

## **BIOL 1220: THE BIOLOGY OF SEX AND DEATH**

Lecture: TR 9:35-10:55 am CULC 102

Lab: W 12:05-2:55 or 3:05-5:55 pm CULC 483

**Course Purpose and Objectives:** This course is designed to teach biology through the lens of the formation and collapse of biological systems, organized around questions pertaining to life, sex, and death. Sex and death are two constants of living organisms and are a consequence of how organisms interact with each other and the environment. We'll explore questions such as why sex exists, how sexual reproduction differs between organisms, and what are the costs and benefits of sex. We will also consider modes of cancer and infectious disease, how forensic DNA fingerprinting can solve crimes, and how climate change and land use decisions by humans cause extinction, the death of entire species.

Students will be able to demonstrate the ability to obtain, analyze, interpret, and criticize qualitative observations and quantitative measurements to explain natural phenomena and to test hypotheses. Lecture time will be spent on a variety of team-based activities designed to allow students to discuss, clarify, and apply new ideas by answering questions, drawing diagrams, analyzing science news articles and figures from the primary literature, and explaining phenomena in the context of biological principles. Specifically, by the end of this course, students will be able to:

- 1) Obtain and interpret information from the course readings, case studies, or online sources to determine how the biology of sex and death impacts how diverse organisms from microbes to animals interact with each other and with the dynamics of natural biological systems.
- 2) Demonstrate critical scientific skills that include hypothesis testing, experimental design, quantitative data analysis and interpretation, and scientific communication. In lab, students collaborate to design and conduct experiments and interpret the collected data, applying statistical tests to gain insight into how interpretations of data generated by scientists include scientific uncertainty.
- 3) Explain and critique their analysis and interpretation of information by writing lab reports in the format of articles for Charged Magazine, answering questions in class, and discussing their ideas with peers and instructors in class.
- 4) Reflect upon how scientific thinking about biological topics can inform ethical decisions about health, social interactions, and how humans interact with the environment.

**Pre-requisites and the General Education Core:** This course is a 4-credit hour lecture and lab course. It has no pre-requisites and fulfills a lab science elective for non-Biology majors. Students who decide to change majors into Biology after taking this course may consult with the course instructor and their academic advisor to take an advanced standing exam to substitute this course for BIOL 1510. This course is not a recommended substitute for BIOL 1510 or BIOL 1511 for Pre-Health students seeking to prepare for medical training and the MCAT. This course is not intended for declared Biology majors.

### **Faculty Instructors:**

**Dr. Chrissy Spencer**, [chrissy.spencer@biology.gatech.edu](mailto:chrissy.spencer@biology.gatech.edu) 404 385 0539

Office: CULC 474C, Office Hours: Mon 1-3 pm or by appointment

Dr. Spencer is the point of contact for all lecture course concerns.

**Dr. Aakanksha Angra**, [aakanksha.angra@biosci.gatech.edu](mailto:aakanksha.angra@biosci.gatech.edu) 470 485 4768

Office: CULC 333, Office Hours: Thurs 3-5 pm or by appointment

Dr. Angra is the point of contact for all laboratory concerns, including absences from lab.

**Dr. Brian Hammer**, [bhammer@gatech.edu](mailto:bhammer@gatech.edu) 404 385 7701

Office: Cherry Emerson 223, Office Hours: Tue 12-2 pm or by appointment

**Teaching Assistant Instructors:**

Sarah Hameed, [sarah.hameed@gatech.edu](mailto:sarah.hameed@gatech.edu), Office hours: Mon 2-4 pm in CULC 365

Mary Beth McWhirt, [mmcwhirt3@gatech.edu](mailto:mmcwhirt3@gatech.edu), Office hours: Mon 4-6 in CULC 365

**Course Materials:**

- Readings and Videos on the course website [bio1220.biology.gatech.edu](http://bio1220.biology.gatech.edu)
- Learning Catalytics subscription at [www.learningcatalytics.com](http://www.learningcatalytics.com)
  - If you already have a Mastering or MyLab account for another course, check first to see if you have free access to Learning Catalytics.
  - If not, purchase for \$12 for the semester at [www.learningcatalytics.com](http://www.learningcatalytics.com). Select the Register link, indicate you are a student, and select “No, I am not using Learning Catalytics with a MyLab or Mastering product”)
- Lab Coat (long sleeve, 100% cotton, available at Georgia Tech Bookstore or from the CULC 5<sup>th</sup> floor Chemistry Stockroom. Please bring your lab coat to lab the first week.)

**Course Mechanics & Expectations:** Lecture time will be spent on a variety of team-based activities designed to let you discuss, clarify, and apply new ideas by answering questions, drawing diagrams, analyzing primary literature, and explaining phenomena in the context of biological principles. We will spend class time on building your comprehension of the material you find the most difficult, based on pre-class assessments. You will play a prominent role in determining 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 optimize your in class time as an opportunity for you to reveal your misconceptions and be corrected in real-time. Mini-lecture tutorials will be offered when needed. 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-class assessment, create a notes template for class, and formulate any questions you want to ask. During class, you can expect to build your understanding through team activities and contribute to class discussions. Following class, there will be short homework assignments 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 complex problem into discreet and solvable parts. 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.

**Academic Honor Code and Plagiarism:** All students are expected to abide by the Academic Honor Code, which can be viewed online at [www.honor.gatech.edu](http://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, completing work while logged in as another student, and plagiarism. Everything that you write or create in this course, including lab reports, test answers, homework, and in-class work, must be original content created by you, not copied from another source. Copying the words or even the ideas of someone else is plagiarism. Any suspected plagiarism will be submitted to the Office of Student Integrity for evaluation.

**Learning Accommodations:** We will make classroom and laboratory accommodations for students with disabilities. These accommodations must be arranged in advance and in accordance with the [Office of Disability Services](#).

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

Pre-class Assignments:	5%
In-class Activity Assignments:	10%
Homework Assignments:	10%
Tests:	35%
Final Exam:	15%
Laboratory:	25%

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:  $< 60.0\%$

**Tests and Final Exam:** *Short tests held weekly at the beginning of class* during the semester will be a mix of multiple choice and short answer questions. Test questions will be focused on recent material but as content knowledge deepens, some degree of cumulative recall is expected. The final exam, held during finals week, will be a cumulative exam. Twelve (12) tests will be given, and the lowest two grades will be dropped. If you miss a test for any reason, you will receive a grade of 0 (zero) on that test unless you petition for a makeup test within 24 h of the start of the missed test, and we approve your petition. Petitions must be submitted by email to [chrissy.spencer@biology.gatech.edu](mailto:chrissy.spencer@biology.gatech.edu) and must include documentation of a legitimate reason for missing the test. You may submit your petition before the test if you know of your scheduling conflict in advance. Examples of legitimate reasons to miss a test include your illness, an illness or death in your immediate family, and participation in official university activities.

**Assignments:** To complete your pre-class and in-class activities and your weekly homework assignments, students are required to have a [Learning Catalytics](https://learningcatalytics.com/users/sign_up) account. Learning Catalytics can be purchased directly at [https://learningcatalytics.com/users/sign\\_up](https://learningcatalytics.com/users/sign_up) or from the Georgia Tech Bookstore. To participate in class, you will need to bring an internet-ready laptop, tablet, or smartphone 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.

**Pre-class assignments:** 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 a short Incoming Knowledge Evaluation (IKE). IKE sessions close at the start of class and will not be reopened for credit, but you can review closed sessions for study purposes. IKE questions are not often at the same level as you can expect to see on a test; instead, they ensure that you come to class with effective baseline knowledge to work up to test level questions in class.

**In-class Activity assignments:** Attendance in lecture correlates with performance and course grades. We will make our lecture materials available and urge you to download and print them for use in active note-taking during class. Questions presented in class are usually at the same level of difficulty as test questions, so attending class gives you practice for taking the tests. In-Class Activity 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.

**Homework:** Homework assignments will be made available each week in Learning Catalytics and are always due on Sundays at midnight. Homeworks close on Sunday at midnight, with few exceptions, and will not be reopened for credit, but you can review closed sessions for study purposes.

**Bloopers and Gaffes:** This course explores many aspects of sex and death, and we will try to present and discuss the material in a fair and balanced way, but everyone makes mistakes – especially when we are talking about a loaded subject such as sex for an entire semester. Faculty, TAs, and students will each need to do their best to choose words carefully and avoid offending others, and we apologize in advance for anything we say that you might find offensive or uncomfortable. We ask that everyone treat these subjects with respect but also with an open mind. Please let a faculty member know if you are upset by any of the content in the course and help us to refine the material with each passing year to make the course better than the year before.

**Intellectual Property:** With the exception of third-party material, course materials provided in BIOL 1220 are licensed under a Creative Commons Attribution-Non Commercial-Share Alike 4.0 International License. They are not to be re-distributed or re-purposed without express permission of the instructor.

### Lecture Topics & Schedule (subject to change)

Date	Module	Who	Topic
10-Jan	1.01	CS	Scientific Methodology
12-Jan	1.02	BH	Life defined
17-Jan	1.03	CS	Biodiversity
19-Jan	1.04	CS	Tree Thinking
24-Jan	1.05	CS	Evolution by NS
26-Jan	1.06	CS	Bioenergetics/Ecosystem Ecology
31-Jan	1.07	AA	Nutrition
2-Feb	2.01	CS	Asexual Reproduction
7-Feb	2.02	CS	Sex (Meiosis)
9-Feb	2.03	CS	Trait Inheritance
14-Feb	2.04	AA	Plant Reproductive Structure and Function
16-Feb	2.05	CS	Animal Reproductive Structure and Function
21-Feb	2.06	CS	Animal Reproductive Structure and Function 2
23-Feb	2.07	AA	Sex Determinism
28-Feb	2.08	AA	Sexual Dimorphism & Sexual Selection
2-Mar	2.09	CS	Biological Basis of Homosexuality
7-Mar	2.10	BH	IVF and Cloning
9-Mar	2.11	BH	STDs/Errors in Meiosis/Heritable disease traits
14-Mar	2.12	AA	Evolution of Sex
16-Mar	2.13	CS	Synthesis
21-Mar	–		<i>Spring Break</i>
23-Mar	–		<i>Spring Break</i>
28-Mar	3.01	AA	Physiology of Senescence
30-Mar	3.02	BH	Heritable Disease
4-Apr	3.03	CS	SIR models
6-Apr	3.04	BH	Vaccination/Immunization
11-Apr	3.05	BH	Innate & Adaptive Immune Responses/Allergies
13-Apr	3.06	BH	Cancer Biology
18-Apr	3.07	JM	Extinction
20-Apr	3.08	CS	Synthesis
25-Apr	3.09	CS	Review Day
2-May	–		Final Exam (Tues 2:50pm - 5:40pm)

## BIOL 1220: The Biology of Sex and Death – Laboratory Syllabus

W 12:05-2:55, or 3:05-5:55 pm lab in CULC 483

**Lab format:** The laboratory provides an opportunity for you to practice biology like a scientist to complement lecture content and activities. In lab, students collaborate to design, conduct experiments, interpret collected data, and present findings in oral presentations. Students also practice communicating their science in a written format.

### Laboratory Learning Objectives:

- 1) Demonstrate critical scientific skills that include hypothesis testing, experimental design, quantitative data analysis and interpretation with statistics, and scientific communication.
- 2) Explain and critique their analysis and interpretation of information by writing lab reports in the format of articles for Charged Magazine.

**Safety:** For every wet lab, you must wear your lab coat, long pants, close-toed shoes, and tie back long hair. Safety policies are mandated by Georgia Tech institutional rules to keep everyone safe. At the beginning of each lab, your TA will alert you to all of the potential hazards. You will lose all of your participation points for that lab if you violate safety policies. The following safety policies are non-negotiable:

- You must wear shoes that cover your feet entirely (i.e., no flip flops, ballet slippers, or sandals). You will not be allowed to enter the lab without appropriate footwear.
- No food or drinks, including water bottles.
- No cell phone use, including texting (phones must be silenced and off the lab bench).
- Clean up your lab station at the end of lab and report any mess left behind from previous lab sections to your TA.
- Properly dispose of trash, glassware, and biohazard waste. Other people's safety may be compromised by your negligence.
- During "wet labs" you must wear long pants to the ankle, your lab coat and safety glasses, and long hair should be tied back. Your TAs will indicate when gloves are necessary. Safety glasses and disposable nitrile gloves are provided in lab.
- Follow additional safety procedures for specific lab activities as indicated by your TA.
- **Report all injuries or accidents to your TA immediately.**

**Absences:** You must attend your assigned lab section unless you have been given permission to attend another lab section to make up an excused absence. Contact your TAs as soon as you know that you will miss lab, preferably beforehand. We advise contacting your group members as well, to get data they may collect.

- *Excused absences:* Documented excused absences may include your illness, an illness or death in your immediate family, and participation in official university activities. Any missed lab assignments will be due within one week of the original due date. There is no penalty for an excused absence. **It is your responsibility to contact your group members to obtain necessary data from the missed lab exercise.**
- *Unexcused absences:* There are no make-up labs for unexcused absences. An unexcused lab results in a 5% reduction of your overall course grade and participation points for that lab.

**Plagiarism will not be tolerated:** Direct copying from primary literature or internet sources, without referencing them will result in a grade of "0" for that assignment, and possibility other penalties and sanctions. Your conduct is expected to conform to the Georgia Tech Honor Code (<http://www.honor.gatech.edu>). Please familiarize yourself with its expectations and responsibilities.

**Late work Policy:** Assignments turned in late without prior notification to the instructors will be marked down 10% each day they are late.

**Additional resources to help you be successful in Biology 1220 Lab:** If you have no experience with statistics and/or creating graphs, we encourage you to use Appendices A and B in the lab manual as a resource, along with graphing resources, which you will find on T-square. You may find the following statistics tutorial on t-tests and chi-square tests at MathBench to be helpful: <http://www.mathbench.umd.edu/> If you're interested in additional resources on writing, check out the following web resources: <http://owl.english.purdue.edu/> and <http://labwrite.ncsu.edu/>

**Grades:** Your lab grade is comprised of the components described below:

Pre-lab assignments (Individual)	10%
Lab Participation (Individual)	10%
Experimental Design Worksheets (4, Group)	15%
PowerPoint Presentations (4, Group)	25%
Peer Graph Evaluations (4, Individual)	15%
Charged Magazine Draft (Individual)	10%
Charged Magazine Final (Individual)	15%

Please note that the grades on the T-square Lab site are for your record-keeping only; T-square does not calculate your lab course grade accurately.

### **Pre-lab assignments:**

Pre-labs are designed to help you to prepare for lab. Pre-lab assignments will be posted on T-square by the Friday before your next lab, and can be found under Pre-labs or Resources (as noted in Schedule below). Pre-labs will be completed online. Pre-labs must be completed before lab. It's your responsibility to read the lab in advance (as indicated on the Schedule). There is no credit for late pre-lab work, except in the case of an excused absence.

### **Lab participation:**

You will be assessed by your lab instructor and TA for each laboratory exercise (3 points per lab) and by your group members at the midpoint and end of the semester. Group work is an essential part of lab. If you are >10 minutes late to lab, you will lose 1 participation point for that lab. A safety violation will result in the loss of all participation points for that lab.

### **Experimental Design Worksheets:**

Four times over the course of the semester, you will be asked to fill out and upload an experimental design worksheet which consists of your research question, rationale and hypothesis, detailed experimental protocol, and your data analysis and communication plans. All group members must contribute equally to these worksheets. All members will sign at the end of the worksheet signifying their approval of the work and verifying their contribution to it. If you do not contribute equally towards your group, you will face penalties, possibly receiving a grade of "o" for that assignment. Experimental Design Worksheets must be completed in class.

### **Group PowerPoint Presentations:**

Four times over the course of the semester, you will be asked to design and deliver your findings to the class in the form of short PowerPoint presentations. Oral presentations are a great way to practice science communication skills. Each PowerPoint presentation is expected to include a title slide, research question, rationale and hypothesis, detailed experimental methodology (independent, dependent variables, controls), data analysis, at least one graph, conclusion, sources of error, and next steps. Ideas and information that was obtained from other sources must be cited.

### **Peer Graph Evaluations:**

Four times over the course of the semester, you will be asked to provide constructive feedback to your peers on their graphs. The purpose of this assignment is two-fold. First, we would like you to practice providing constructive feedback. Your name will only be visible to the instructor and TA in the course and will not be visible to the student whose graph you provided a reflection on. Because of this, we ask that you provide honest feedback. The second purpose of this assignment is to make you aware of your own knowledge with graphs. By exposing you to different types of graphs, we hope that you will expand your own graph knowledge and create better graphs for future assignments connected to this course and your future courses.

### **Concerns about grades:**

There is no extra credit that is offered for Biology 1220 lab. We think the distribution of points possible to earn is fair, and in particular, we feel strongly about giving you credit for your weekly participation in lab, since doing lab can be a lot of work. Your lab grade is 25% of the Biology 1220 final course grade. It is your responsibility to keep up to date with grades posted on T-square to confirm that your work is correctly reflected in the assigned grade. If a grade on T-square appears to be inaccurate, e.g., a zero entered for an assignment you turned in, etc., contact your TAs within 3 weeks of the assignment due date, to request a grade re-evaluation.

### **Lab Schedule (subject to change)**

<b>Week</b>	<b>Lab</b>	<b>Lab Assignment due</b>
1-Jan 11	Sea Urchin Embryology	Pre-lab on t2: Sea Urchin Lab
2-Jan 18	Pokémon Go	Assignment on t2:
3-Jan 25	Pokémon Go/ Science Literature Searches	Pre-lab on t2
4-Feb 1	Bean beetle biomonitoring Part1	Nothing due
5-Feb 8	Bean beetle biomonitoring Part2	
6-Feb 15	Fiddler Crabs Part 1	Pre-lab on t2
7-Feb 22	Fiddler Crabs Part 2	Nothing due
8-Mar 1	Fiddler Crabs Presentation/ Writing Activity	Bring a draft of your Charged article
9-Mar 8	Soil Microbes Part 1	Assignment on t2 and bring soil samples
10-Mar 15	Soil Microbes Part 2	Nothing Due
11-Mar 22	<i>No lab- Spring Break</i>	<i>Nothing Due</i>
12-Mar 29	Soil Microbes Part 3	Assignment on t2
13-Apr 5	Forensics Lab Part 1	Assignment on t2: Draft of Charged Magazine article on lab of your choice
14-Apr 12	<i>Forensics Lab Part 2</i>	<i>Nothing due</i>

15-Apr 19	Forensics Lab Part 3/Wrap-Up	Article for Charged Magazine due
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