CS-4711 / CS-8803 Syllabus

Health Sensing and Interventions, CS-4711 / CS-8803, 3 credits

Summer 2026

Instructor Information

Instructor: Alexander Adams

Email: alex.adams@gatech.edu

General Course Information

Description

This course, Health sensing and interventions (HSI), aims to bridge the gap between the medical sciences and computing. At a high level, this course explores how to sense the human body and the various conditions/contexts that affect our health. More specifically, this course will investigate:

- Different systems of human physiology (high level)
- Existing devices that can measure our health.
- Devices that can provide feedback to users regarding their health
- How these medical devices and health technologies work
- Which technology to choose for a given problem
- How can we design new devices ourselves?

We will explore the different systems of the human body and discuss how to measure (or trigger in case of interventions) various aspects of them. We will brainstorm possible solutions, discuss how to test them, and discuss the implications of different approaches. Students will be able to, but not required to, build a physical device. A health sensing kit will be available for students to use. Some solutions require hardware, while others can be based on software-as-a-medical-device (SaMD), including mobile applications, data analysis, and algorithmic solutions. Students should leave this course with the skills and confidence to tackle problems in healthcare that previously seemed insurmountable.

At the undergraduate level (CS 4711), you will learn technical skills through several labs and apply those skills in a semester-long project in a team of 4. At the graduate level (CS 8803), you will take your understanding of health technology and physiological data

processing further through in-depth analysis of the labs, generating lab reports intended to push you to not only implement the code for processing the data, but also to demonstrate an understanding of the data to make informed decisions on how process the data based on your understanding of the techniques and physiology. You will leverage this knowledge while working on a semester-long research project in a group of 2.

Course Learning Outcomes

Upon successful completion of the course, students will be able to:

- Build on the foundations of health technology to develop practical applications.
- Discern the capabilities of different components of health tech, which enables informed decisions on feasibility, usability, and potential technical challenges.
- Exploit the potential of technology to address real-world health and medical problems.
- Feel enabled to attack issues in healthcare that seemed unreachable or impossible before

Skills

Through active course participation, the students will gain the following:

- The ability to appreciate and analyze the foundations of Health Technology
- The ability to use Precision Health, Medical Devices, and Health Technology in innovative, real-world, practical applications.

Required Course Materials

N/A

Grading Policy

- Assignments 35%, Labs 10%, Discussions 10%, Quizzes 5%, Projects, 40%

- The standard 10-point scale is used for letter grades

  A 90-100%
  B 80-89%
  C 70-79%
  D 60-69%
  F 0-59%

Category	Sub-Category	Undergraduate %	Graduate %	Max Grade Contribution
2 Assignments				35%
Participation	Quizzes	5%	5%	25%
	Discussions	10%	10%	
	Lab Attendance	10%	Required	
	Lab Reports	Submit Code Only	10%	
Projects	Proposal	5%	5%	40%
	Mid-Term Presentation	5%	5%	
	Final Presentation	15%	15%	
	Final Report	15%	15%	
10% penalty for incomplete CITI training		4 Group Members	2 Group Members	
Total				100%

Description of Graded Components

IRB: Students can only start working on their project after providing evidence of successful completion of relevant IRB (Institutional Review Board) training (CITI certificate(s) as outlined above).

All projects are—by definition—classroom (educational) projects and, as such—if adhering to good academic practice as attested through successful IRB training—are exempt from IRB approval. However, without proper IRB approval (if required by the project), the results cannot be published as is. Publication (for example, in the form of a scientific article) typically requires IRB approval (depending on the project). Teams aiming to publish their project results should discuss this with their mentors/professors to seek advice.

Labs: In-class exercises designed to provide students with an in-depth understanding of physiological signals, the rationale behind how we analyze signals in specific ways, and an understanding of how to apply their technical skills. Lab reports should include detailed descriptions and a justification for your analysis.

Assignments: There are two assignments in this course. They are designed to demonstrate how we can use software as a medical device, leveraging the mobile phones' built-in sensors to dive deeper into physiological signal analysis and human activity recognition. The second is designed to explore. Each is designed to build your confidence in the skills you may need for your final project.

Projects: Students will work in groups on one practical project (per group) throughout the semester. Each project will be of the student's creation, with some help from the TAs and instructor. Students will have to organize themselves into groups and define the specifics of their project. For **graduate students**, groups may have no more than 2 members; **undergraduate student** groups may have up to 4 members.

The projects can be solely the student's idea. The instructor and TAs will also pitch several ideas for the students to use or build on. Teaching assistants will support students during the project definition phase to ensure all students can work on a project they want, find interesting, and lead to achievable results.

All projects must be discussed with and approved by TAs or the instructor. Part of these discussions involves adjusting the complexity (by the TAs in discussion with project teams) to aim for class-appropriate projects that are neither trivial nor unachievable. Examples of successful projects from previous semesters will be shared with the students.

Process: Students will form project teams at the start of the semester. Based on the initial readings, the example projects from previous years, and research areas and suggestions from mentors, teams will begin exploring the broader area of health technology to understand what interests them and what direction their project could take. TAs will play an active role in this process, helping students discover their passion.

TAs will also give feedback on the intended complexity of a project. Ideally, it should be challenging to push students out of their comfort zone, thus enabling learning without being unrealistically ambitious. This process will be iterative and require substantial work, but—if done well—it will pay off with a project the team will be passionate about, leading to mastery of Health Technology.

Project Teams: Students are responsible for forming teams. Graduate Teams should consist of no more than 2 members, and Undergraduate teams may consist of up to 4 members. Students are encouraged to enter basic information about their background, experience, and motivation/interests into a class-public spreadsheet, making the project-forming process easier. The link to the document is given on Canvas.

All project team members will complete a team contract outlining their goals and objectives, anticipated roles within the project, and overall ambitions. This contract is a required deliverable (pass/fail grade). It will be used throughout the project to track progress, particularly the individual contributions of all team members. See grading guidelines below.

Project Deliverables: Projects have the following deliverables that will be graded (totaling up to 40% of the overall grade):

- Team contract — must be signed by all team members and is binding
- Project proposal [5% of overall grade]
- Halftime project update (report, presentation, and discussion – details to be specified) [5% of overall grade]
- Project demo (end of project) [15% of overall grade]
- Project report [15% of overall grade]

Guidelines for writing proposals, reports, demos, slides, and video presentations are available on Canvas (Files section).

Course Policies

Attendance and/or Participation

Attendance is required and assessed through in-class exercises and labs.

Academic Integrity

Students are expected to maintain the highest standards of academic integrity. All work submitted must be original and properly cited. Plagiarism, cheating, or any form of academic dishonesty will result in immediate consequences as outlined in the university's academic integrity policy.

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.

Core IMPACTS

This course aims to provide students with an overview of and the foundations of research in technology for healthcare. Through critical thinking and problem-solving, this course aims to cultivate an appreciation of the field's practical applications for researchers and practitioners.

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 email 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

N/A

Extra Credit Opportunities

Extra-credit opportunities are available for the final project, assignments, and select labs.

Collaboration, Group Work, and Use of Generative AI

Group Work: Group work is explicitly encouraged for the project that students will work on throughout the course. Project reports will be written in groups (all team members submit the same report and receive the same grade). Group discussions will be fostered in the classroom at appropriate times throughout the course.

Generative AI: AI can be used as a tool to aid programming and assist with grammar in writing. You must cite code that was generated with AI tools and add a statement about how AI was used in your writing.

Submission Policy: All work must be submitted via Canvas using the Assignments feature. For group assignments, only one submission per team is required. We will use the group feature in Canvas as soon as the project teams are finalized. TAs will assist students with submissions.

The acceptable format for written reports is PDF (only): The acceptable format for slide submission (not presentation) is PDF (only). Use your preferred presentation software for the in-class presentation, but please export the slides to PDF for submission to Canvas.

Alternatively, students may submit links to online resources (such as Google Slides) for in-class presentations.

When submitting videos, please use standard codecs that can be played on both Mac and Windows (test before submission). However, it is strongly encouraged that links to online resources (such as YouTube) where the videos have been uploaded should be provided.

Extensions, Late Assignments, & Re-Scheduled / Missed Exams

Late assignments are not accepted without a suitable excuse (doctor's note, police report, etc.). Note that extenuating circumstances must be brought to the instructor's attention **before the fact**, through the regular channels; that is, *do not send doctor's notes to the instructor or TAs*, but instead send them to student services, who will contact the instructor. Late submission without evidence of extenuating circumstances will result in zero marks for the component. In the event of a planned absence (e.g., for interviews), students must notify the team and instructor well in advance so that they can discuss alternative arrangements. In the event of unplanned yet excused absences (e.g., illness), the instructor and team will discuss options for a student to make up any missed work. Missing a quiz — without evidence of extenuating circumstances as defined before — will result in failing the quiz and thus zero marks for this component.

However, in the event of extenuating circumstances as defined previously, quizzes/exams may be rescheduled, or other accommodations may be discussed, in accordance with the official Georgia Tech's official policy and procedures. In any case, it is strongly advised to consult with the instructor well in advance (at least one week's notice) should extenuating circumstances result in extraordinary difficulties with the schedule. We will always aim to find a satisfying solution within the constraints of fair treatment and within reason.

Inclement Weather and Digital Learning Days

Lectures and in-class activities will be held on Zoom

Student Use of Mobile Devices in the Classroom

Not permitted unless part of an exercise or assignment

Campus Resources for Students

Undergraduate Student Academic Success Resources:

- Academic Support: Academic Success and Advising (a unit in the Office of Undergraduate Education & Student Success) provides free support for your courses. Students can attend scheduled supplemental review (PLUS) sessions, stop by Drop-In Tutoring, or schedule a one-on-one appointment through Knack. To

explore what options work best for you, please visit us online at success.gatech.edu/tutoring, email us at tutoring@gatech.edu, or come see us at Clough Undergraduate Learning Commons, Suite 283.

Graduate Student Academic and Professional Success Resources:

A list of resources for graduate students is given on the Office of Graduate and Postdoctoral Education website. Specific information for current graduate students includes

- Academic Resources such as the Communications Center, Language Institute, Library, Catalog, Registrar, resources for conducting research, Advocacy and Conflict Resolution resources, and how to manage unexpected situations that may impact your academic performance;
- Student Resources such as Campus Services, Child Care/Family programs, Health & Wellness, Career Services, and the Student Resource Guide; and
- *Professional Development such as the programming from the Career Center and other professional development resources and events"*

Student Well-Being:

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)