BIOE 385: Bioinstrumentation Laboratory

Fall 2022

Instructor

Dr. James Long
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BRC 765

Teaching Assistants

Monday	*Wednesday*	*Thursday*
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Office Hours

BRC 230: Wednesday and Thursday 4pm-5pm
Please email for appointments outside the above times.

Course Website

The course website, which includes all necessary documents, is hosted on Github. You may access it through this link or the following: bit.ly/bioe385_f22. Assignment submission and grading will be hosted on Canvas.

Course Description

In this laboratory course, you will learn to design, build, and test biomedical instrumentation using the NI ELVIS hardware system and LabView software. Students will work in teams to complete two design projects: an Optical Immunoassay system and an EMG/Reflex measurement device. Mastery of instrumentation principles and the below course objectives will be evaluated with pre/in-lab assignments, reports, project demos, and written/practical lab exams.

Course Objectives

By the end of the course, students will demonstrate the ability to:

1. Design, build, and troubleshoot electrical circuits to acquire engineering measurements.
2. Analyze and present acquired data in a user-friendly manner.
3. Solve open-ended engineering problems, taking resource constraints and design criteria into consideration.
4. Communicate and justify engineering decisions and designs in a written document.

Prerequisites

You must have successfully completed ELEC 243 and the associated lab course to complete this class. No exceptions.

Textbook

Paul Scherz, Practical Electronics for Inventors, 4th Ed., McGraw Hill, 2016.

This textbook is available for free online as follows:

1. If you are accessing from off-campus, log in to the Rice University VPN
2. Using OneSearch on the Fondren Library Website, search for "Practical Electronics for Engineers"
3. In the search results, click the link to McGraw Hill Access Engineering
4. Double-check that you are browsing the most recent edition (4th ed., pub. 2016)

Safety

Laboratory environments include inherent dangers and thus strict compliance to safety measures is important. All students are expected to work safely and to ask for assistance when uncertain. Absolutely no eating, drinking or gum chewing will be allowed at any place or time in the lab.

Attendance Policy

Students are required to attend ALL sessions of the laboratory. Exceptions for illness, family emergencies, or other excusable absences may be granted with instructor approval on a case-by-case basis. Any make-ups for valid absences must be done at the convenience of the instructor and your lab partner.

Grading Policy

Category	Submissions	Total Points	% Final Grade
Pre-Labs/In-Labs	In class	155	31%
Miscellaneous	In class	25	5%
Lab Reports	Canvas	120	24%
Project Demos	In class	100	20%
Exams	In class	100	20%

Penalties may be applied for the following violations:

- -5 points: Unsafe laboratory practices, leaving lab area messy, or not returning components correctly (per event)
- -50 points: Failure to return lab supplies at the end of the semester. A complete list of supplies can be found here.

For a full list of assignments and due dates, see here.

Late Policy

Pre-lab and In-lab assignments will not be accepted late without a valid excused absence. Late reports will be penalized 30% of the assignment value per day.

Regrade Policy

If you believe that an error was made in grading your assignments, you should write a short justification of your claim and attach it to the original homework assignment. You can bring the documents to class or to my office (BRC 765). Make sure to write your contact email so I can review your concern(s) and respond to you directly. The “statute of limitations” for submitting such claims is one week after the assignment was returned. I will respond to re-grading requests – but note that the entire report might be re-graded, not just the section in question, in order to ensure consistency and fairness.

Honor Code Policy

Collaboration between group members is expected for the completion of high quality lab reports. However, you may not consult the materials from previous years' BIOE 383 or 385 courses, including but not limited to: written reports, posters, data calculations, and code. Additionally, while you may discuss aspects of the lab projects and reports with other groups, your group's submitted work must reflect your individual efforts. In other words, you cannot submit another group's work as your own, and these materials may include but are not limited to: writing, graphs, code, and data calculations. You cannot collaborate on lab exams.

In simpler terms, only submit work that is your own. If you need clarification, please contact the instructor *prior to submission* to avoid an infraction. For a list of standard definitions as outlined by the Honor Council, please see this link.

Commitment to Equitable Learning

This class is committed to an equitable learning environment. Accommodations will be made for students with alternative needs, but it is critical that you alert the instructor in advance of any additional resources you need prior to assignment submission and lab exams. In particular, you must notify the instructor of any alternative testing needs *at least two weeks prior to an exam*. For additional resources and more information, please visit the Disability Resource Center and the Access and Opportunity portal.

Schedule

Please see the Rice University Academic Calendar for important administrative (add/drop/withdraw) dates.

Project 1: Optical Immunoassay System (OIA)

Project 2: EMG Reflex Measurement Device (EMG)

Week	Lab/Topic	Reading	Pre-Lab/Repor
1 (08/22)	OIA 1: Introduction to ELVIS	Electrical Safety	
2 (08/29)	OIA 2: Photodetector Circuits	LED Basics What is a Photodiode? Operational Amplifier Basics	Prelab 2 Due
3 (09/05)	Labor Day: No lab this week		
4 (09/12)	OIA 3: LabVIEW Interface		Prelab 3 Due
5 (09/19)	OIA 4: Finalize Projects		
6 (09/26)	OIA 5: **Project Demos**		**OIA Report Du**
7 (10/03)	OIA 6: Exam 1	c	
8 (10/10)	Midterm Recess: No lab this week		
9 (10/17)	EMG 1: Passive and Active Filters	Introduction to Filters 2.31, 7.1-7, 8.1-7, 9	
10 (10/24)	EMG 2: Reflex Hammer Circuit		Prelab 2 Due
11 (10/31)	EMG 3: Measurement Circuit		Prelab 3 Due
12 (11/07)	EMG 4: LabVIEW Interface		Prelab 4 Due **EMG Report Draft**
13 (11/14)	EMG 5: Finalize Projects		
14 (11/21)	Thanksgiving Recess: No lab this week		
15 (11/28)	EMG 6: **Project Demos**		**EMG Report Du**
Finals	EMG 7: Exam 2		