

# BIOS 4401 Syllabus

## Experimental Design & Statistical Methods

Mon/Wed 9:30 – 10:45 Molecular Science and Engineering G011

**\*All Class Materials and Links are on Canvas\***

### Instructional Team

**Note: when emailing us, please put BIOS4401 in the subject line to ensure we see it!**

**Course Instructor:** Dr. Robbie Richards (he/him) [r.richards@gatech.edu](mailto:r.richards@gatech.edu)

**Drop-In Hours:** Wed 2:30pm-4:30pm Cherry Emerson 315 or Virtual (link on Canvas) & by appointment

### Teaching Assistants (TAs):

<u>Name</u>	<u>GT Email</u>	<u>Drop-In Virtual Office Hours</u> <u>(Times in Eastern; Links on Canvas)</u>

### 1.0 Course Description

Statistics is how we learn things from data. In this introductory course, we will cover a broad range of probabilistic and statistical methods applicable to many areas of biological research. This is an introductory course on probability distributions and statistical testing, using techniques commonly applied in biological research. In-class activities will be split between mini-lectures, which will introduce general concepts and outline/model steps for solving statistical problems, and exercises, where you will actively implement these ideas on your own or working in small groups.

### 2.0 Course Approach

*Why not just lecture?* It's actually because studies show that you don't learn much through lecture alone (Ok, we know you're thinking that you're the exception, so here are a couple sources: Klymkowsky et al. (2003) *Cell Biology Education*; Freeman et al. 2014 *PNAS*; Weigel and Angra (In Press) *JCST*). So, instead of this being a class where you can expect to show up, sit back, let us do all the talking, download the slides after class, and skim through readings the night before the exam, you CAN expect that most of our class meetings will revolve around things like case studies and real data, and basically lots of you talking and listening to each other. This is because the ultimate goal is for you to truly understand basic stats and experimental design.

You will be expected to be able to understand, apply, critique, hypothesize, predict, interpret and analyze using real data, so coming to class having done any necessary prep-work (read a reading, go out and make some observations to share, etc.), and *continuing to practice* after class via homeworks, will be essential to your learning in this course. Homework assignments will demonstrate concepts learned in class through writing, drawing, and using the statistical programming language R. *Please note: although this course may introduce students to R for the first time, it is not a "How to use R" class, nor do we expect prior coding experience.*

### 3.0 Course Goals

Through this course, you will be able to:

- Summarize and describe data using summary statistics and data visualizations
- Design experiments to test specific hypotheses.

- Choose and apply an appropriate statistical test for a hypothesis.
- Assess whether a set of data meets the assumptions of a statistical test.
- Interpret statistical tests to make inferences about populations.
- Examine how the biases and interests of a statistician/scientist (including you!) may have affected an analysis.
- Communicate findings in text and data visualizations

These goals will be divided into specific learning objectives for each lesson that will be posted in readings and lecture slides and we will practice across the term.

#### 4.0 Required Resources

- **Laptop** – This is required by GT, and for this class, pretty indispensable, both for in- and out-of-class, particularly to complete assignments in R. If you don't have access to this technology, or something happens during the term, please see the library loaner program ([b.gatech.edu/laptop-loaner](http://b.gatech.edu/laptop-loaner)) or on-campus computer labs.
- **Learning Catalytics** account (\$12/six months) purchased at [learningcatalytics.com](http://learningcatalytics.com)
- **A scanner/scanning app that can generate a pdf** (e.g. CamScanner, evernote)
- **R statistical computing software** (free; we'll walk you through how to download it)
- **When connecting remotely:** a computer with decent internet speed, webcam/video-streaming, and microphone/audio-streaming capabilities is highly advised to facilitate class participation

Other materials will be made available via Canvas, including readings which will serve as your (free) textbook.

#### 5.0 Course websites / accounts

##### Canvas

The course main page on Canvas is the virtual home for our course. **Go here first for everything!** All documents (course notes, readings, etc) will be available for download here, and all announcements will be archived here. Make sure your account is set to send you an email for each announcement. <https://gatech.instructure.com/>

##### Piazza

We will use the interactive Piazza forum as the primary support for this class. **All content questions should be posted to Piazza!** If you email us a question of general nature, we will ask you to post it on Piazza—it helps others, and generally, it's a way to get an answer faster than email.

##### Learning Catalytics (LC)

We will use Learning Catalytics (LC) extensively, thus it's required. Accounts cost \$12 for six months, and it can be purchased directly at [https://learningcatalytics.com/users/sign\\_up](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.** LC works on an internet-ready smartphone, but it's but it's often best to do on a laptop/tablet for screen size. *Critically important: if you have an LC account from another institution or an instructor account as a TA, you must make a student account affiliated with GT.*

#### 6.0 Course Readings

We'll ask you to complete short (3-8 page including pictures) background readings before most classes in order to introduce yourself to new concepts and skills. We will cover these concepts and skills briefly in mini-lectures but we will spend much of the class considering case studies and practicing the new skills using exercises. In order to further encourage reading before class, there will also be a short set of guided reading questions associated with each reading (see section 9.1 below).

Historically this course has been taught without a textbook. This is because experimental design and stats textbooks are mostly written by experts that have basically forgotten what it's like to see this stuff for (almost) the

first time. As a result, some readings become super unapproachable and discourage engagement with the ideas. I respect that students like having resources to read and evidence shows that exposure to content multiple times in multiple formats is beneficial to learning. For this reason, I have developed a custom set of intro readings for each of the lessons in this course. I welcome feedback on how these readings could be made more useful for your learning. *I also encourage you to share things you find helpful with me.*

## 7.0 Grading Philosophy

This course covers a lot of material, but everything we do is designed to prepare you to do well in this class and as scientists. This *requires* practice. Except for tests, which are our source of summative assessment, all other assignments are graded focused on engagement, rather than absolute correctness. I fully believe in reflective, honest, and accurate assessment of one's skills, but also that every student can earn a good grade in the course. Again, *practice and reflection are key tools to learn and achieve.* We will provide feedback, both numeric and written, quickly and regularly to help you gauge your progress in real-time; you should plan to review this feedback often. If at any point you are concerned about your performance, please make an appointment with me. I will be happy to help you strategize improvements.

## Grading Schema

Component	Weighting A**	Weighting B
Reading questions	5%	5%
"In class" exercises	20%	20%
Homework Assignments	45%	15%
Exams	30%	60%

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

1. We will **calculate subtotals** including the dropping of assignments as outlined in this syllabus.
2. We will **calculate your grade assuming Weighting A**, and calculate again assuming **Weighting B**.
3. We will compare your scores under each weighting, and ***the higher of the two resulting scores will be your score for the course.***
4. 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.*

\*\*This is the default schema set up in Canvas. If at any point you would like to calculate your grade using Weighting B, please use the raw scores or subscores as shown in Canvas to recalculate an overall grade.

## 8.0 Graded Components

### 8.1 Guided Reading Questions

In order to encourage reading before class, there will be a short set of guided reading questions available on Canvas. These questions should be completed while reading and are due at 9:00 AM on the day of the lesson that a reading relates to. The questions are designed to draw your attention to key concepts or common points of confusion in the readings. These questions will be graded for correctness and you can make up to 3 attempts.

## 8.2 In Class Exercises

Exercises will be delivered during our synchronous class time through either Learning Catalytics or Canvas. These exercises will reinforce the concepts from readings and lecture, ask you to discuss/reflect on those concepts, and often represent the type of questions that you will see later on the exams. All in class exercises are open book, and working with other students is encouraged. Presence in class is not alone sufficient to earn credit. Rather, points will be awarded for participation and a good faith attempt to solve problems, not on the “correct” answer. *Using and reflecting on a careful, deliberative and logical process is more important than “guessing” the answer correctly.*

## 8.3 Homework Assignments

This is your opportunity to both practice problems and evaluate your own thinking. *Homeworks are intended to help you determine your level of understanding and to help you to identify strategies that do or do not work in advance of exams, so it is very important that you take this seriously.* Homework will have 2 stages:

- **Stage 1:** We will post ~5 homework questions for you to solve AND rate your own understanding. Your grade will come from (1) giving answers and showing your work to arrive at those answers, even if incorrect, and (2) rating your understanding, regardless of the if rating is high or low.
- **Stage 2:** We will post the answer key to Stage 1. You are then to review your work from Stage 1 in comparison to the key, and for each problem (1) state specifically where you went wrong/what you did not understand when attempting the problem AND correct your mistakes (when your answer was wrong) OR explain the answer in a new, different way from the key (when you were right), and (2) re-rate your understanding (which can change or stay the same, BUT is an indication of where to review/get help). *Be sure you explicitly state whether your answer was right/wrong initially to help frame your reflection and clearly denote areas for later review.* Note that, even if you have gotten a question correct in your first encounter with the problem, it is often a sign you are weak in that area if you cannot easily generate new questions or apply the idea to a new scenario, so please be open to admitting and fixing deficiencies.
- **Your overall homework grade will come 50% from a good faith initial attempt (Stage 1), and 50% from your careful corrections and/or new explanations (Stage 2). Stage 1 is required for Stage 2.**

*Why two stages?* This format requires that you regularly engage with the material at spaced intervals, giving you distributed practice through time, which is the most efficient way to learn (Taraban et. al (1999); Rohrer & Pashler (2007), among \*many\* others). This means it takes you \*less time\* overall to get to the same level of mastery. Additionally, reflection as a part of learning reinforces finding and fixing trouble-spots, so you achieve more than just doing problems alone (Balgopal & Montplaisir (2011); Chang (2019), among \*many\* others, too!). Finally, this gives you the opportunity to practice carefully delineating your logic; often you will find that your own work may not be as clear as you thought it was initially when you are forced to return to it some time later. Practicing making logic clear will help you in many ways for science, but particularly when conveying your work to others.

Homework assignments will have some general questions for written response and some that require the use of the R statistical computing platform. We advise typing to ensure your answers are legible, but you may hand-write some responses when needed. You are welcome to collaborate with other students, but all submitted work must be your own. This means you must perform and record the work yourself; copying is plagiarism. If you work with one or more other students, you will be asked to acknowledge your collaboration when you submit the assignment. Generally, homeworks will open on Tue., and Stages 1 and 2 will be due 5pm Thur. and Mon., respectively.

**Homework 7:** The final homework assignment will follow a slightly different format. In this assignment you will investigate your own research question about a dataset that you have chosen and gotten to know earlier in the course. There will only be one part of Homework 7. It will consist of a series of short response questions about your analysis. Because your analysis is unique to you, there is no key to homework 7. Because these skills are not tested in a final exam (see below) **Homework 7 cannot be dropped.**

## 8.4 Exams

We'll have lots of smaller exams, rather than a few big ones, but don't underestimate them: the content on each exam is \*cumulative\*. This means you will need to *repeatedly demonstrate mastery* of past topics as you complete each exam; any content previously covered in the course could show up on a test, either individually or as part of

an integrative question linking multiple topics. This is challenging, but this approach accurately represents what abilities you will need to do statistics and experimental design in the real world.

Exams are a combination of short answer/multiple choice; focused questions on data interpretation, experimental design, or quantitative concepts; and essays/short answers that require you to synthesize material in different ways.

**Exams are open-note and have a Part A and a Part B.**

- **Part A** is worth 70% and is primarily focused on fundamental concepts. Part A will be held synchronously during class time to allow for students to ask questions of the instructional team in real time. For equity, standard time (50 min) and 1.5x extended time (75 min) exams will be worked into class time that all students have already set aside in their schedules. 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 until we give an all-clear** so that everyone has a fair shot to do their best on the exam without distraction.
- **Part B** is worth 30% and is primarily deeper material. This section will be a take-home available for a longer period of time to allow you to digest and reflect. Importantly, for Part B *only*, you will be allowed (but not required) to work with a small group (3-4 fellow students in a single collective) to solve these challenging problems. Any groupwork for this should not be done by simply posting to web forums, groupmes, google docs, etc., but instead through meeting (in-person or virtually) with other students in real time to work together on analyses, as scientists in lab groups often do; you may work with a consistent group for each exam, or change for future tests. Exactly how you form your groups and when/how you work is up to you, and we can aid you in finding groupmates. The goal is for you to chew on these problems, try out a few ways to solve them, and eventually justify your approaches logistically and statistically—to yourself and others.

We reserve the right to confirm understanding on and adjust exams based on student performance and other mitigating factors. More exam info will be announced as exams approach, so please always look for those details.

## 8.5 Wait, there's no Final Exam?

That's correct. There will be no comprehensive final test for this course. Since tests are cumulative as we go, this will give you a break during finals. I trust you to work hard enough during the term that this will work.

## 8.6 "Stuff Happens" Clause:

In a time that is so tumultuous, things can happen. It can be difficult to keep up with assignments, and late/make-up work can often work *against* students by allowing work to pile up and force 'just get it done' behavior, rather than helping you meaningfully engage in completing the work and reviewing the feedback in a timely manner. In recognition of this, we will **drop your 5 lowest Reading Questions, 5 lowest In-Class Exercise scores, your lowest Homework, and your lowest Exam** to account for days when you cannot arrive, think with optimum clarity, make a deadline (e.g. started too late to upload and check your work before the deadline), are temporarily ill, have a technological snafu/issue, need to do something else, just need a break, etc. To level the playing field, this universal catch-all policy was created in consultation with several campus offices to design a common but flexible buffer for all students; it is intended to cover both official institute-excused items, as well as issues for which getting excuse letters presents a barrier, such as getting an illness or disability officially documented (Soria and Stebleton 2012; Winograd and Rust 2014).

My goal is to craft a class where accommodations/extensions/exceptions are not necessary to request because maximum flexibility is extended to all from the start. If you find you don't need these adjustments, ok. If you find you do, they're there. Please understand that, because you are not competing with others for your grade, this policy keeps us focused on learning and supporting our classroom community. If you're thinking otherwise, I encourage you to read and reflect on Brown et al. 2022's work (link: <https://www.science.org/doi/10.1126/sciadv.abm2385>)

Remember, each graded component is worth a small amount, especially relative to all of the challenges of life, some of which will be unanticipated and serious. So, please 1) generally focus less on grades overall, and 2) *be mindful and judicious of how you plan to use your drops* to insure you leave some room for unexpected issues, as this lenient policy is the extent to which flexibility can go before compromising course goals. Please also do not be surprised if I email just to check in to see how you are doing—I care!



*What if my 'stuff' is 'bigger'?* Let me know (to the extent you're comfortable sharing) and I can try to point you to the right campus resources, as things that require additional assistance beyond the lenient policy above are likely worthy of broader solutions that address more than just this course. For your privacy, please do not send sensitive info, medical documentation, etc. to me in an email, but rather talk with me or use the confidential official institute processes for this big stuff. Please also let me know if you need assistance with these processes. Please do not interpret it as a lack of caring if I refer you to someone else or place boundaries to prevent secondary trauma to me; these safeguards protect us all. ***In sum, while I hope conditions will allow for meaningful engagement in the course, our wellbeing is of higher priority.***

## 8.7 Assignment Submission, Lateness, and Make-ups

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, readable files; technological hiccups are surmountable, so, *please get in the habit of checking your submissions prior to their deadlines to ensure everything is on time, the correct assignment, and appears as intended.* Be aware: Assignments submitted via email or as linked documents (e.g. google docs) will not be accepted.

*Canvas marked it late by like 2 seconds...can't you just make an exception?* Just like a p-value, which is compared to a pre-set cutoff (an alpha, usually 0.05) for whether a result is significant or not (*there is no "almost"*), the deadlines are the pre-set times that determine on time for credit, or late and no credit. Deadlines which are pre-announced and consistent provide clear cut-offs; this approach helps to keep bias from creeping in through arbitrary exceptions, and particularly in the cases where feedback or keys are set to be returned, it avoids delays that can impact your classmates' learning. We strongly suggest incorporating the due dates in all of your syllabi into a common schedule (agenda, app, calendar) that you will reference often and use to plan your study time.

*What happens if I missed an assignment?* Late work, one-off extensions, and make-ups generally don't support the class structure for providing rapid feedback, or effective practice skills, so we've made alternative arrangements that are more inclusive of everyone's individual circumstances (see "Grading Schema" and "Stuff Happens Clause"). For this reason, we won't accept late work or do make-ups for assignments, but we'll ask you to review the posted materials and consult with us if you'd like feedback/help with those ideas. This way, you can *prioritize learning* as we go through the course, and don't have to worry about completing everything or submitting past-due assignments/make-ups just for points.

*Please note:* Any assignment which is 0 because of institute OSI procedures is not eligible for being dropped and will factor into all grade calculations.

## 8.8 Missed Test Policy

You should email Dr. Richards within 24hr of a missed exam, and ideally before a test if you know of your scheduling conflict in advance. We will strive for consistency, but also treat each situation individually, which may give us some flexibility beyond what's accounted for here. Generally, should you miss an exam, the first miss (for any reason, for all students- not just those with more ready access to institute excuses) is covered in your drops (see "Stuff Happens Clause"). If needed, a second miss will be handled at the instructor's discretion through either a make-up test (not necessarily identical to the original test) or the grade-neutral approach of using average of your other tests to replace the missing score; this will happen only with documentation, following <http://www.catalog.gatech.edu/rules/4/> and requestable through institute processes, such as the Dean's referral [https://gatech-advocate.symplicity.com/care\\_report/index.php/pid201106](https://gatech-advocate.symplicity.com/care_report/index.php/pid201106). If you need to miss 3 or more exams, you'll likely have missed too much, so we'll pursue an Incomplete in the course for you to give it another go in a future term.

*Please note:* Any test which is 0 because of institute OSI procedures is not eligible for being dropped and will factor into all grade calculations.

## 8.9 Grade Dispute Policies and Procedures

Grades are not negotiable, but mistakes can occur in the grading process. If you feel a homework or test has been incorrectly scored, notify us to request we take a second look. Any requests for adjustment of grades must be submitted in writing via your GT email to Dr. Richards directly no more than 72 hrs after the work has been

returned. Your email should include the question number and 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. If in review we see changes that clearly impact the accuracy of an exam for all students (e.g. a miskeyed multiple choice), we will adjust accordingly. Be aware that regrading takes time, so please be patient.

## 9.0 Course Expectations & Guidelines

### 9.1 Collaboration and Group Work Policy

I encourage students to work together, but I have three important notes:

1. Each course component is explicitly indicated as either collaborative or individual work. If you are unsure/unclear about the definitions or boundaries of academic misconduct and whether you are allowed to collaborate, it is your explicit responsibility to ask *before* collaborating.
2. Individual submissions which allow collaboration (which can include comparing and changing your answers) still need to show what you know. Even if heavily influenced by others, each student is expected to create their own figures and figure legends, compose their own code, and write their own responses to written work. Please don't simply copy over (plagiarize) work, as it hurts your learning. *Put your own spin on things to help you remember and recall it later.*
3. Items completed in collaboration with other students must accurately list the first and last names of those collaborators when submitted (not doing so will be considered Unauthorized Collaboration under the Honor Code). Generally, you'll be prompted to note your collaborators on these assignments, but should we forget, please be proactive to list them.

### 9.2 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 BIOS4401 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.** Although we request that you give us at least 24 business hours to respond, we will generally reply well within that time 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, a test, etc.), please don't feel the need to immediately respond. We understand we all need balance and have lives outside of this course. Please pass on this same respect.

*Additionally, should you email to request a special appointment for office hours and be very late or fail to show, we reserve the right to no longer allow you to schedule individual appointments outside of regular office hour times. If you have an unavoidable, unforeseen conflict, please do let us know as soon as you can, but otherwise plan to make the appointments you set.*

### 9.3 Piazza and 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 enable the chat feature in video conferences (e.g. in office hours). We ask that you first review the questions before posting (in case your question has already been answered), and we also ask that you do not post solutions or code to the board to give everyone the chance to do their own work. Please remember that conversations on Piazza and in the chat are not private and are visible to the class, so please email if your concern is personal (a grade, illness, etc.)

*Important: A challenge with written communication can be in interpreting text without the visual and auditory clues from speech. Please remember that this is an academic course, taught and taken by real people, so we are asking that you treat your fellow students and instructors with respect. 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.*

### 9.4 Student-Faculty Expectations

At Georgia Tech, we believe that it is important to continually 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 expectations—that you can have of me, and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek in our class.

### 9.5 Accommodations for Individuals with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (often referred to as ODS) at (404) 894-2563 or <http://disabilityservices.gatech.edu/>, as soon as possible, to make an appointment to discuss your needs and to obtain an accommodations letter. Please also e-mail Dr. Richards using your GT email as soon as possible to discuss your needs. Be aware that accommodations must be discussed *prior to* implementation, particularly to ensure that an accommodation can work for your needs and the course goals. The more proactive you are, the better we can collectively accomplish these goals.

### 9.6 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. We acknowledge that your fellow students, or indeed we the instructors, may say or do things that are harmful to you, unknowingly, carelessly, or even deliberately. We commit to addressing these events when we witness them. 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. We promise that there will be no repercussions of any form for making suggestions or corrections about how we could better foster that community.

### 9.7 Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. All students are expected to be aware of and abide by the Academic Honor Code, which can be viewed online at [www.honor.gatech.edu](http://www.honor.gatech.edu). By rule, *we are required to report any student suspected of cheating or plagiarizing to the Office of Student Integrity*, who will investigate the incident and identify the appropriate penalty for violations. Additionally, unapproved collaboration/discussion of assignments (e.g. GroupMe/Discord activity, posting to Chegg/CourseHero, etc.), devices, software, and other violations of the Honor Code may be referred to OSI. If you have any questions regarding these expectations, I encourage you to consult me before submitting materials or engaging in questionable behavior. Remember that the honor code extends to a responsibility of students to report when violations are observed. Help each other out by setting clear boundaries and gentle reminders.

### 9.8 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 but not limited to In-Class Materials, Tests, '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 whole or in part 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, even after the course has concluded and/or you have left GT.

### 9.9 Health and Epidemic Prevention

You have a definite stake in your personal health as well as that of the community. Vaccination for COVID-19 and seasonal influenza significantly reduces likelihood of severe disease and overburdening of shared resources, like hospitals. We also ask that you refrain from eating in the classroom to avoid allergen exposure and distraction to



those who are food-insecure. Keep in mind- you do not know the health conditions of the other people in the room, and everyone should have access to a safe learning space.

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 respiratory diseases. COVID-19, Seasonal Influenza, and other infectious diseases pose 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 respiratory diseases like COVID-19.

If you are sick, **do not attend class in-person**. If you may have been around folks who were/now are sick, particularly but **not limited to COVID-19 please wear a mask**. 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 health and safety without impacting your grade. We trust each of you to use your best judgment to keep yourself and those around you safe. We are invested in your successes not just as students but as *human beings*. In sum, while this is a statistics course, **you will not be reduced to a statistic**.

## 10.0 Campus Resources for Students

### Academic support

- **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 tutors
- **OMED: Educational Services** (<http://omed.gatech.edu/programs/academic-support>)-Group study sessions and tutoring
- **Communication Center** (<http://www.communicationcenter.gatech.edu>)-Individualized writing and multimedia help
- Academic advisors for your major <http://advising.gatech.edu/>

### Personal Support at GT

- **The Office of the Dean of Students:** <http://studentlife.gatech.edu/content/services>; **404-894-6367**; Smithgall Student Services Building 2<sup>nd</sup> floor
  - Request assistance: [https://gatech-advocate.symplicity.com/care\\_report/index.php/pid383662?](https://gatech-advocate.symplicity.com/care_report/index.php/pid383662?)
- **Center for Mental Healthcare and Resources:** <https://mentalhealth.gatech.edu> ; **404-894-2575**; Smithgall Building 2<sup>nd</sup> floor
  - Services include short-term individual counseling, group counseling, couples counseling, testing and assessment, referral services, and crisis intervention.
  - *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**

## Syllabus Disclaimer

Course content and assignments may vary from this syllabus to meet the needs of this particular class. Students will be notified by the instructor via Canvas when adjustments to this syllabus are required.

## Course Schedule

\*Mondays are included on this schedule to make the due-date pattern clear, but we do **\*NOT\*** meet Mondays.

\*\*Buffer days are included in case we need to shift for any reason (need more time with a topic, institute shifts, etc.) If we do not need these days, we will ask that you take the day off and simply take care of yourselves.

Date	Topic	Assignment DUE by 5pm
Mon., Jan. 8	01. Introduction to the course: What are our tools, what are our assumptions?	
Wed., Jan. 10	02. What are data?: Descriptive Stats, Types of Data, Population vs. Sample	Prep Check: Download R
Fri., Jan. 12	##	
Mon., Jan. 15	<b>Institute Holiday (No Class)</b>	
Wed., Jan. 17	03. Combinations, permutations, and random variables	Homework 1.1
Fri., Jan. 19	##	Homework 1.2
Mon., Jan. 22	04. Distributions: Normal, Binomial and Poisson	
Wed., Jan. 24	Test 1: Part A	
Fri., Jan. 26	##	Test 1: Part B
Mon., Jan. 29	05. Z-Scores and the Standard Normal Distribution	
Wed., Jan. 31	06. Experimental Design and Sampling	Homework 2.1
Fri., Feb. 2	##	Homework 2.2
Mon., Feb. 5	07. Experimental Questions, Hypotheses, and Predictions	
Wed., Feb. 7	08. Statistical Hypothesis Testing: Type I and Type II Errors; Test Tails	Homework 3.1
Fri., Feb. 9	##	Homework 3.2
Mon. Feb. 12	09. Confidence and Power: (Sample) Size Matters	
Wed., Feb. 14	Test 2: Part A	
Fri., Feb. 16	##	Test 2: Part B
Mon., Feb. 19	10. Quality Control: Testing Normality and Managing Your Data	
Wed., Feb. 21	11. Graphical Representation: Use in Design, Analysis, and Presentation	
Fri., Feb. 23	##	
Mon., Feb. 26	12. Correlation and Simple Linear Regression	
Wed., Feb. 28	13. Regression... a bit bigger	Homework 4.1
Fri., Mar. 1	##	Homework 4.2
Mon., Mar. 4	<b>Buffer Day</b>	
Wed., Mar. 6	Test 3: Part A	
Fri., Mar. 8	##	Test 3: Part B
Mon., Mar. 11	14. One-sample tests	
Wed., Mar. 13	15. T-test and Intro to ANOVA	Homework 5.1
Fri., Mar. 15	##	Homework 5.2
Mar. 18-22	<b>Spring Break (No Class)</b>	
Mon., Mar. 25	16. ANOVA continued (1- and 2- way) & Post-Hoc Tests	
Wed., Mar. 27	Test 4: Part A	
Fri., Mar. 29	##	Test 4: Part B
Mon., Apr. 1	17. Intro to Non-Parametrics: What do you do when you're not normal? Or...?	
Wed., Apr. 3	18. Chi-squared tests	Homework 6.1
Fri., Apr. 5	##	Homework 6.2
Mon., Apr. 8	19. Rank-based tests	
Wed., Apr. 10	<b>Buffer Day</b>	
Fri., Apr. 12	##	
Mon., Apr. 15	20. R workflow and Coding	
Wed., Apr. 17	Test 5: Part A	
Fri., Apr. 19	###	Test 5: Part B
Mon., Apr. 22	21. Last Class: Where do we go from here?	Homework 7 (Research Project)