

Quantitative Physiology

BME 4409 Section 11233

Class Periods: MWF, period 3, 9:35am – 10:25am

Location: NZH 0112

Academic Term: Fall 2024

Instructor:

Meghan C. Ferrall-Fairbanks, Ph.D. (she/her)

Email: mferrall.fairbanks@bme.ufl.edu

Office Phone Number: (352) 846-2762

Office Hours: virtual office hours, see Canvas for scheduled times, or by appointment

Teaching Assistant/Peer Mentor/Supervised Teaching Student:

Learning Assistants (LAs) are fellow undergraduates who have passed this course with strong academic performance and are trained in collaborative learning strategies. Your LAs will help you navigate and digest course material. Your LA does not participate in direct instruction or grading. Contact information and LA Office Hours will be posted on Canvas.

Course Description

A junior/senior level physiology course. Quantitative modeling of organ system physiology of the nervous system, the cardiovascular system and the respiratory system are discussed and students work on quantitative problems.

Course Pre-Requisites / Co-Requisites

Pre-requisites with minimum grades of C:

- PCB 3713C - Cell and system physiology or similar course (with instructor approval)
- BME 3053C – Computer Applications for BME
- BME 3060 – Biomedical Engineering Fundamentals
- BME 3508 – Biosignals and Systems

Course Objectives

- to be able to describe a physiologic system in a quantitative way
- to be able to analyze physiologic measurements and use them for parameter estimation

Materials and Supply Fees - None

Relation to Program Outcomes (ABET):

This course incorporates mathematics and basic sciences appropriate to Biomedical Engineering. Basic sciences are defined as biological, chemical, and physical sciences. It also incorporates engineering topics, consisting of engineering sciences, and engineering design appropriate to Biomedical Engineering.

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	High (Emphasized)
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	Medium (Reinforced)
3. An ability to communicate effectively with a range of audiences	
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	

6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	Medium (Reinforced)
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Medium (Reinforced)

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

Required Textbooks and Software

None

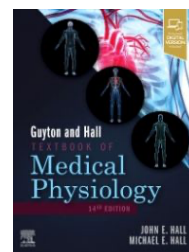
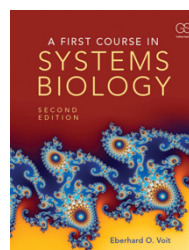
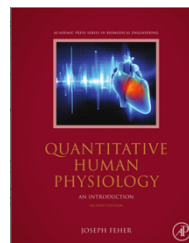
Recommended Materials

This course pulls material from a variety of different areas and these three texts cover material that most of the coursework will draw on.

- **Title: Quantitative Human Physiology**
- **Author:** Joseph Feher
- **Publication date and edition:** Second Edition (2012)
- **Publisher:** Academic Press/Elsevier
- **ISBN number:** 978-0-12-800883-6
- Available at [Marston Science Library in Course Reserves](#)

- **Title: A First Course in Systems Biology**
- **Author:** Eberhard O. Voit
- **Publication date and edition:** Second Edition (2017)
- **Publisher:** Garland Science, Taylor & Francis Group
- **ISBN number:** 978-0815345688
- Available online through [UF Libraries](#)

- **Title: Guyton & Hall Textbook of Medical Physiology**
- **Author:** John E. Hall & Michael E. Hall
- **Publication date and edition:** 14th Edition (2020)
- **Publisher:** Elsevier
- **ISBN number:** 978-0-323-59712-8
- Earlier editions available online through [UF Libraries](#)



Required Computer

Computer access is integral to a biomedical engineering student's success in Quantitative Physiology. The HWCOE specifications for computer requirements for undergraduate students in the HWCOE are available: <https://www.eng.ufl.edu/students/advising/fall-semester-checklist/computer-requirements/>

This course will use MATLAB as well as open-source languages to give students real-world experience for developing collaborative computing environments.

- MATLAB can be accessed online at <http://info.apps.ufl.edu>. Full help including FAQ and a Help Request can be found here: <https://info.apps.ufl.edu/>.
- Alternatively, MATLAB can be accessed by purchasing MATLAB student edition (from the bookstore) OR other access to a computer with MATLAB.

Course Schedule

See course website for class schedule. The posted schedule is tentative, subject to change. Any revisions will be announced in class and will be posted on Canvas. Note with detail important deadlines within a given week (holidays, project due dates, midterm, etc.) and the assignments associated with the module. Assignments are typically due 1 week after the conclusion of the module. Module Quizzes are due before the start of the next module.

Class Website

- Canvas (elearning.ufl.edu) will be used extensively, including posting all assignments and grades.
- Each student is fully responsible for ensuring that they have access to Canvas and must check the course website routinely to ensure they are fully aware of all assignments and postings.
- Failure to check the course website will not be a valid excuse for not completing an assignment.

COURES POLICIES =====

Attendance Policy, Class Expectations, and Make-Up Policy

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies:

<https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>

Attendance

- Regular attendance expected in addition to class discussions and satisfactory performance on activities.
- Attendance will be taken in class periodically. Make sure to be in class or send an excuse to your instructor by email or Canvas message.
- How to send an excuse
 - What constitutes a valid excuse? Excused absences must be consistent with University policies in the undergraduate catalog: <https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/> and require appropriate documentation. Absences will be excused under the following conditions:
 - 24 hours ahead of time that you have a legitimate, unavoidable absence (such as an exam conflict for a higher-numbered academic course)
 - Verifiable medical or family emergency
 - Travel for a student conference – provided all excuse request prior to travel
 - Need to come to class late or leave early for a legitimate reason
 - Contact the instructor at least 24 hours before missing class due to interview confirmation email; conference email; UF official sporting event
- Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Accommodations for missing an in-class presentation or other assignments will only be made for student who provide appropriate documentation of an excused absence.

Class Expectations

- Students are expected to attend and participate in class in person. Students will not be able to attend the lectures via Zoom synchronously. The material you will learn is very application based and is not taken from a single source. In case of an absence, ask a classmate for lecture material, review the recommended book sections, and access supporting slides and activities on Canvas.
- Dr. Ferrall-Fairbanks will post recordings of lectures for your review after class. Recordings will cover lecture material and will not be available to cover in-class exercises/problems.
- Don't be afraid to ask for help during class or office hours.
- Be an active learner – ask yourself questions during lectures, as you read, and as you attempt problems.
- Study in advance and go to office hours. Don't wait until the day before the exam, homework, or project deadline to get clarification on the material.
- Check Canvas for class updates, assignments, announcements, lessons, calendar, and resources.
- If using a laptop or other device in class, you shouldn't be on Facebook, Netflix, Hulu, etc. or do other things that are not class related. If the instructor asks you to put your device away, please do so.
- You need to notify your instructor if you need accommodations from the Disability Resource Center. Your instructors want to help you.

Make-Up Policy

- **“Life Happens” Policy:** Students are permitted one missed homework, no questions asked. The policy will be implemented by dropping the lowest homework assignment grade. This policy does not apply to exams.

Beyond the one missed assignment, documentation of a university approved absence is required to make-up further assignments.

- Assignments/Quizzes: Assignments and quizzes may be submitted late with a 5% per day late penalty. Otherwise, the “Life Happens” policy allows for dropping the lowest homework assignment grade with no questions asked.
- Midterm Exam: The midterm exam may only be made up if scheduled in advances for an approved conflict and this will likely include an earlier midterm exam time than the scheduled for the rest of the class.

Communication

- Address the instructor as Dr. Ferrall-Fairbanks or Prof. Ferrall-Fairbanks in all communications.
- Dr. Ferrall-Fairbanks will do her best to be available to all students for questions and discussions.
- Announcements will be shared periodically during class and on Canvas. It is your responsibility to attend class and read the emails/announcements from Canvas.
- After each assignment is graded, you are responsible for reviewing your instructor’s feedback.
- Emails, announcements, and feedback may occur outside business hours.
- Please only use your official UF email address to communicate with Dr. Ferrall-Fairbanks or your LAs.
- Dr. Ferrall-Fairbanks prefers that you use Canvas when sending messages for automatic association with the class. Include BME 4409 in the subject line.
- Please allow up to 48 hours for Dr. Ferrall-Fairbanks to respond or longer if the email is sent at night or during the weekend, holidays, or breaks.

GRADING =====

Evaluation of Grades

Student performance will be assessed by:

- Assignments that will be assigned approximately 1 per module and will account for 25% of the final grade.
- The Semester Project and its accompanying reports and presentations will account for 30% of the final grade. The end goal of the project is to work in small groups to develop a simple model of a physiological phenomenon and evaluate the model for a specific system. The projects will be evaluated based on an in-class presentation and a 5-page report detailing the results and there are 3 milestone reports throughout the semester prior to the final presentation and report.
- Module Quizzes will account for 15% of the final grade and are due before the start of the next module.
- One midterm exam will be administered around Week 10 of and will each account for 20% of the final grade. This midterm exam will assess fundamental concepts in modeling that can be applied to a variety of different physiologic systems.
- Participation will account for 10% of the final grade.

Assessment	Percentage of Final Grade
Assignments	25%
Module Quizzes	15%
Midterm Exam	20%
Semester Project	30%
Participation	10%
	100%

Grading Policy

The following grading standards will be used in this class:

Percent	Grade	Grade Points
100 % to 92.0 %	A	4.00
< 92.0 % to 90.0 %	A-	3.67
< 90.0 % to 87.0 %	B+	3.33
< 87.0 % to 83.0 %	B	3.00
< 83.0 % to 77.0 %	B-	2.67
< 77.0 % to 76.0 %	C+	2.33
< 76.0 % to 74.0 %	C	2.00
< 74.0 % to 70.0 %	C-	1.67
< 70.0 % to 67.0 %	D+	1.33
< 67.0 % to 64.0 %	D	1.00
< 64.0 % to 61.0 %	D-	0.67

Percent	Grade	Grade Points
< 61.0 % to 0.0 %	F	0.00

More information on UF grading policy may be found at:
<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Re-Grade Policy

We do our best to grade evenly and fairly, but mistakes in grading can happen. Requests to modify points on assignments, project milestones, or exams must be submitted in writing to Dr. Ferrall-Fairbanks within 1 week from when the graded assignment was made available. The request should identify the question and provide clear justification/reasoning for the requested change. The instructor will then review the request and modify the grade, as necessary. For grade challenge requests, the instructor reserves the right to regrade the entire assignment, not just the points in question. The instructor also reserves the right to turn down unreasonable or frivolous grade challenge requests. Any request for re-grading where the student has altered the assignment after it was returned to gain a grade benefit will be considered a violation of the University honor code.

CLASSROOM ENVIRONMENT =====

Professional Conduct

- Students are expected to engage with the instructor and fellow students in a courteous and professional manner when participating in the classroom via Canvas.
- Any student who behaves in a disrespectful or disorderly manner may be asked to leave the classroom.

Inclusion Statement

It is my intention that students from all backgrounds and perspectives will be well served by this course and that the diversity that students bring to this class will be viewed as an asset. I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, socioeconomic background, family education level, ability – and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful and welcoming learning environment for every other member of the class.

Lived Name / Pronoun Statement

I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records.

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

RELEVANT UNIVERSITY POLICIES =====

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.ua.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.ua.ufl.edu/public-results/>.

Course Recording

Our class sessions may be audio visually recorded for students in the class to refer to and for enrolled students who are unable to attend live. Likewise, students who participate orally are agreeing to have their voices recorded. If you

are not willing to consent to have your voice recorded during class, abstain from verbalizing your contributions. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

University Honesty Policy

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://sccr.dso.ufl.edu/process/student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University’s core values, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Francis Lai, BME Undergraduate Academic Advisor, 352-273-8096, undergrad@bme.ufl.edu
- HWCHE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual

violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

AI Policy

Generative AI is a powerful new tool that can help learners to engage with a topic of interest. Please be aware of the limitations of generative AI including the tendency to hallucinate (invent) incorrect responses. Many students believe AI tools are more trustworthy than they actually are.

Feel free to use AI tools/software:

- As part of your study regimen to help you better understand course material (keeping in mind AI can and does give incorrect responses)

Do not:

- Substitute AI for primary sources of information (textbooks, lecture materials, scientific literature).
- Use AI to do the writing of any substantive portion of an assignment for you. I will treat this as plagiarism and an honor code violation, the same as hiring any other external person, entity, or service to complete your assignments for you.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

CAMPUS RESOURCES =====

Health and Wellness

U Matter, We Care:

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: <https://counseling.ufl.edu>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://elearning.ufl.edu/>.

Career Connections Center, Reitz Union, 392-1601. Career assistance and counseling; <https://career.ufl.edu>.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. <https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. <https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>;
<https://care.dso.ufl.edu>.

On-Line Students Complaints: <https://distance.ufl.edu/getting-help/>; <https://distance.ufl.edu/state-authorization-status/#student-complaint>.