1 Course overview & basic information

1.1 Instructional Team

Faculty Instructors
Dr. C.W. Peak ***Call me:*** C.W. ***Email:*** charles.peak@bme.gatech.edu
Student Instructors
TBD ***Call me:*** ***Email:***

You can reach out to any of us as you feel appropriate/comfortable. For grading questions, start with whoever did the grading. For major concerns or emergencies start with both faculty members. See course communication section for more details

1.2 Course Meeting Schedule

Day	Time	Location

1.3 Office hours

Office hours will be in person in the UAW Learning Commons.

1.3.1 Office hours schedule

Day	Time (all times Atlanta time)	Person	Virtual/Hybrid

Office hours will be announced week 1 and start week 2 of the semester

1.4 Syllabus table of contents

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1.5 Course 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 meaning of real data in biomedical engineering work. The primary focus is practical and applied rather than theoretical, but will be theoretical when such understanding is necessary to properly understand the tools covered. Basically, it is a course where you will be treated like engineers more than an engineering course.
(i.e., Think more 2250 than to whatever flavor of calculus you took)

1.6 Course learning objectives

Core

- Translate real life problems and decisions into proper statistical and/or inferential models.
- Use Bayes theorem to design or analyze medical tests using sensitivity, specificity, positive predicted value, and ROC curves.
- Identify and employ probability tools and rules to assess frequencies or likelihood of occurrence of independent and dependent events.
- Perform the following statistical test: t-test, ANOVA, Z-Test, Regression, Correlation, Multiple Regression[1], Non-parametric tests, Chi-square tests
- Formulate, formally state, and identify appropriate inferential tests to serve research goals
- Summarize and describe data, identify parameters and calculate their point and interval estimates.
- Make meaning from statistical tests on real data using appropriate contextual information

Complementary

In addition to the core learning objectives, we have a set of 'complimentary' learning objectives that round out the core learning objectives to ensure comprehensive preparedness of young engineering-statisticians. These include:

- Read, interpret, and validate statistical analysis in BME papers and media
- Prepare professionally appropriate reports on data analysis
- Make and execute data collection and analysis plans
- Work effectively with statistical data
- Think consciously about the credibility of data

1.7 Textbook and Notes about the readings in this class:

Primary text:

We will post various online resources as reading for each class. It is critical that you do the readings to

get the most out of the class. *The readings serve the purpose both of informing about the topic and practicing learning statistics by learning*. Anecdotally, there is a strong relationship between students who ask questions showing that they have done the online readings and those who do well in class.

Secondary text:
Title: Engineering Biostatistics: An Introduction using MATLAB and WinBUGS
Author: Dr. Brani Vidakovic
ISBN: 978-1-119-16896-6
URL for a FREE PDF copy: http://statbook.gatech.edu/statb4.pdf
(also posted on canvas)

Notes about readings and resources:

- One of our goals in the course, noted in the learning objectives, is teaching you how to (1) find, (2) digest, and (3) apply things you find through your own searching as you learn about a new topic.
- Because of our complementary learning outcomes, you will see *Wikipedia* readings as well as other internet sources. We will talk about their credibility – and you should think critically about it.
- We STRONGLY suggest you keep the digital textbook after this course. It is an amazing statistics reference manual, and a great book to learn statistics better. That is why we list it - ***It is a wonderful technical resource***. It is also *very* hard to read as an amateur statistician. You should learn how to read this type of text book as an engineer. Reading dense technical literature is a critical, and learned, skill. Yes, the language is a little dense or subtly different from what we use in class – we see that as an opportunity. If you don't believe me come by my office – I still have and use all my undergrad textbooks. I struggled with them at the time and now find them invaluable.

1.8 Questions you may have at this point

Where will assignments and other information be posted?	Canvas. Everything you need for the course will be posted in Canvas. That includes readings, resources, and other fun stuff. – **If it's in canvas it is treated as canon 24hrs after we post it.**
Where will I submit work?	You will submit work through a tool called Gradescope, which is integrated with Canvas. We'll explain more early in class.
What assignments will I do/how is this course graded?	See section 2 of this syllabus.
What is the course schedule?	See section 2 of this syllabus
What other policies should I know?	See section 3 of this syllabus. If you have questions, ask, we are happy to clarify.
What software will I use in this class?	The course will primarily use Microsoft Excel or another spreadsheet tool that allows iterative solutions, we will also use the MATLAB coding language as a secondary tool for statistical analysis. You can download both of these softwares for free.
What do I do if something is impacting my ability to perform to my best ability in class?	Tell us as soon as possible. We cannot stress enough that if you are having issues, please let us help. **Please don't just disappear! We can't help if you disappear!**

Why are there so many quotes from movies my parents love?	Because C.W. is probably only a little younger than your parents and had older cousins that made him watch the og Predator, Indiana Jones, and Terminator movies when he was younger than 10 years old.

2 Course structure

2.1 Planned course schedule: TBD

See the schedule on the canvas page.

2.2 Grading and Course assignments

There are three types of work you will submit in this class and four things your grade is based on. The grading percentages are as follow, and the types of assignments are described below:

Type of assignment	Number	Total value towards grade
Homework	11 (lowest dropped)	30% (3% each for 10 homeworks)
Tests	3	60%
Projects	1 or 2*	10% (& Up to 5% Bonus)
CIOS Extra Credit	1	1% Bonus if >90% CIOS completion.[2]
*There are three project options that we believe require similar amounts of time and effort. You MUST complete one project of your choice, which is worth 10% of your grade. You can complete a second project of your choice for up to 5% extra credit.		

The purpose of each of these assignments is very specific and somewhat different in what they accomplish as well as how they are graded. The tests are designed to be summative assessment – literally a *formal* evaluation of what you understand and what you do not understand. The projects and homework are designed to be *formative* – meaning the goal is to engage in the process for the sake of increasing your learning and receiving qualitative rather than quantitative feedback. See Assessment Description document for more information.

2.2.1 Final Grade Scale

The final grading scale is based purely on the score on each assignment. They are rounded at the first decimal place to the nearest integer percentage. Grades are individual and based on mastery they are not 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	Final Score	Notes
A	90%	
B	80%	B is usually the course avg. (the median is usually A)
C	70%	
D	60%	Extra credit cannot push you from an F to a D. You have to at least pass the class on the merits

2.2.2 Grading detritus

- Please understand that the teaching team sometimes make mistakes. If you think a mistake was made in grading, please ask us. Regrading requests must be submitted via Gradescope within one week of an assignment being returned to you.

- To reduce the stress and chaos everyone feels around regrades, we handle them in the following way: Regrade requests must be submitted within a week. For tests we will respond to them within a week. However, for homeworks, we do not respond to them immediately. We handle all regrade requests at the end of the semester. We only evaluate the regrade request if it can improve your final

[2] In 8 sections across 6 semesters and only 1 section got extra credit. We do not round to the completion rate, and give zero flexibility – so don't bother asking.

grade. A shocking number of people find their worry about 1 point or 2 on a homework matters very little in the grand scheme of things.

- Requests for regrades must be well formed. That means you must identify where we misinterpreted what you did and deducted points that we should not have deducted. Typically this is because we either did not carry errors through or we misunderstood a step. We prefer typed homework assignments to reduce mistakes due to handwriting. Requests to simply decrease the deduction for a mistake will generally be ignored.

- While we understand that grading and grades are stressful, that does not exempt students from treating the instructional team with respect when discussing grades and grading. Because the first escalation point for grading will be the Student Instructors (i.e., your peers and near peers) we take this very seriously. The Faculty Instructors reserve the right to apply a grade penalty to any student who is abusive, harassing, or disrespectful in how their communication with the Student Instructors.

3 Policies and expectations for our learning environment

This section explains the overarching policies and guidelines we ask everyone to participate in and respect. They apply equally to the instructional team and students.

3.1 Course communication

When you need to communicate with us about the course please pause and think for a moment about who and where to communicate to help everyone, including you.

- Any communication about regrade requests should be made through Gradescope. We cannot engage in grading conversations via email because we do not have the necessary information.
- Communication about office hours should be with the person or persons whose office hours you are asking about.
- In general, if you are emailing a faculty member please email both faculty, we will reply all.
- Please put the course number [BMED2400] at the start of the subject line, this helps your email not get lost
- We do our best to respond to emails within 24 business hours (8 business hours per M-F calendar day).
- The only thing you need to communicate with us about attendance is institute approved absences, otherwise attendance policy applies and you are not required or expected to inform us.

3.2 Attendance Policy

Summary: attendance is important and encouraged but not required.

Attendance and participation in this class is usually expected, but given the many uncontrollable variables at play I am choosing not to require it this semester. Every study that we are aware of[3] 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. Your presence ALSO aids in your peer's learning. Basically, I work to make class time valuable to *you*, and you should maximize that value but you also have other pressures I may not know or fully understand.

[3] If you ask, we can provide probably **dozens** of articles on this topic.

3.3 Collaboration and group work policy

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

Individual assignments (primarily tests) should be your own work and only 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. For tests, you are not allowed to speak with ANYONE besides the teaching team about the it until after the deadline.

Collaborative assignments (primarily homework) what you submit should be your own work and only your own work – but helping each other is encouraged. What that means is that the intellectual output, thinking, and written/typed work should be your own, but it is acceptable to have conversations and ask for help from others. In such cases, you will be asked to list who you collaborated with.

Group assignments are those were you have a particular group of students completing the assignment together (primarily the projects). For group 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. In addition, honestly, don't just divide and conquer on this stuff – you will learn far less and turn in lower quality work. For group assignments, the responsibilities of fair group work include everyone being flexible with teammates given the potential for illness, snow, outside responsibilities, etc. If you are running into issues please let us know.

3.4 Academic integrity

Academic misconduct, including plagiarism and completing others' work for them, hurt you and your classmates and will not be tolerated in our course. Students are expected to act according to the highest ethical standards and Tech's Academic Honor Code (http://www.catalog.gatech.edu/policies/honor-code/). As a member of the Georgia Tech community, we assume that you have read and understood the Academic Honor Code. So far, in my three years teaching this course, I have had to report three students to OSI. I hate that I have to do it, but I feel it is my responsibility to do so. However, by rule, we are required to report any student suspected of cheating or plagiarizing on a quiz, exam, or assignment to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations. Specifically, we will submit any cases where there is ***significant evidence*** of academic misconduct and are then constrained by that process.

Two specific points of what I consider cheating are important. *(1) I consider being aware of any cheating and not reporting it to me to be a form of cheating.* (2) I consider sharing an assignment or answers to an assignment for the purposes of helping yourself or others an example of academic integrity violations – whether or not someone uses it. We are aware there is significant concern about an uptick in cheating due to our online environment. We plan to use software tools to detect cheating, unfortunately.

3.5 Class culture

We want our classroom to be a place where you, and everyone else, are treated with respect. Our class will welcome individuals of all backgrounds, beliefs, and identities both visible and invisible. All members of this class are expected to cooperate in the creation of a respectful, welcoming, and inclusive environment for every other member of the course. If there are things the teaching team or others have done to degrade that environment we encourage you to bring them to my attention and we will work to correct them.

3.6 Basic needs statement

Any student who has difficulty affording or accessing sufficient food to eat every day or who lacks a safe and stable place to live and believes this may affect their performance in the course, is urged to contact the Dean of Students for support and direction to available resources. Furthermore, if you are comfortable doing so, please talk to me. This will enable me to direct you towards any resources that we are aware of or that are within my control. While we strongly believe in the importance of education, we also believe that your success in this course is contingent on having your basic personal safety and needs met. Research has shown that addressing these issues are necessary precursors to effective learning. They are also personally important to me because we are all human beings first.

3.7 Disability and accommodations

We all need some accommodations in education because we each learn differently. If you are a person with circumstances that you believe may affect your learning experience (e.g., visual, hearing, learning disabilities) please let me know as soon as possible so that we can collaborate on appropriate accommodations. You should also contact the Office of Disability Services 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 accommodation letter. If you need assistance with that process, let Todd know and he will do his best to help

3.8 Snow days and other schedule changes

In the increasingly likely event that weather or some other unplanned for event affects our schedule, changes and plans will be communicated via Canvas. Generally, we will follow university guidance – if they say ‘closed’ no class, if they say ‘virtual’ we’ll do a lecture on Teams or other platform. If there is enough snow to meaningfully sled on campus, expect some grace on the schedule.