero, etc...). Violations of this policy will be subject to student conduct proceedings under GT's Student Code of Conduct, and applicable laws.

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>).

Statement of Intent for Inclusivity: As members of the Georgia Tech community, we are committed to creating a learning environment in which all students feel safe and included. Because we are individuals with varying needs, we are reliant on your feedback to achieve this goal. To that end, we invite you to enter into dialogue with us about the things we can stop, start, and continue doing to make our classroom an environment in which every student feels valued and can engage actively in our learning community.

Student-Faculty Expectations Agreement: At Georgia Tech we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. See <http://www.catalog.gatech.edu/rules/22/> for an articulation of some basic expectation that you can have of me and that we have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, we encourage you to remain committed to the ideals of Georgia Tech while in this class.

Academic Support: 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 commmlab.gatech.edu).

Additional resources for academic support include:

- Center for Academic Success: <http://success.gatech.edu>
 - 1-to-1 tutoring: <http://success.gatech.edu/1-1-tutoring>
 - Peer-Led Undergraduate Study (PLUS): <http://success.gatech.edu/tutoring/plus>
 - Academic coaching: <http://success.gatech.edu/coaching>
- Residence Life's Learning Assistance Program
<https://housing.gatech.edu/learning-assistance-program>
 - Drop-in tutoring for many 1000 level courses
- OMED: Educational Services: <http://omed.gatech.edu/programs/academic-support>
 - Group study sessions and tutoring programs
- Communication Center: <http://www.communicationcenter.gatech.edu>
 - Individualized help with writing and multimedia projects
- Academic advisors for your major: <http://advising.gatech.edu/>

Personal Support: In your time at Georgia Tech, you may find yourself in need of support. Below are some resources available on campus.

- The Office of the Dean of Students: <http://studentlife.gatech.edu/content/services>; **404-894-6367**; Smithgall Student Services Building 2nd floor
 - You also may request assistance at https://gatech-advocate.symplicity.com/care_report/index.php/pid383662?
- Counseling Center: <http://counseling.gatech.edu>; **404-894-2575**; Smithgall Student Services Building 2nd floor
 - Services include short-term individual counseling, group counseling, couples counseling, testing and assessment, referral services, and crisis intervention. Their website also includes links to state and national resources.
 - *Students in crisis may walk in during business hours (8am-5pm, Monday through Friday) or contact the counselor on call after hours at 404-894-2204.*
- Students' Temporary Assistance and Resources (STAR): <http://studentlife.gatech.edu/content/need-help>
 - Can assist with interview clothing, food, and housing needs.
- Stamps Health Services: <https://health.gatech.edu>; **404-894-1420**
 - Primary care, pharmacy, women's health, psychiatry, immunization and allergy, health promotion, and nutrition
- OMED: Educational Services: <http://www.omed.gatech.edu>
- Women's Resource Center: <http://www.womenscenter.gatech.edu>; 404-385-0230
- LGBTQIA Resource Center: <http://lgbtqia.gatech.edu/>; 404-385-2679
- Veteran's Resource Center: <http://veterans.gatech.edu/>; 404-385-2067
- Georgia Tech Police: 404-894-2500

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

In-class exams (midterms)	40%
Final exam (Cumulative)	20%
Scientist Spotlights + Plagiarism assn.	20%
Participation*	20%

*equally weighted between Homeworks, TICAs, and IKEs

The maximum overall score we will allow in this course is 100%, so this scheme 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, spotlights, 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

The above scale is the most stringent we will use, and *you are not competing with anyone for your grade.*
We are in this together!

Date	Lecture Topics	Required Reading & Videos
23 Aug	Course Overview	
=> M1	Start Module 1: Biodiversity	
25 Aug	Phylogenetic Trees Recognizing relationships between life on Earth	<u>Phylogenetic Trees</u>
27 Aug	Prokaryotes: Bacteria and Archaea Earliest signs of life Prokaryotes as ancient architects Roles in medicine & bioremediation	<u>Prokaryotes: Bacteria and Archaea</u>
30 Aug	Eukaryotes and their Origins Diversity in life cycles, morphology, and metabolism Avoiding Plagiarism assignment due by 11:59pm	<u>Eukaryotes and their Origins</u>
1 Sep	Land Plants Seedless and seed plants Origins and ecological importance	<u>Land Plants</u>
3 Sep	Fungi Ecosystem services	<u>Fungi</u>
6 Sep	<i>No Class: Labor Day</i>	

8 Sep	Animals: Invertebrates Annelids, cephalopods, and insects	<u>Animals: Invertebrates</u>
10 Sep	Animals: Vertebrates Fish, reptiles, birds, and mammals Scientist Spotlight 1 due by 11:59pm	<u>Animals: Vertebrates</u>
13 Sep	The Tree of Life over Geologic Time	<u>The Tree of Life over Geologic Time</u>
15 Sep	Mass Extinctions & Climate Variability Causes and evidence for mass extinctions Climate variability	<u>Mass Extinctions and Climate Variability</u>
17 Sep	Module 1 Exam	
=> M2	Start Module 2: Nutrition, Transport, and Homeostasis	
20 Sep	Nutritional Needs & Adaptations Autotrophy, heterotrophy, mixotrophy	<u>Nutrition: what plants and animals need to survive</u>
22 Sep	Acquisition of Nutrients in Plants Soil processes, N ₂ -fixation	<u>Nutrient acquisition by plants</u>
24 Sep	Plant Transport Processes I Uptake of water and minerals Xylem and evapotranspiration	<u>Water transport in plants: xylem</u>
27 Sep	Plant Transport Processes II Phloem, sieve tubes, and translocation	<u>Sugar transport in plants: phloem</u>
29 Sep	Acquisition of Nutrients in Animals Structure and function of digestive organs Microbial roles in nutrition	<u>Nutrient acquisition by animals</u>
1 Oct	Animal Gas Exchange and Transport Principles of diffusion Lungs and gills Mechanisms for transporting O ₂ and CO ₂	<u>Animal gas exchange and transport</u>
4 Oct	Animal Circulatory Systems Evolution of circulatory systems, heart structure, blood vessel structure and function	<u>Animal circulatory systems</u>
6 Oct	Mammalian Cardiac Cycle Human cardiac cycle, hormonal regulation Scientist Spotlight 2 due by 11:59pm	<u>Mammalian cardiac cycle</u>
8 Oct	Animal Ion and Water Regulation Excretory mechanisms and systems Adaptations in different environments	<u>Animal ion and water regulation</u>
11 Oct	<i>No Class: Fall Break</i>	
13 Oct	Mammalian Kidney Mammalian kidney function and hormonal regulation	<u>Mammalian kidney</u>
15 Oct	Plant and Animal Environmental Responses Photosynthetic strategies & water conservation Thermoregulation	<u>Plant and animal responses to the environment</u>
18 Oct	Module 2 Exam	

=>M3 Start Module 3: Chemical and Electrical Signals

20 Oct	Principles of chemical signaling, and communication by microbes Quorum sensing, biofilm formation in microbes	<u>Principles of chemical signaling, and communication by microbes</u>
22 Oct	Plant Hormones and Sensory Systems Growth, dormancy, germination Responses to injury, chemical defenses	<u>Plant hormones and sensory systems</u>
25 Oct	Neurons Ion channels, action potentials, synapses, neurotransmitters	<u>Neurons</u>
27 Oct	Nervous Systems Integration, learning & memory	<u>Nervous systems</u>
29 Oct	Animal Hormones Hormone effects, production, distribution Case study systems	<u>Animal hormones</u>
1 Nov	Animal Sensory Systems Sensory cells & organs, specificity Scientist Spotlight 3 due by 11:59pm	<u>Animal sensory systems</u>
3 Nov	Motor proteins and muscles Cilia, flagella, muscles	<u>Motor proteins and muscles</u>
5 Nov	Motor units and skeletal systems Control of contraction strength Types of skeletal systems	<u>Motor units and skeletal systems</u>
8 Nov	Module 3 Exam	

=> M4 Start Module 4: Growth and Reproduction

10 Nov	Multicellularity, Development, and Reproduction Differentiation and growth	<u>Multicellularity, Development, and Reproduction</u>
12 Nov	Animal Reproduction I Mating systems and reproductive strategies	<u>Animal reproductive strategies</u>
15 Nov	Animal Reproduction II Reproductive structures and functions	<u>Animal reproductive structures and functions</u>
17 Nov	Animal Development I Fertilization, polarity, cleavage	<u>Animal development I: fertilization and cleavage</u>
19 Nov	Animal Development II Gastrulation, differentiation, amniotic membranes Scientist Spotlight 4 due by 11:59pm	<u>Animal development II: gastrulation and organogenesis</u>
22 Nov	Plant Reproduction Double fertilization, seeds, fruit Alternation of generations	<u>Plant reproduction</u>
24 Nov	<i>No Class: Thanksgiving break</i>	
26 Nov	<i>No Class: Thanksgiving break</i>	

29 Nov	Plant Development I Tissue development, differentiation, and function	<u>Plant development I: Tissue differentiation and structure</u>
1 Dec	Plant Development II Role of meristems Primary and secondary growth	<u>Plant development II: Primary and secondary growth</u>
3 Dec	Module 4 Exam	
6 Dec	Class synthesis	
15 Dec (W)	Final Exam 8:00 AM - 10:30 AM	Comprehensive Note the final exam will end 20 minutes earlier than the officially scheduled time. The final exam guidelines can be found here: https://registrar.gatech.edu/info/exam-guidelines