Schaefer School of Engineering and Science

Department of Biomedical Engineering

BME 322 Engineering Design VI

Spring 2022

Instructor:	Peter S. Popolo, Ph.D.
Course Website:	see canvas
Meeting Times:	Fri 8-10:50 am
Classroom Location:	McLean 414
Contact Info:	Altorfer 213, ppopolo@stevens.edu
Office Hours:	Thurs & Fri 11:00 am-12 noon, or by appointment (Please schedule ahead of time via email)
Prerequisite(s):	ENGR 212, ENGR 232
Corequisite(s):	--
Cross-listed with:	--

COURSE DESCRIPTION

Introduction to the principles of wireless transmission and the design of biomedical devices and instrumentation with wireless capabilities. Electrical safety and equipment validation standards for FDA compliance are introduced. Use of Matlab & Simulink for homework and in-class exercises.

STUDENT LEARNING OUTCOMES

After successful completion of this course, students will be able to…

Student Outcome 1: (*Problem Solving*)
1.1 Design and implement low-pass filters by building circuits in Simulink.
1.2 Analyze the circuits with passive (resistor and capacitor) and active (op-amp) elements using circuit analysis methods.
Student Outcome 2: (*Design*)
2.1 Design a system with my computer microphone, speaker, and Simulink to monitor the loudness of a voice and produce corresponding sound alerts.
2.2 Design state machines to simulate the blood pressure measurement and diagnosis.
Student Outcome 3: (*Communication*)
3.1 Write and present about an existing design in biomedical engineering field.
Student Outcome 6: (*Experimentation*)
6.1 Design a heartbeat monitoring system with my computer webcam and Simulink.
6.2 Design a sound recognition system with my computer microphone and Simulink.

COURSE FORMAT AND STRUCTURE

This course is on-campus (in-person). To access the course website, please visit stevens.edu/canvas . For more information about course access or support, contact the Technology Resource and Assistance Center (TRAC) by calling 201-216-5500.

Course Logistics

This course will have both homework assignments and in-class assignments. All homework assignments are due by 8:00 am on the due date listed in the course schedule. In-class assignments collected for your participation grade (see **Course Requirements**) will generally be due at the end of class.

Deadlines are an unavoidable part of being a professional, and this course is no exception. Course requirements must be completed and posted or submitted on or before the specified due date and delivery time deadline. Avoid any inclination to procrastinate. Due dates have been established for each assignment to encourage you to stay on schedule; 10% of the total points will be deducted for assignments received 1 day late; 20% of the total points will be deducted for assignments received 2-6 days late; assignments received 7 or more days late will receive 0 points.

Instructor's Online Accessibility

I am available via email during business hours and will generally respond within 24 hours on weekdays and 48 hours on weekends. When emailing me, please place in the subject line the course number/section and the topic of the email (i.e., BME 322 – Homework 2 Question). This will help me tremendously in locating your emails quicker when I scan the emails in my inbox.

Office Hours

Office hours for this course will be as listed on the first page of this syllabus. I encourage you to take advantage of in-person office hours, and I look forward to these types of interactions with my students. To ensure that you will find me at my desk and ready to focus my attention on you, I ask that you please schedule your office hour visits with me ahead of time via email. Additional times (during business hours) on the same days as the published office hours may also be available, by appointment, if the times for this course don't fit your schedule. If none of my in-person office hours work for you, or if you prefer to meet virtually via zoom, please let me know and I will try my best to find a time that works for both of us.

Classroom Etiquette Guidelines

Your instructor and fellow students wish to foster a safe online learning environment. No matter how different or controversial they may be perceived, all opinions and experiences must be respected in the tolerant spirit of academic discourse. You are encouraged to comment, question, or critique an idea, but you cannot attack an individual. Our differences, some of which are outlined in the University's inclusion statement below, will add richness to this learning experience. Please consider that sarcasm and humor can be misconstrued in interactions and generate unintended disruptions. Working as a community of learners, we can build a polite and respectful course ambiance. Please read the etiquette rules for this course:

- Do not dominate any discussion. Allow other students to join in the discussion.
- Do not use offensive language. Present ideas appropriately.
- Avoid using vernacular and/or slang language as it could lead to misinterpretation.
- Keep an "open-mind" - be willing to express or accept a minority opinion.

TENTATIVE COURSE SCHEDULE

Week	Class Date(s)	Topic(s)	Assignments
1	Fri 1/20	Introduction to Bioinstrumentation	Take Knowledge Survey on Canvas **before 1st class**
2	Fri 1/27	Electric Circuits with Matlab/Simulink - Resistive Networks Pt 1	Install/update Matlab & Simulink **before class on 1/27**
3	Fri 2/3	Electric Circuits with Matlab/Simulink - Resistive Networks Pt 2	Homework 1 due
4	Fri 2/10	Circuits and Systems with Simulink – Op-amps Pt 1	Homework 2 due **Quiz 1** in-class
5	Fri 2/17	Circuits and Systems with Simulink – Op-amps Pt 2	No Homework due
6	Fri 2/24	State Machines with Simulink - Blood Pressure Measurement Control	Homework 3 due **Quiz #2** in-class
7	Fri 3/3	Sound Signals with Matlab/Simulink Pt 1– Vocal Loudness Measurement	Homework 4 due
8	Fri 3/10	Special Topic: Coding & Computational Methods for BME Pt. 1	Homework 5 due; Presentation Topics due
9	Fri 3/17	**SPRING BREAK**	
10	Fri 3/24	Sound Signals with Matlab/Simulink Pt 2– Vocal Pitch Determination	No Homework due **Quiz #3** in-class
11	Fri 3/31	Special Topic: Coding & Computational Methods for BME Pt. 2	Homework 6 due
12	Fri 4/7	Digital Signals with Matlab – ECG Signal Processing	No Homework due **Quiz #4** in-class
13	Fri 4/14	Image Signals with Matlab/Simulink - PPG Heart Rate Monitor	Homework 7 due
14	Fri 4/21	Sound Recognition with Matlab/Simulink– Speaker Identification / Biometrics	Homework 8 due **Quiz #5**
15	Fri 4/28	In-class Presentations – WEEK 1	Homework 9 due; ALL Presentations upload to Canvas due **before class on 4/28**
16	**Thu 5/4 Fri Sched.**	In-class Presentations – WEEK 2 **NO CLASS** on Fri 5/5 (Reading Day)	Essays upload to Canvas due

The syllabus and schedule are subject to change at any time. Updates will be made via CANVAS if changes are to occur.

COURSE MATERIALS

Textbook(s):	No assigned textbook.
Other Readings:	Optional/ supplemental reading materials will be provided on CANVAS as needed.
Materials:	**Matlab, including Simulink, is required**. Laptops will be required for all classes.

COURSE REQUIREMENTS

Attendance:
Attendance is required. Except for emergency situations (medical/health-related or otherwise), advance email notice to the instructor (not a verbal communication) is required at least one business day before the class you will miss, in order for it to be an excused absence (as determined by the instructor). Even in the case of an emergency for which it is not possible to send advance email notice, you must still send me an email as soon as physically possible (ideally the same day), in order for it to be deemed an excused absence. Your participation grade will depend on your attendance (see below).

Participation:
10% of your grade will be based on class participation. For certain class meetings, there will be in-class exercises or activities, for which you can receive up to 2 points, based on your interactions with me or your peers (group exercises), your responses to questions posed during specific activities (e.g., pair-and-share, PollEverywhere, etc.), and/or roll call taken promptly at the beginning of class. The days on which these in-class activities are graded will be unannounced, therefore it will be to your advantage to attend class regularly, and to be on-time. If you are not present in class, you will not be able to earn participation points.

Quizzes:
25% of your grade will be based on in-class quizzes (which are distinct from other in-class activities). These will be short (typically 5-6 questions) pre-announced (scheduled), time-limited (10 minutes), and closed-book (no internet, notes, or group discussion allowed). The quiz questions will be drawn from class lectures (Powerpoints) and the in-class activities.

Homework:
45% of your grade will be based on homework assignments. Homework submission will be through Canvas. **Submissions are due by 8am before the start of class on the due date**.

Final Presentation & Essay:
20% of percent of your grade will be based on a final presentation and essay (10% for your Powerpoint presentation and 10% for your essay). Instructions will be provided in class and on Canvas. Briefly, students will present (10 minutes) on an existing design in the biomedical engineering field, based on a scientific paper or a commercial product, and will write an essay (3 pages, 1-inch margins, 12-point font, 1.15 line spacing) on the design. Presentations will be in the last two weeks of class, during class time. Powerpoint slides are required for the presentation and will be due in the first week of presentations. Essays will be due on the last day of classes.

GRADING PROCEDURES

Grades will be based on:

Class Participation	10%
In-class Quizzes	25%
Homework	45%
Presentation + Essay	20% (10% Ppt presentation, 10% Essay)
TOTAL	**100%**

Late Submissions Policy:
Without prior written approval from the instructor, late submissions of assignments will be graded as follows:

- 10% of the total points will be deducted for assignments received 1 day late
- 20% of the total points will be deducted for assignments received 2-6 days late
- assignments received 7 or more days late will receive 0 points.

Other Policies:

- No cellphone use is permitted during meetings.

ACADEMIC INTEGRITY

Undergraduate Honor System

Enrollment into the undergraduate class of Stevens Institute of Technology signifies a student's commitment to the Honor System. Accordingly, the provisions of the Stevens Honor System apply to all undergraduate students in coursework and Honor Board proceedings. It is the responsibility of each student to become acquainted with and to uphold the ideals set forth in the Honor System Constitution. More information about the Honor System including the constitution, bylaws, investigative procedures, and the penalty matrix can be found online at http://web.stevens.edu/honor/

The following pledge shall be written in full and signed by every student on all submitted work (including, but not limited to, homework, projects, lab reports, code, quizzes and exams) that is assigned by the course instructor. No work shall be graded unless the pledge is written in full and signed.

"*I pledge my honor that I have abided by the Stevens Honor System*."

Reporting Honor System Violations
Students who believe a violation of the Honor System has been committed should report it within ten business days of the suspected violation. Students have the option to remain anonymous and can report violations online at www.stevens.edu/honor.

LEARNING ACCOMODATIONS

Stevens Institute of Technology is dedicated to providing appropriate accommodations to students with documented disabilities. The Office of Disability Services (ODS) works with undergraduate and graduate students with learning disabilities, attention deficit-hyperactivity disorders, physical disabilities, sensory impairments, psychiatric disorders, and other such disabilities in order to help students achieve their academic and personal potential. They facilitate equal access to the educational programs and opportunities offered at Stevens and coordinate reasonable accommodations for eligible students. These services are designed to encourage independence and self-advocacy with support from the ODS staff. The ODS staff will facilitate the provision of accommodations on a case-by-case basis.

Disability Services Confidentiality Policy

Student Disability Files are kept separate from academic files and are stored in a secure location within the Office of Disability Services. The Family Educational Rights Privacy Act (FERPA, 20 U.S.C. 1232g; 34CFR, Part 99) regulates disclosure of disability documentation and records maintained by Stevens Disability Services. According to this act, prior written consent by the student is required before our Disability Services office may release disability documentation or records to anyone. An exception is made in unusual circumstances, such as the case of health and safety emergencies.

For more information about Disability Services and the process to receive accommodations, visit https://www.stevens.edu/office-disability-services. If you have any questions please contact: Phillip Gehman, the Director of Disability Services Coordinator at Stevens Institute of Technology at pgehman@stevens.edu or by phone (201) 216-3748.

INCLUSIVITY

Name and Pronoun Usage

As this course includes group work and in-class discussion, it is vitally important for us to create an educational environment of inclusion and mutual respect. This includes the ability for all students to have their chosen gender pronoun(s) and chosen name affirmed. If the class roster does not align with your name and/or pronouns, please inform the instructor of the necessary changes.

Inclusion Statement

Stevens Institute of Technology believes that diversity and inclusiveness are essential to excellence in academic discourse and innovation. In this class, the perspective of people of all races, ethnicities, gender expressions and gender identities, religions, sexual orientations, disabilities, socioeconomic backgrounds, and nationalities will be respected and viewed as a resource and benefit throughout the semester. Suggestions to further diversify class materials and assignments are encouraged. If any course meetings conflict with your religious events, please do not hesitate to reach out to your instructor to make alternative arrangements.

You are expected to treat your instructor and all other participants in the course with courtesy and respect. Disrespectful conduct and harassing statements will not be tolerated and may result in disciplinary actions.

MENTAL HEALTH RESOURCES

Part of being successful in the classroom involves a focus on your whole self, including your mental health. While you are at Stevens, there are many resources to promote and support mental health. The Office of Counseling and Psychological Services (CAPS) offers free and confidential services to all enrolled students who are struggling to cope with personal issues (e.g., difficulty adjusting to college or trouble managing stress) or psychological difficulties (e.g., anxiety and depression). Appointments can be made by phone (201-216-5177).

EMERGENCY INFORMATION

In the event of an urgent or emergent concern about the safety of yourself or someone else in the Stevens community, please immediately call the Stevens Campus Police at 201-216-5105 or on their emergency line at 201-216-3911. These phone lines are staffed 24/7, year round. Other 24/7 resources for students dealing with mental health crises include the National Suicide Prevention Lifeline (1-800-273-8255) and the Crisis Text Line (text "Home" to 741-741). If you are concerned about the wellbeing of another Stevens student, and the matter is *not* urgent or time sensitive, please email the CARE Team at care@stevens.edu. A member of the CARE Team will respond to your concern as soon as possible.