

## BE491 Fall 2016 COURSE OVERVIEW

**Lecture: Monday's at 2:30pm – 3:20pm, SAR 101**

**Lab: ERA209**

### *Instructors*

**Professor Darren Roblyer** Labs B3

44 Cummington Mall, Room 231

Email: [roblyer@bu.edu](mailto:roblyer@bu.edu)

Office hours: Make appointments via email

**Professor Herbert Voigt** Labs B2, B5, B6

44 Cummington Mall, Room 414C

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### *Graduate Teaching Assistants*

Mitch Clough Lab B3 - Monday

Email: [maclough@bu.edu](mailto:maclough@bu.edu)

Uros Kuzmanovic Lab B2 - Tuesday

Email: [ukuzma2@bu.edu](mailto:ukuzma2@bu.edu)

Chenguang Peng Lab B5 - Wednesday

Email: [pcg11@bu.edu](mailto:pcg11@bu.edu)

Jiarui Yang Lab B6 - Thursday

Email: [jryang@bu.edu](mailto:jryang@bu.edu)

### *Lab Sections:*

Note: There are **A** and **B** subsections for each of the sections listed below, please consult the BE491 schedule document for more details

B3: Monday 6:30pm – 9:15pm

B2: Tuesday 8:00am - 10:45am

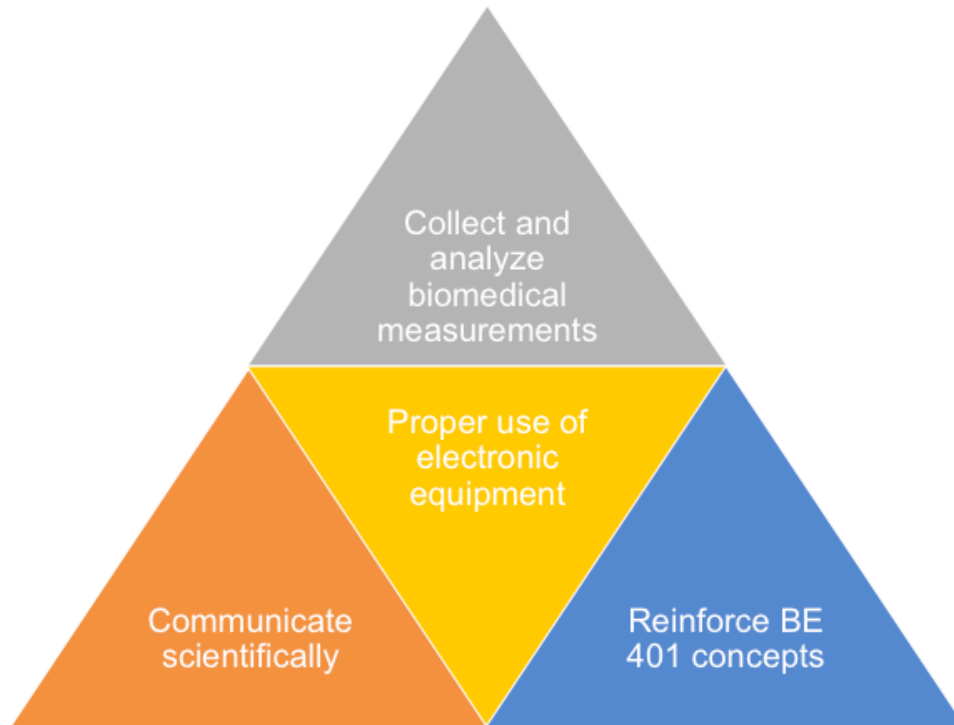
B5: Wednesday 6:30pm - 9:15pm

B6: Thursday 8:00am - 10:45pm

***COURSE OBJECTIVE***

BE491 is designed to accomplish four goals, shown below in the pyramid.

## BE491 Learning Objectives

***TEXTBOOKS***

*None required*

***GRADING***

Grades will be based on composite performance as follows (subject to change during the semester):

Lab Worksheets (2)	20% (10% each)
Lab Reports (2)	40% (20% each)
Project Oral Presentation	20%
Project Report	20%
Midterm Exam	Pass/Fail (must pass to pass course)

## ***LAB WORKSPACE***

Please keep the lab workspace clean and put back all equipment when you are done. You may have points removed if you leave a messy workspace.

## ***LAB WORKSHEETS***

There will be one worksheet per group, put your names on the top of the page. Answer the questions in lab manual (worksheet) and turn in the lab exercises to your GTF at the end of lab. Only questions outlined in a box will be graded. For some labs, you may need to have a GTF or professor sign off on your worksheet before you leave lab. **Worksheets are due at the end of your lab session.** If late, the score will be reduced by 25% of the total possible score for every 24 hour period.

## ***LAB REPORTS***

Lab Reports are required for two labs (Labs #2 and #4), you will be provided a due date the week of the lab. If late, the score will be reduced by 25% of the total possible score for every 24 hour period. The report must be submitted in paper form in the submission box in the lab ERA209. Each group must submit a report of their own crafting.

**No raw data, processed data, figures, tables, or any other component of the lab may be shared between lab groups unless the instructor has given explicit and specific permission.**

**Plagiarism in any form will not be tolerated!** The report will be assigned a zero grade and the College of Engineering Academic Conduct Committee will be notified!

## ***MIDTERM***

The Midterm Exam takes place during scheduled lab time and tests student mastery of skills, such as setting up equipment, taking measurements, and analyzing data. Students must perform satisfactorily on the midterm in order to pass the course.

## ***RESEARCH PROJECT***

The purpose of the project is to allow groups to explore a biomedical measurement technique or method we didn't cover in class, explore new ways of using the techniques we did use in class, and to improve data analysis and presentation skills.

Research projects must contain data collected with equipment that belongs to the student (i.e., fitness monitor if you can access the raw data) or the BE491 lab (EKG, EOG, galvanic skin sensor, pulse oximeter, etc.). You may conduct a study with one of the techniques we covered in class (e.g. how does listening to different kinds of music effect an EKG measurement?), use a biological technique we didn't cover in class (several will be made available), or make and test your own bioinstrument (e.g. a Biopotential Mouse Cursor).

The project should involve teams of 4-5 students from the same lab section, and each team in the class must work on independent projects. The research topic may be inspired by the team or selected from the list below.

After identifying a project, a one-paragraph research proposal must be presented to your GTF/Prof at a TBD date. The proposal must include the title, hypothesis, aims, planned experiments, and rationale of the project. The GTF's and professor will help you shape your plan to make sure it is the correct scope for the class. During the open lab weeks (see schedule), equipment and GTF support will be available to assist you.

Each team must make an oral presentation on their project and submit a single full report at the end of the semester.

Example Project Ideas:

1. Design a sensor to measure muscle tremor. Do stimulants like caffeine increase tremor?
2. Design an electrode to pick up evoked auditory potentials. Can you measure ear function?
3. Design an electrode to pick up evoked visual potentials. Can you measure eye function?
4. Design a visual hearing aid. Can your eyes learn to hear?
5. Design an EOG-based control system. Can you move a computer cursor with your eyes?
6. Design a respiratory monitor. Can you quantify respiratory rate variability?
7. Design an event detection system. Can you count heart beats in real time?
8. Design a compression algorithm for ECG waveforms. Is time or temporal frequency more efficient for storage?
9. Design a voice recognition algorithm. Can it distinguish amongst lab mates?
10. Investigate drying blood splatter like a crime scene investigator. Can you determine the time of application from spectrometer readings? (use bovine blood, not your own)
11. Investigate limb kinematics. How well can speed and accuracy be maintained?
12. Investigate body sway. Are short people more stable than tall people?
13. Investigate the galvanic skin response. Can you build a lie detector?
14. Investigate muscle contraction. Can you specify a transfer function for finger motion?
15. Investigate heart sounds. Can you design an electronic stethoscope that "hears the beat"?
16. Investigate eye movements. Can you design a system that identifies different sleep stages?
17. Investigate visual thresholds. Does peripheral motion affect your ability to see?
18. Investigate tactile thresholds. Does sensitivity change when you are warm or cold?
19. Investigate auditory thresholds. Can you hear better at night or during the day?
20. Investigate binaural hearing. Is there a "sweet spot" for audition?
21. Investigate sensory perception. Does Red Bull give you "Spidey senses"?