

**Lecture:** MW, 11:30-12:20, 1279 Anthony Hall

**Lab:** W 5:00-8:00, Th 11:30-2:30 or 3:00-6:00, EB 3230A

**Instructor:** Dr. Andrew Mason, EB 1217, [mason@egr.msu.edu](mailto:mason@egr.msu.edu)

**Office Hrs.:** Mon 10:30-11:30am or email for an appointment

**Lab TA:** Yuning Yang, [yangyuni@msu.edu](mailto:yangyuni@msu.edu), email for appointments

**Course Website:** <http://www.egr.msu.edu/classes/ece445/mason>

A significant amount of material for this class will be posted on the course website, including assignments, lab tutorials, and lecture notes. Please check regularly throughout the semester.

**Preferred Prerequisite:** ECE 302/303 or ECE 345

**Reference Text (not required –will post class notes):**

*J. Webster, Medical Instrumentation: Applications and Design, John Wiley & Sons, 1998. ISBN 0-471-15368-0*

### Course Description:

Fundamentals of biomedical measurements; sensor instrumentation electronics; biomedical devices; applications and case studies; hands-on experience with sensors, instrumentation electronics, and biomedical devices.

### Attendance and Conduct in Class:

Students are expected to attend and participate in class. Attendance will not be taken, but a portion of your grade will be based on participation, and you can't participate if you're not there! It is the student's responsibility to get notes and handouts for any missed class. For excused absences (illness, professional travel, etc.) please notify Dr. Mason ([mason@msu.edu](mailto:mason@msu.edu)) before class.

### Grading:

30% 2 Exams (15% each)  
10% Homework  
5% Participation  
25% Lab Assignments  
30% Project

Tentative dates for the exams are shown on the Course Schedule below. This course has a final project but no final exam. 3-4 homework assignments will be given between each exam, typically due a week after assigned.

### Other Policies:

- Cheating in any form will not be tolerated! This includes copying homework, copying labs, cheating on exams, or any other form of unethical behavior. Direct copying of homework will result in a zero-point score for all people involved.
- Laptops can be used in class to view/record class-related material, but please **no email, social media, or entertainment** during class time. Likewise, use of cellular phones or similar devices for communicating with friends, viewing entertainment media, etc. is **not allowed** during class lectures or labs.
- Homework must be turned in at the beginning of class on the due date. **No late homework will be accepted.**
- Lab check offs and reports must be completed by their due date. Extensions for extreme situations should be arranged with the instructor.
- Makeup exams will only be allowed for excused absences and only when the instructor is informed *before* the exam.

**Participation:**

Students will be given the opportunity to briefly present a new/neat biomedical device or system or news story to the class. Students will also be asked to judge the quality of other students' presentations. Details to follow.

**Lab Assignments:**

Students must complete several lab assignments covering physiological measurements and design and testing of instrumentation. Labs will typically include a **pre-lab portion, which must be completed before attending lab**, and an in-lab portion to be completed within the lab session. The lab will only be open during the designated lab section times when a TA will be available. Come prepared if you hope to complete the lab.

**Project**

Teams (nominally of 3 students) will choose a biomedical instrument/application to research, analyze and invent a product. Teams will study their selected topic, gain an understanding of the relevant technology and what companies are currently involved in that market. They will also research up and coming technology and make an analysis of existing and near-future solutions. Students will propose a new instrument to address a vacancy in the commercial market. Projects will be summarized into a written report and an illustrated presentation to be delivered to the class. Projects will be graded as follows:

50% Project Quality    25% Report    25% Presentation

**Planned Course Schedule:**

	Date	Lecture	Ch	HW	Lab
W	Aug 29	Welcome, Basic Concepts	1		
M	Sep 3	<i>Holiday -no class</i>			
W	Sep 5	Basic Concepts	1		
M	Sep 10	Basic Concepts	1	1	
W	Sep 12	Electrical Safety, Sensors	14, 2		
M	Sep 17	Sensors	2	2	
W	Sep 19	Sensors	2		Introduction
M	Sep 24	Amplifiers & Signal Processing		3	
W	Sep 26	<b>Exam 1</b>	3		LabView
M	Oct 1	Amplifiers & Signal Processing	3		
W	Oct 3	Biopotentials	4		DAQ
M	Oct 8	Biopotentials	4	4	
W	Oct 10	Bioelectrochemistry	5		Physiology I
M	Oct 15	SPICE		5	
W	Oct 17	Biopotential Amplifiers	6		Physiology II
M	Oct 22	Biomedical Measurements	7-9	6	
W	Oct 24	Introduction to projects, form teams			Instrumentation Circuits
M	Oct 29	Entrepreneurship			
W	Oct 31	Patents & IP			Instrumentation Circuits II
M	Nov 5	Biomedical Signal Processing		7	
W	Nov 7	BioMEMS			Filters
M	Nov 12	Lab on a Chip		8	
W	Nov 14	Brain Machine Interface			Matlab
M	Nov 19	<b>Exam 2</b>			
W	Nov 21	Technical Writing & Presentations			Project
M	Nov 26	Oral presentation skills (video)			
W	Nov 28	Wrap-up			Project
M	Dec 3	Presentations			
W	Dec 5	Presentations			
W	Dec 12	(10am-12pm) Presentations and Project Reports			