



# Engineering Physiology II

## BME 503 (U Sections)

School of Engineering and Science  
Spring 2025

Instructor: Rachel Jones, Ph.D.

Course Schedule: Thursdays 6:30-9 pm

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Office Hours: Thursdays 4-6 pm EAS 411, additional by appointment, & virtual by appointment

Prerequisite(s): BME 502

Corequisite: BME 513 (Physiology Lab class)

### COURSE DESCRIPTION

This is a continuation of BME 502. This course serves as an introduction to human physiology from an engineering perspective. Students will learn to apply knowledge of mathematics, science, and engineering to physiology. The course also addresses societal and ethical responsibility associated with the development, testing, and implementation of biomedical devices or treatments. Modeling physiological systems with control block diagrams will be a skill students develop in order to understand multi-level mechanisms to maintain homeostasis. Topics covered in this course include cardiovascular, circulatory, respiratory, and renal physiology.

### COURSE OBJECTIVES

This course will prepare students and future engineers who:

1. Have a fundamental knowledge of cardiovascular, circulatory, respiratory, and renal physiological systems, as well as their interactions to maintain homeostasis.
2. Can analyze physiological systems from an engineering perspective.
3. Will appreciate the ability of biomedical engineering to improve quality of life.
4. Can recognize the societal and ethical issues associated with testing and implementation of biomedical devices and treatments.
5. Can organize their understanding of physiological mechanisms into multi-layer systems from cellular to multi-organ.

# STUDENT LEARNING OUTCOMES

- Explain how physiological control systems affect design parameters of biomedical engineering solutions.
- Explain physiological relationships between pressure gradients, volume, and resistance.
- Explain the physiological control systems that maintain homeostasis from the molecular level to multi-organ systems.
- Compare the design parameters of devices and the societal need for treatments that improve or restore physiological functions in relation to public health needs across diverse populations.
- Explain the societal and ethical contexts of biomedical solutions (e.g., devices and treatments) to address physiological issues.

## COURSE FORMAT AND STRUCTURE

This course is on campus. To access the course, please visit [stevens.edu/canvas](https://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

The lecture will take place in person, with some exceptions with advanced notice, as needed. Assignments will be due on Friday and will be posted on Canvas at least a week before they are due. **Missing lectures or late submission of assignments without prior written approval will result in receiving zero points.**

Though I want to challenge you to develop and practice professional skills like timeliness and being active in your learning experiences, I am committed to being accommodating and empathetic. Please note that accommodations can be made if you or those you are in close contact with have contracted COVID-19, if you have flu-symptoms, or if you have challenging life events. Please let me know if something is going on sooner rather than later, if possible. You do not need to disclose details if you are not comfortable doing so, but being proactive by sharing what you are comfortable with sharing as soon as possible, is greatly appreciated. If you are not comfortable telling me what is going on directly, please reach out to the proper support systems at Stevens, and/or our BME advisor, Amy Mattare, and/or our Department Chair, Dr. Jennifer Kang-Mieler.

### Instructor's Online Hours

I will be available via email during business hours and respond as soon as I am available (generally within 2 business days). If you feel you are being neglected in any way, please contact me. When emailing me, please place in the subject line the course number/section and the topic of the email (e.g., BME 482 – section A – HW 2 Question). This will help me tremendously in locating your emails more quickly when I scan the emails in my inbox.

### Office Hours

Office hours will be held Thursday afternoons from 4:00-6:00 pm EST. If it is preferred to meet on zoom, please let me know ahead of time, and I will log into zoom. If you would like to request an office hour or meeting, please let me know as soon as possible.

### Etiquette Guidelines

Your instructor and fellow students wish to foster a safe 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.
- Be cautious in using Internet language. For example, do not capitalize all letters since this suggests shouting.
- Avoid using vernacular and/or slang language as it could lead to misinterpretation.
- Keep an "open-mind" and be willing to express even your minority opinion.
- Think and edit before you push the "Send" button.
- Do not hesitate to ask for feedback.

## TENTATIVE COURSE SCHEDULE

To facilitate your learning, we suggest developing a habit to read the textbook a little bit each day, or at some regular frequency (vs. trying to read a whole chapter in one sitting).

**\*Due dates for Homework will be posted on Canvas with at least one week notice. Estimated due dates are included in the below table. Homework will be due Friday nights, at 11:59 pm EST.**

*Changes to the course schedule will be communicated in class, as needed.*

| Week                     | Topic(s)  | Homework Due            |
|--------------------------|---|-------------------------|
| <b>Week 1</b><br>Jan 23  | Course overview<br>Chapter 9: Cardiovascular System |                         |
| <b>Week 2</b><br>Jan 30  | Chapter 9   |                         |
| <b>Week 3</b><br>Feb 6   | Chapter 9   | HW Ch 9                 |
| <b>Week 4</b><br>Feb 13  | Dr. Granato Guest Lecture: Part 1                   |                         |
| <b>Week 5</b><br>Feb 20  | Chapter 10: The Blood Vessels                       |                         |
| <b>Week 6</b><br>Feb 27  | Chapter 10  | HW Ch 10                |
| <b>Week 7</b><br>Mar 6   | Chapter 10/Review                                   |                         |
| <b>Week 8</b><br>Mar 13  | <b>Midterm</b>                                      |                         |
| Mar 20                   | <b>Spring Break – no class</b>                      |                         |
| <b>Week 9</b><br>Mar 27  | Dr Granato Guest Lecture: Part 2                    | HW Dr. Granato Lectures |
| <b>Week 10</b><br>Apr 3  | Chapter 13: Respiratory System                      |                         |
| <b>Week 11</b><br>Apr 10 | Chapter 13  | HW Ch 13                |
| <b>Week 12</b><br>Apr 17 | Chapter 14: Urinary                                 |                         |
| <b>Week 13</b><br>Apr 24 | Chapter 14  |                         |
| <b>Week 14</b><br>May 1  | Chapter 14/Review                                   | HW Ch 14                |
| <b>Week 15</b><br>May 8  | No class – study for final                          |                         |
| <b>Finals</b><br>TBD     | See finals schedule                                 | Final Exam              |

## COURSE MATERIALS

### Textbook(s):

1. **Required:** Lauralee Sherwood, Human Physiology from Cells to Systems, 9th edition, Brooks/Cole Cengage Learning, 2015  
ISBN 10:1-337-07873-5, ISBN 13: 978-1-337-07873-3(REQUIRED).

**Other Readings:** Supplemental readings will be posted on Canvas

**Materials:** Other notes and slides on canvas

## COURSE REQUIREMENTS

**Attendance:** Attendance will be taken manually **at the start** of class meetings. Late attendance or missing class without prior written approval will result in a score of zero for that day. Your attendance will be used for your participation score, if you are not present, you will receive a zero score for participation that day.

**Participation:** Participation in class and on canvas discussions account for **10%** of your course grade. During lectures, I will randomly pull names to prompt your participation in addition to students volunteering questions and answers. This practice aligns with best practices in pedagogy and is related to real-world situations.

**Chapter Homework:** Homework will account for **25%** of your course grade. You will complete assignments and submit them via Canvas. In cases that I specify that you can work together, you can collaborate for these assignments in groups of 2-3, and submit a single file for all of your partner(s), so long as their name(s) is/are included with the submission. Only one submission is necessary.

**Exams:** There will be a midterm and final. Each will have a portion to take within Canvas and a different in-person component. Portions of each exam will be open book, open notes, but no internet, messaging, texting, or other forms of communication are permitted (see exam condition section below). The in-person portion of each exam will require a single reference page 8.5" x 11". The midterm will account for 30% of your course grade and the final exam will account for 35% of your course grade.

## TECHNOLOGY REQUIREMENTS

### Baseline technical skills necessary for online courses

- Basic computer and web-browsing skills
- Navigating Canvas
- Live web conferencing using Zoom (as needed)

### Technology skills necessary for this specific course

- Computer: current Mac (OS X) or PC (Windows 7+) with high-speed internet connection

- Webcam: built-in or external webcam, fully installed (when using zoom)
- Microphone: built-in laptop or tablet mic or external microphone (when using zoom)

## GRADING PROCEDURES

Grades will be based on:

|                     |     |
|---------------------|-----|
| Class Participation | 10% |
| Homework            | 25% |
| Midterm             | 30% |
| Final               | 35% |

Grade scale for your final course grade:

|    |              |
|----|--------------|
| A  | 93.0 – 100.0 |
| A- | 90.0 – 92.9  |
| B+ | 87.1 – 89.9  |
| B  | 83.0 – 87.0  |
| B- | 80.0 – 82.9  |
| C+ | 77.1 – 79.9  |
| C  | 73.0 – 77.0  |
| F  | Below 73.0   |

### Late Policy

Without prior written approval from the instructor, late submissions of homework, or exams will receive a score of zero.

## ACADEMIC INTEGRITY

### Generative AI Technologies

You may use AI programs e.g. ChatGPT to help generate ideas and brainstorm. However, you should note that the material generated by these programs may be inaccurate, incomplete, or otherwise problematic. Beware that use may also stifle your own independent thinking and creativity.

You may not submit any work generated by an AI program as your own. If you include material generated by an AI program, it should be cited like any other reference material (with due consideration for the quality of the reference, which may be poor).

Any plagiarism or other form of cheating will be dealt with under relevant Stevens policies.

### 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."***

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](http://www.stevens.edu/honor).

### **Special Provisions for Undergraduate Students in 500-level Courses**

The general provisions of the Stevens Honor System do not apply fully to graduate courses, 500 level or otherwise. Any student who wishes to report an undergraduate for a violation in a 500-level course shall submit the report to the Honor Board following the protocol for undergraduate courses, and an investigation will be conducted following the same process for an appeal on false accusation described in Section 8.04 of the Bylaws of the Honor System. Any student who wishes to report a graduate student may submit the report to the Senior Vice Provost for Graduate Education or to the Honor Board, who will refer the report to the senior vice provost. The Honor Board Chairman will give the Senior Vice Provost for Graduate Education weekly updates on the progress of any casework relating to 500-level courses. For more information about the scope, penalties, and procedures pertaining to undergraduate students in 500-level courses, see Section 9 of the Bylaws of the Honor System document, located on the Honor Board website.

## **EXAM CONDITIONS**

The following procedures apply to quizzes and exams for this course. As the instructor, I reserve the right to modify any conditions set forth below by printing revised Exam Conditions on the quiz or exam.

One portion of the exam will be open-book, open notes, except that there is no access to the Internet except for the Canvas classroom or if you have purchased an electronic copy of the text book. Another portion of the exam will include a reference sheet and will be completed in-person.

1. Students may use the following materials **during the open-book open notes component of the midterm and final**. Any materials that are not mentioned in the list below are not permitted.

| Material or Method  | Permitted? |    |
|---|------------|----|
|   | Yes        | No |
| Handwritten Notes<br>Conditions: i.e. size of note sheet          | X          |    |
| Typed Notes<br>Conditions: i.e. size of note sheet                | X          |    |
| Textbooks (online or physical)<br>Conditions: i.e. specific books | X          |    |
| Readings<br>Conditions: i.e. specific documents                   | X          |    |

2. Students may use the following materials **during the closed-book component of the midterm and final**. Any materials that are not mentioned in the list below are not permitted.

| Material or Method  | Permitted? |    |
|---|------------|----|
|   | Yes        | No |
| Single-sided 1 reference page of notes that are typed or hand-written on a 8.5" x 11" paper | X          |    |

3. **Students are not allowed to work with, text, message, or talk to other students during exams.**

## ACCOMMODATIONS

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 disabilities to help students achieve their academic and personal potential. They facilitate equitable 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.

For more information about Disability Services and the process to receive accommodations, visit <https://www.stevens.edu/student-diversity-and-inclusion/disability-services>. If you have any questions please contact the Office of Disability Services at [disabilityservices@stevens.edu](mailto:disabilityservices@stevens.edu) or by phone: 201.216.3748.

### 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.

## INCLUSIVITY

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.



## **Name and Pronoun Usage**

As this course includes group work and 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 pronouns and/or name, please inform the instructor of the necessary changes.

## **Religious Holidays**

Stevens is a diverse community that is committed to providing equitable educational opportunities and supporting students of all ethnicities and belief systems. Religious observance is an essential reflection of that rich diversity. Students will not be subject to any grade penalties for missing a class, examination, or any other course requirement due to religious observance. In addition, students will not be asked to choose between religious observance and academic work. Therefore, students should inform the instructor at the beginning of the semester if a requirement for this course conflicts with religious observance so that accommodations can be made for students to observe religious practices and complete the requirements for the course.

## **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), online at <https://stevensportal.pointnclick.com/confirm.aspx>, or in person on the 2<sup>nd</sup> Floor of the Student Wellness Center.

## **EMERGENCY INFORMATION**

In the event of an urgent or emergent concern about your own safety or the safety of 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. For students who do not reside near the campus and require emergency support, please contact your local emergency response providers at 911 or via your local police precinct. Other 24/7 national 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](mailto:care@stevens.edu). A member of the CARE Team will respond to your concern as soon as possible.