

BMED 2400 Syllabus

Introduction to Bioengineering Statistics , C & CIA, 3 Credit hours

Fall 2026

A. Instructor Information

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B. General Course Information

Description

This course is a biomedical engineering specific introduction to statistics, probability, and inference. It is also an introduction to the related skills that are needed to employ statistics, probability, and inference in biomedical engineering contexts. It is primarily concerned with the use of statistical tools for modeling, analysis, and making sense of data in biomedical engineering research. The primary focus is practical and applied rather than theoretical but will be theoretical when such understanding is necessary to properly understand the methods covered. Basically, it is an engineering course. Closer to 2110 and 2250 than to whatever flavor of calculus you took.

Course Learning Outcomes

1. Translate real life inferential problems to proper statistical models.
2. Use Bayes theorem in the context of medical testing: sensitivity, specificity, positive predicted value, and ROC curves.
3. Identify and employ basic probability tools to assess frequencies or likelihood of occurrence of independent and dependent events.
4. Perform the following statistical test: T-test, ANOVA, Z-Test, Regression, Correlation, Multiple Regression, Non-parametric tests, Chi-square tests
5. Formulate, formally state, and identify appropriate tests to serve research goals
6. Summarize and describe data, identify parameters and calculate their point and interval estimates.

Required Course Materials

Textbooks

Required: Engineering Biostatistics: An Introduction using MATLAB

Free PDF copy here: <http://statbook.gatech.edu/statb4.pdf>

Software support

The course will require the use of Microsoft Excel or another spreadsheet tool that allows iterative solutions (PRIMARY) and **a more robust tool like MATLAB, python, or R** (SECONDARY).

Grading Policy

Assignments

- Homework,(10%) - At least 10 HW assignments throughout the semester. These will be time consuming and require use of software.
- Tests (75%) - three tests, 25% each – specific schedule on canvas.
- Project (10%) - Team assignments introduced during second third of course
- Participation (5%) – throughout semester assessed with participation in class through point solution or other surveys

Description of Graded Components

Homework grading scale

Every worked homework problem will be graded on a 3-point scale as detailed below. The scale is meant to highlight the three key components of working with statistical data. This section outlines the grading scheme and describes the components.

Setup – The first part of any statistical work is preparing yourself to do the math. In my experience, this is the area where most mistakes are made. During the setup you need to figure out precisely what question you are asking, what data you have or need, what analyses you need to run, what your dependent and independent variables are, and what assumptions you are making implicitly and explicitly.

Calculation – With the setup complete, you need to actually run your analyses properly. That includes identifying correctly the formulas, selecting the right options for any formulas, calculating the results, and reporting the results. That includes things like arithmetic but also includes things like reporting the correct number of significant digits.

Interpretation – With the setup and the calculation in hand, you need to make sense of what you have found out. That includes synthesizing the results and communicating them to whoever is reading your assignment – e.g., stating whether a hypothesis was accepted or rejected or suggesting a decision based on your results. Just getting the calculation right isn't the end of the problem, you have to articulate what the answer means. Most importantly, you must draw the conclusions from your calculations and your setup.

Pts.	Setup	Calculation	Interpretation	Notes
3	Correct	Correct	Correct	To get 3/3, you really need to get all three components correct. Whether your calculation is by hand, in excel, or in Matlab you have to set the problem up right, do the correct math correctly, <i>and</i> then properly interpret your results. Mistakes at any of these phases can, and has, created major problems in the use of statistics.
2	Correct	Correct	Incorrect	Option A for a 2/3 involves getting the setup and answer closely approximate to our answer (e.g., 4.24 instead of 4.22) but interpreting it incorrectly.
		Incorrect	Correct	Option B for a 2/3 involves getting the setup right but the calculation wrong. However, if you provide a correct interpretation of your calculated results, you still get 2 points.
1	Correct	Incorrect	Incorrect	If you get the setup right you are on the way to getting the whole problem right. You get a point for that, but need to get at least one of the other two pieces right to get more points.

A final note on homework. You should expect most homework to include a small thing – such as a formula – that was not covered in class. That is intentional and by design. That content will not be on the test, but the process is designed to help you practice your research skills.

Final Grade Scale

Your final grade will be converted to a letter grade using the following formula and table. Grades are individual and based on mastery – rather than relative or a ‘bell curve’. In plain English, that means that there are no limits on how many people can earn a specific grade. Theoretically, and hopefully, everyone can get an A in the course.

Grade	Minimum Final
A	90 %
B	80 %
C	70 %
D	60 %

Calculated final averages will be rounded at the first decimal place to the nearest integer value. Because portions of your grade are based purely on submitting work on time, because there is the opportunity to earn up to extra credit, and because of the test revisions, we will not entertain requests to further roll up grades.

Grading detritus: Late assignments, re-grading, etc.

Each homework will have 1 point out of 10 points that are awarded for turning the assignment in on time and making a sincere attempt at each problem.

The only assignments that will be accepted ‘late’ are homework. Late homework will be accepted up to 24 hours later than it is due. If turned in late, you will lose 1 point out of 10 points.

Regrades: The number of points awarded for each part of an assignment is decided by the instructors. However, if you believe, using the grading rubric designed by the instructors, that you should have been awarded more points than you were, please submit a typed regrade request within one week after receiving the graded assignment. Please do not discuss regrade requests orally with your TA or instructor. Instead, take the time to carefully compare your graded work to the published solutions and grading rubric. Then, if you find a mistake has been made and your overall grade is lower than it should be, please by all means write up your observations and submit the typed written request. Please know that whenever an assignment is regraded, the entire assignment is regraded. These processes are to help ensure the regrade process results in a fair grade.

C. Course Policies

Attendance and/or Participation

Attendance and participation in class is expected. While we will post slides, they will not include any work on the board or the performance of any examples in class. Further, your presence in class not only supports your own learning and growth, it supports the learning and growth of your course peers and instructor as well. Every study that we are aware of shows a strong correlation between course attendance and final grade. You will learn in this course that correlation is not causation, but it does point a flashing red arrow towards what may be the cause.

However, we also believe in treating you as professionals – because you are. That being said, we will use multiple factors, including daily clicker questions and engagement in in class activities, to assign a grade for class participation. Part of your role in the course is helping your peers learn – both as a part of our community and because it helps you learn as well. That necessitates active engagement.

Finally, out of fairness to your classmates, we are hesitant to reschedule in class assignments such as tests. However, we are also empathic about the things that happen in your life. If you must miss an assignment please let me know as soon as possible so we can jointly work out a plan. It is helpful if you tell us in advance, and even more helpful if you propose a plan on how you want to make up the assignment. In the end, unless overridden by university policy, the decision is mine on how to address missed assignments. However, we are sympathetic.

Collaboration and group work policy

Each assignment is explicitly indicated as either collaborative or individual work. If you are unclear about the definitions or boundaries of academic misconduct in regards to individual or academic work, it is explicitly your responsibility to seek clarification in advance.

Individual assignments should be your own work. What that means is that the intellectual output should be yours and yours alone, in your words, completed by you and you alone. On individual assignments, learning or getting help from peers is acceptable – submitting others' (in or out of this class) work, in part or whole, as yours is not. If, under this policy, you have questions on or need help with appropriate citation of others' work, just ask.

For collaborative assignments, we expect all group members to participate in the intellectual labor of assignments. Students choosing not to effectively and meaningfully collaborate on such assignments should not expect to receive credit for the work of their teammates.

Emergency Procedures

In the event of a fire alarm, everyone must immediately evacuate the building until given the all clear by the fire department. In the event of an all hazards siren, everyone should immediately seek shelter in a safe location. In both cases, you should solicit additional clarifying information by all possible means: Georgia Tech Homepage, TV, radio, email, etc. Additional information about campus preparedness is available at <http://www.gatech.edu/emergency/>

In the event of a major campus emergency, including severe weather, course requirements, deadlines, and grading totals we may need to revise the course. If that happens, we will work together to balance our learning objectives, constraints, and students' needs. Information about course changes related to campus emergencies will be made available via Canvas and will also be distributed via email as soon as is practical.

How to succeed in this course

The creation of the learning environment that we hope to have requires a set of expectations for how both the instructors and students will act. Therefore, we hope that you, and we, will do the following 5 shared things:

- Attend and fully engage in all classes
- Come prepared for class
- Be honest about what you understand, what you do not, and what you need help with
- Provide a supportive environment that fosters mutual success of everyone in our classroom
- Honor and respect each other and each other's interests

Based on my prior experience as an engineering student, engineer, and professor, I feel it useful to list some techniques that you may find helpful to succeed in the course I have found that the most successful students:

- Engage with the wide range of resources available to you on campus, including the Writing Center, Tutoring Center, and Academic Advising Center. (i.e., get help when you need it)
- Carefully document your work, thinking, and activities so that they become a resource when creating the deliverables for your assignments (i.e., keep detailed notes as you work)
- Start all deliverables early and create drafts that are thoughtful and intentional to structure your work and documentation (i.e., keep the goal in mind). This will allow you to step away from and come back to assignments to ensure they are complete and high quality.
- Think deeply about their intended learning outcomes of the course and their relation to your activities (i.e., remember why we are here)
- Be open to new ways of thinking about learning and thinking.

Office hours

It is important to us that you have a positive learning experience in this course. Your regular and active participation in office hours is a great way to help make sure this happens. Office hours are a scheduled opportunity for you to meet with your professor or teaching assistants one-on-one, or in a small group setting, to discuss course topics and concepts. In fact, feel free to chat with us about *anything* that interests you or concerns you. We want to help you have a good experience in this course and as a student at Tech – please give us the opportunity to do so by attending office hours!

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review [Georgia Tech's Honor Code](#) and the student [Code of Conduct](#).

Any student suspected of cheating or plagiarism on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Homework will not be accepted without an attestation of how AI was used in its creation.

Core IMPACTS

[Core IMPACTS](#) is the University System of Georgia's General Education curriculum. If you are teaching a course that counts towards Core IMPACTS, you should include a syllabus statement about the Core area and associated [career competencies](#). [This resource](#) developed by the Center for Excellence in Teaching and Learning and Online Education at Georgia State University includes template syllabus statements for each of the Core IMPACTS areas that you may adapt for your course.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, [contact the Office of Disability Services](#) (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

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. [The Student-Faculty Expectations](#) articulate 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. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Pre- &/or Co-Requisites

MATH 1552 and CS 1371/1301

D. Campus Resources for Students

At Georgia Tech, we are concerned about your overall physical, social, and mental well-being. A [comprehensive list](#) of wellness related resources has been compiled and maintained by the Office of the Vice President for Student Engagement and Well-being ([student-resource-guide \(gatech.edu\)](#))