

BIOE 303: Quantitative Physiology Lab

Course Syllabus

Fall 2023

Course Personnel

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

Teaching Assistants (TAs):

- Sarah Lindley (sarahel3@illinois.edu), Section AB1
- Amaan Mirza (amaanam2@illinois.edu), Section AB2
- Jaena Park (jaenap2@illinois.edu), Section AB3

Undergraduate Course Assistants (CAs):

- Ahmad Al-Juboory (ahmada@illinois.edu), Section AB1
- Ainsley Hanner (ahanner2@illinois.edu), Section AB2
- Maya Miriyala (mayasm2@illinois.edu), Section AB3

Course Information

Course credit: 2 hours. Concurrent enrollment in BIOE 302 (Modeling Human Physiology) is allowed.

Course website: The Canvas site (<https://canvas.illinois.edu/courses/38107>) will be used for posting pre-lab materials, lab assignments, quizzes, all assignment upload/submission, grading, and announcements.

Weekly instruction format and meeting times:

- 1-hour lecture that reviews physiology and introduces the lab procedure and analysis tools.
- 3-hour lab session to perform the experimental testing, simulation, and analysis.

Every student should be registered for the lecture and one of the lab sections below:

- Lecture: Monday 1:00 – 1:50 pm, 1302 Everitt Laboratory (AL1)
- Lab sections:
 - Tuesday 2:00 – 4:50 pm, 0215 Everitt Laboratory (AB1)
 - Thursday 2:00 – 4:50 pm, 0215 Everitt Laboratory (AB2)
 - Tuesday 11:00 am – 1:50 pm, 0215 Everitt Laboratory (AB3)

Office hours:

- Monday 11:00 am – 12:00 pm, 0215 Everitt Laboratory
- Wednesday, 1:00 – 2:00 pm, 0215 Everitt Laboratory
- If necessary, by appointment with course instructor

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 FA23]" in the subject line.

Course 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.

Course 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 Content and Schedule

Tentative schedule of topics: The schedule below is subject to change. 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.

Week	Dates	Lab	Topic	Lab Type	Assignment	Due
1	Aug 21-24	1	Cell Membrane Potential (Nernst-Goldman Simulation)	Simulation	Question set	1 week
2	Aug 28-31	2	Cell Transport & Permeability	PhysioEx	PhysioEx report	In class
3	Sep 4-7	3	Introduction to BIOPAC	BIOPAC	Question set	1 week
4	Sep 11-14	4	Nerve Conduction Velocity	BIOPAC	Mini lab report	1 week
5	Sep 18-21	5	Neurophysiology	PhysioEx	PhysioEx report	In class
6	Sep 25-28	6	ECG and Pulse Plethysmograph	BIOPAC	Mini lab report	1 week
7	Oct 2-5	7	Blood Pressure	BIOPAC	Question set	1 week
8	Oct 9-12	8	Impedance Cardiography	BIOPAC	Question set	1 week
9	Oct 16-19	9	Electromyography (EMG)	BIOPAC	Full lab report	2 weeks
10	Oct 23-26	10	Skeletal Muscle Physiology	PhysioEx	PhysioEx report	In class
11	Oct 30-Nov 2	11	Ventilation and Lung Volumes	BIOPAC	Poster	2 weeks
12	Nov 6-9	12	Renal System	PhysioEx	PhysioEx report	In class
13	Nov 13-16	13	Endocrine System	PhysioEx	PhysioEx report	In class
14	Nov 20-23	<i>Fall Break</i>				
15	Nov 27-30	--	Final Projects		Project	Finals
16	Dec 4-7	--	Final Projects		Project	Finals
Finals	Dec 11-14	--	Final Projects		Project	Finals

Course Assignments and Grading Policies

Overview: Grades will be based on quizzes, post-lab assignments, and participation, as detailed below. All assignments will be submitted via 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 lowest two quiz scores will be dropped without penalty. No makeup quizzes will be given. A missed quiz will only be excused with a university-approved absence.

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.

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. Students are expected to complete assignments as a group, with equal effort.

- **Question Sets and Mini Lab Reports (30% total, 5 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 Mini Lab Reports, students write a group report that results and discussion of the lab. Due within 1 week of lab session.
- **Full Reports (20% total, 1 assignments):** Students work in groups to perform experiments and collect data using the BIOPAC system, then write a full report or create a poster that includes an introduction, materials and methods, results, discussion, and figures. Detailed instructions will be provided. Due within 2 weeks of 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 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.

Grade composition:

Component	% of Grade
Quizzes	10
Participation	5
Post-lab Assignments	75
• <i>Question Sets and Mini Lab Reports</i>	30
• <i>Full Reports</i>	20
• <i>Virtual Lab Reports (PhysioEx)</i>	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-

Late policy: The course late policy is as follows:

- Question Sets, Mini Lab Reports, and Full Lab Reports are due by the beginning of the lab session.
- 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.

Expectations and Academic Integrity

Attendance: This is a lab-based course in which attendance at weekly lecture and lab sessions is imperative for success. Assignments (85% 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 who are not feeling well or who have been exposed to someone with COVID are not permitted to attend the lab section. In this case, students should coordinate with the instructors to complete a makeup lab. For planned schedule changes for university excused absences, please contact the instructors at least one week before lab. For last minute schedule changes, please alert the instructor, TAs, and lab group as soon as you are able.

Due to safety training requirements, students who arrive late to lab and miss the safety overview might not be allowed to participate. The student may be asked to make up the lab and assignment at an agreed upon date and time. Makeup labs may include additional assignments at the instructor's discretion.

Lab rules: 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 is below. 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.
- Know the emergency phone number (9-911 from a campus phone, 911 from a mobile device).
- If you are using a circuit or recording equipment separate from the BIOPAC unit, students must have their setup checked by an instructor before connecting the subject and collecting any data.
- Any student may refuse to be the subject of an experiment, without consequences.
- No eating or drinking is allowed in the lab.
- Students should not take parts from the supply cabinets or storage bins without permission from their TA or instructor.
- Students are expected to respect the lab equipment and their fellow students by keeping their lab stations in working order and cleaning up at the end of the lab session.
- Students should report any malfunctioning equipment to their TA or instructor.
- During each section, only students registered for that section are allowed in the lab. If a student must attend a different section, the instructor and TAs must be notified before the change.
- When using the physiologic stimulator, never exceed the recommended levels without permission of an instructor. Always check the toggle switch to ensure that the output stimulus duration is correct.

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

Students with Disabilities: 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>.

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.

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/>

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 complete the [Request for Accommodation for Religious Observances](#) form should any instructors require an absence letter in order to manage the absence. In order to best facilitate planning and communication between students and faculty, students should make requests for absence letters as early as possible in the semester in which the request applies. Within the first 2 weeks of classes, if possible, notify your instructor of potential conflicts and [request appropriate accommodations](#).

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 and Disability Office. In turn, an individual with the Title IX and Disability 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: wecare.illinois.edu/resources/students/#confidential. Other information about resources and reporting is available here: wecare.illinois.edu.

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.

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.

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.

University COVID-19 policy and guidance: Refer to <https://covid19.illinois.edu/> for the most updated guidance and safety policies. Following University policy, all students are required to follow the campus COVID-19 protocols and engage in appropriate behavior to protect the health and safety of the community.