BIOE 303: Quantitative Physiology Lab

Meeting times and locations:
Monday (lecture): 1:00 – 1:50 PM, 1302 Everitt Lab
Tuesday (AB3 lab): 11:00 – 1:50 PM, 0215 Everitt Lab
Tuesday (AB1 lab): 2:00 – 4:50 PM, 0215 Everitt Lab
Thursday (AB2 lab): 2:00 – 4:50 PM, 0215 Everitt Lab

Credit hours: 2
Prerequisites: Concurrent BIOE 302 enrollment allowed.

Course Staff

Instructor: Caroline Cvetkovic, Ph.D. (ccvetko@illinois.edu), 3138 Everitt Lab

Teaching Assistants (TAs):
- Siva Nalla (snalla2@illinois.edu), AB3
- Lingyun Xu (lx5@illinois.edu), AB1
- Aman Dhoraje (dhoraje2@illinois.edu), AB2

Undergraduate Course Assistants (CAs):
- Anushka Agashe (aagashe3@illinois.edu), AB1/AB3
- Nina Soofi (ninams2@illinois.edu), AB1/AB3
- Michelle Stilger (stilger4@illinois.edu), AB2

Course Information

Description: Lab exercises in this course consist of both hands-on and simulation experiments in animal and human physiology. Simulations are used to provide a mathematical description of physiological behavior, and the models are calibrated and validated through hands-on experiments. Experiments will cover neural, cardiovascular, respiratory, and muscular systems. Simulations will cover neural, cardiovascular, respiratory, muscular, endocrine, and renal systems. The course will build upon models developed in BIOE 302, expanding them to systems capable of simulating their behavior under experimental conditions. Additionally, students will learn to analyze physiological signals, understand the limitations of modeling in physiology, and develop scientific communication skills.

This course is organized in the following weekly instructional format:
- 1-hour lecture (Monday) that reviews physiology and introduces the lab procedure and analysis tools.
- 3-hour lab session (Tuesday or Thursday) to perform data acquisition, experimental testing, simulation, and analysis.

Objectives: At the end of the course, you should be able to:
- Explain basic terminology, anatomy, and physiology of several major human systems.
- Design experiments to test models.
- Analyze and interpret measured data to describe system behavior.

- Describe methods of measurement and monitoring of physiological systems.
- Work in teams to address design, testing, and presentation of a measurement technique for a physiological system or model validation.

Course Resources

Website: The Canvas site (https://canvas.illinois.edu/courses/48379) will be used for posting pre-lab materials, lab assignments, quizzes, all assignment upload/submission, grading, and announcements.

Office Hours:
- Wednesday 2:30-3:30 PM, 0215 Everitt Lab
- Friday 1-2 PM, 0215 Everitt Lab
- If necessary, by appointment with course instructor or TA

Textbook and Reading Materials: No textbook is required. Reading materials relevant to the content will be assigned via Canvas.

Course Content and Assignments

In this course, the topics include:
- Nervous System (Cell Membrane Potential and Nernst-Goldman, Cell Transport & Permeability, Nerve Conduction Velocity, Neurophysiology)
- Cardiovascular System (ECG and Pulse Plethysmograph, Blood Pressure, Impedance Cardiography)
- Skeletal Muscle (Electromyography EMG, Skeletal Muscle Physiology)
- Respiratory System (Ventilation and Lung Volumes)
- Renal System
- Endocrine System

For each lab, students will work in groups to complete at least one relevant assignment. The nature of the assignment and time allotment vary by the type of lab performed. Students are expected to complete assignments as a group, with equal effort. Grades will be based on quizzes, post-lab assignments, and participation (see below). Assignments will be submitted via Canvas.

Please note that the instructor reserves the right to make changes to the schedule at any time if necessary. Every effort will be made to convey the changes to the students in a timely manner. The updated schedule is posted on Canvas.

Quizzes (10% total): Weekly quizzes will be given at the beginning of Monday lecture, with the objective to assess preparedness to perform that week's lab, including basics of the procedure and background information, as well as general physiology review covered in the pre-reading material. Quizzes will be administered on Canvas, and students are expected to complete them individually, without notes or online resources. The two lowest or missing quiz scores will be dropped without penalty. As such, makeup quizzes will not be given. Any missed quizzes beyond the first two will count as zeros.

Participation (5% total): As teamwork is central to the success of any experiment, you will receive a participation grade based on your effort as well as feedback from your group, TA, and instructor.

Students are expected to complete assignments as a group, with equal effort. Students will be required to provide Author Contribution Statements on some assignments.

Post-Lab Assignments (75% total): For each lab session, students will work in groups to complete a relevant assignment. The nature and time allotment vary by the type of lab performed.

- *Question Sets and Lab Reports* (50% total, 7 assignments): Students work in groups to perform assigned simulations or experiments with the BIOPAC system and answer all given questions and/or summarizing collecting data. For Full Lab Reports, students write a group report that includes an introduction, materials and methods, results, discussion, and figures. Detailed instructions will be provided. Due within 2 weeks of the lab session.
- *Virtual Lab Reports (PhysioEx)* (25% total, 5 assignments): Students work in groups to perform virtual experiments using PhysioEx software. Due at the end of the lab session.

Final Project (10% total): At the end of the semester, students will work in teams to complete a project using principles of physiological measurements and analysis gained throughout the semester. More information will be provided.

Grading

Components of Grade:

	% of Grade
Quizzes	**10**
Participation	**5**
Post-lab Assignments	**75**
• *Question Sets and Lab Reports*	*50*
• *Virtual Lab Reports (PhysioEx)*	*25*
Final Project	**10**

Grading Scale:

≥97.0	A+	≥87.0	B+	≥77.0	C+	≥67.0	D+
≥93.0	A	≥83.0	B	≥73.0	C	≥63.0	D
≥90.0	A-	≥80.0	B-	≥70.0	C-	≥60.0	D-

Final grades may be rounded at the instructor's discretion. Requests for grade inflation or extra points will not be accepted.

Course Policies

Course-Related Communication: Email communication is preferred between students and the instructor/TAs. The Canvas discussion board may also be used and will be occasionally monitored by the instructor or TAs. There is no guarantee that communication sent after 5:00 pm will be answered that same day. Please include "[BIOE 303 FA24]" in the subject line.

Attendance: This is a lab-based course in which attendance at weekly lecture and lab sessions is imperative for success, and your group's grade depends on your active involvement. Assignments (75% of grade) are based on laboratory exercises and participation is thus necessary to pass the course. Attendance in lecture is required and students are responsible for all materials and announcements given during the class time, including weekly quizzes. Students must be present

to take quizzes during lecture. For planned schedule changes for university excused absences, religious observances, interviews, or university-sponsored athletic events, please contact the instructors as soon as possible, and at least two weeks before lab. In this case, students should coordinate with the instructors to complete a makeup lab. For last minute schedule changes, please alert the instructor, TAs, and lab group via email as soon as you are able.

Due to safety training requirements, students who arrive late to the lab and miss the safety overview might not be allowed to participate. Makeup labs may be scheduled in that case, and may include additional assignments at the instructor's discretion.

Illness Policy: Students who feel ill must not come to class. In this case, students should let the instructor/TA know as soon as possible and coordinate with their lab partner to complete the lab work. An appropriate plan for making up missed lab experiments (in-person or virtually) and assignments will be initiated by the instructor as appropriate for the assignment, and agreed upon by the instructor, TA, and student. Repeated absences will require an absence letter from the Dean of Students addressed to the instructor.

Late Policy: The course late policy is as follows:

- Question Sets and Lab Reports are due by the beginning of the lab session, either in 1 week or 2 weeks, depending on the assignment.
- PhysioEx Lab Reports are due at the end of the lab session.
- An assignment submitted within 24 hours after the deadline will lose 10% of the total points. An assignment submitted 24-48 hours after the deadline will lose 20% of the total points. No credit will be received after 48 hours past the assignment deadline.
- Each group will receive one 2-day extension on a question set assignment (not applicable for PhysioEx Lab Reports), with no penalty and no excuse needed. However, no partial credit option will be given after that point, and it is possible that feedback will be delayed. An online form will be provided for a group to use their "pass".

Laptops and Mobile Devices: Mobile devices should be silenced and out of sight during lecture. Laptops and mobile phones may be used for course-related tasks only (e.g., to take notes, complete the quiz, or answer polling questions) and not for other coursework or email.

Safety: The procedures of the Quantitative Human Physiology Lab are designed to be safe for students and instructors. However, like most labs, there are things that can increase the risk of injury. A list of rules to be followed in this course will be provided. Students are expected to abide by all rules and safety guidelines and will sign their name to a safety agreement during the first week of the semester. Students who do not sign will not be allowed to participate in the course. Any student who knowingly endangers themselves, fellow students, or instructors will be asked to leave the lab immediately and will fail the course.

Use of Generative AI Technology: Generative AI, such as ChatGPT, Bard, and Microsoft Copilot/Bing Chat, can answer questions and generate text, images, and other media. The appropriate use of generative AI varies from course to course. In BIOE 303, there are times when generative AI may be useful in the course. If you choose to use generative AI as permitted below, you must document and attribute all AI contributions to your coursework and take full responsibility for the contributions including the accuracy of the information and reliability of sources. When using generative AI, keep a journal documenting prompts, AI responses, and your usage. Your instructor may ask you to provide this documentation.

You may use generative AI in BIOE 303 for the following:

- Revision of your own text in assignments for spelling and grammar
- Creating study aids (e.g., flashcards) for quizzes
- Testing and practicing your knowledge of course topics

You MAY NOT use generative AI in BIOE 303 for the following:

- Generating data for experiments conducted in the course
- Assistance during quizzes
- Writing entire sentences, paragraphs, or papers to complete class assignments such as lab reports or question sets
- Conducting basic research on the course and assignment topics for lab reports

If you have a question about the use of Generative AI, please reach out to your instructors. Failure to abide by these guidelines is a violation of academic integrity. We will investigate suspected uses of generative AI that do not follow these guidelines and apply sanctions as outlined in the Illinois Student Code. Visit https://www.vpaa.uillinois.edu/digital_risk_management/generative_ai for guidance, support, and policies.

Academic Integrity: Students will sign their name to an academic honesty agreement during the first week of the semester in order to be allowed to participate in the course. Academic dishonesty may result in a failing grade. All students are expected to:

- Read and abide by the University of Illinois at Urbana-Champaign Student Code, including Article 1, Part 4: Academic Integrity.
- Perform all of the lab procedures themselves.
- Use only the data obtained by their lab group to write reports, unless stated otherwise by the TA or instructor.
- Write lab reports in assigned groups only. Although some discussions about data and analysis strategies may occur between groups, each lab report should reflect the work of that lab group only. (In the case of individual lab reports, students may discuss data and analysis strategies with their peers, however, each report should reflect the work of the individual student only.)
- Complete online quizzes without the aid of class materials, peer input, or the internet.
- Uphold the highest ethical standards, be honest, and practice academic integrity. This includes doing original work and citing sources used. TurnItIn will be used to check for plagiarism in assignments uploaded to Canvas.
- Ask the instructor(s) if in doubt about what constitutes plagiarism, cheating, or any other breach of academic integrity. Ignorance is not an excuse for any academic dishonesty.

University Policies and Resources

DRES Accommodations: To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor as soon as possible and provide the instructor with a Letter of Academic Accommodations from Disability Resources and Educational Services (DRES). To ensure that disability-related concerns are properly addressed from the beginning, students with disabilities who require assistance to participate in this class should apply for services with DRES and see the instructor as soon as possible. If you need accommodations for any sort of disability, please speak to the instructor. DRES provides students with academic accommodations, access, and support services. To contact DRES, you may visit 1207 S. Oak St., Champaign, call 217-333-1970, e-mail disability@illinois.edu, or visit the DRES website. Apply for services at https://www.disability.illinois.edu/applying-services.

Diversity and Inclusion: I value all students regardless of background and am committed to fostering a climate of inclusion in the classroom. The diversity of participants in this course is a valuable source of ideas, problem solving strategies, and engineering creativity. If you feel that your or any other student's contribution is not being valued for any reason, please speak with me directly or submit anonymous feedback.

Grainger College of Engineering Statement on Anti-Racism and Inclusivity: The Grainger College of Engineering is committed to the creation of an anti-racist, inclusive community that welcomes diversity along a number of dimensions, including, but not limited to, race, ethnicity and national origins, gender and gender identity, sexuality, disability status, class, age, or religious beliefs. The College recognizes that we are learning together in the midst of the Black Lives Matter movement, that Black, Hispanic, and Indigenous voices and contributions have largely either been excluded from, or not recognized in, science and engineering, and that both overt racism and micro-aggressions threaten the well-being of our students and our university community.

The effectiveness of this course is dependent upon each of us to create a safe and encouraging learning environment that allows for the open exchange of ideas while also ensuring equitable opportunities and respect for all of us. Everyone is expected to help establish and maintain an environment where students, staff, and faculty can contribute without fear of personal ridicule, or intolerant or offensive language. If you witness or experience racism, discrimination, micro-aggressions, or other offensive behavior, you are encouraged to bring this to the attention of the course director if you feel comfortable. You can also report these behaviors to the Bias Assessment and Response Team (BART). Based on your report, BART members will follow up and reach out to students to make sure they have the support they need to be healthy and safe. If the reported behavior also violates university policy, staff in the Office for Student Conflict Resolution may respond as well and will take appropriate action.

Emergency Response: Emergency response recommendations can be found at the following websites:

- Emergency preparedness: http://police.illinois.edu/emergency-preparedness/
- Campus building floor plans: http://police.illinois.edu/emergency-preparedness/building-emergency-action-plans/
- "Run, Hide, Fight": https://police.illinois.edu/emergency-preparedness/run-hide-fight/

Sexual Misconduct Reporting Obligation: The University of Illinois is committed to combating sexual misconduct. Faculty and staff members are required to report any instances of sexual misconduct to the University's Title IX Office. In turn, an individual with the Title IX Office will provide information about rights and options, including accommodations, support services, the campus disciplinary process, and law enforcement options.

A list of the designated University employees who, as counselors, confidential advisors, and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found here: https://wecare.illinois.edu/resources/students/#confidential. Other information about resources and reporting is available here: https://wecare.illinois.edu/

Religious Observances: Illinois law requires the University to reasonably accommodate its students' religious beliefs, observances, and practices regarding admissions, class attendance, and the scheduling of examinations and work requirements. Students should view the policy here: https://odos.illinois.edu/resources/students/religious-observances. In order to best facilitate planning and communication between students and faculty, students should make requests for

absences as early as possible in the semester. Within the first 2 weeks of classes, if possible, notify your instructor of potential conflicts and request appropriate accommodations.

Family Educational Rights and Privacy Act (FERPA): Any student who has suppressed their directory information pursuant to Family Educational Rights and Privacy Act (FERPA) should self-identify to the instructor to ensure protection of the privacy of their attendance in this course. See https://registrar.illinois.edu/academic-records/ferpa/ for more information on FERPA.

Mental Health: Diminished mental health, including significant stress, mood changes, excessive worry, substance/alcohol abuse, or problems with eating and/or sleeping can interfere with optimal academic performance, social development, and emotional wellbeing. The University of Illinois offers a variety of confidential services including individual and group counseling, crisis intervention, psychiatric services, and specialized screenings which are covered through the Student Health Fee. If you or someone you know experiences any of the above mental health concerns, it is strongly encouraged to contact or visit any of the University's resources provided below. Getting help is a smart and courageous thing to do for yourself and for those who care about you.

- Counseling Center: 217-333-3704, 610 East John Street, Champaign, IL 61820
- McKinley Health Center: 217-333-2700, 1109 South Lincoln Avenue, Urbana, IL 61801
- University of Illinois Wellness website: https://wellness.illinois.edu/
- National Suicide Prevention Lifeline (800) 273-8255
- Rosecrance Crisis Line (217) 359-4141 (available 24/7, 365 days a year)
- If you are in immediate danger, call 911.

Community of Care: As members of the Illinois community, we each have a responsibility to express care and concern for one another. If you come across a classmate whose behavior concerns you, whether in regards to their well-being or yours, we encourage you to refer this behavior to the Student Assistance Center (SAC; 217-333-0050). Based on your report, the staff in the Student Assistance Center reaches out to students to make sure they have the support they need to be healthy and safe.

Further, as a Community of Care, we want to support you in your overall wellness. We know that students sometimes face challenges that can impact academic performance (examples include mental health concerns, food insecurity, homelessness, personal emergencies). Should you find that you are managing such a challenge and that it is interfering with your coursework, you are encouraged to contact the SAC in the Office of the Dean of Students for support and referrals to campus and/or community resources.

Disruptive Behavior: Behavior that persistently or grossly interferes with classroom activities is considered disruptive behavior and may be subject to disciplinary action. Such behavior inhibits other students' ability to learn and an instructor's ability to teach. A student responsible for disruptive behavior may be required to leave class pending discussion and resolution of the problem and may be reported to the Office for Student Conflict Resolution (conflictresolution@illinois.edu) for disciplinary action.