BME/ECE 386: Biomedical Instrumentation

Winter 2020
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- **Website**: http://minerva.union.edu/bumat
  - The course website contains lecture notes ("Before" and "After"), homeworks (assignments, due dates, solutions), homework solutions, last year's exams + solutions, lab assignments, and datasheets for electronic components. When in doubt about any aspect of the course, first check the website!

- **Textbook**: None (lecture notes and supplemental material on the course website should be sufficient).

- **Homework**: There will be 5 problem sets, 2 exam "re-dos", a team presentation, and 1 ethics paper. Assignments and due dates are posted on the course website.
  - You are allowed to work together, but YOU MUST TURN IN YOUR OWN WORK.
  - **Assignments turned in more than six days after the assigned date will receive a zero**. Of course, these rules will be waived for good reason (such as illness, family emergency, conference travel, athletic tournament, etc.).
  - **Exam "re-do" assignments** are basically test corrections. This is your opportunity to work on the exam problems without time pressure, which can make a big difference!
  - **Team Presentations**: Teams of two or three students give a 20 minute PowerPoint presentation on a topic of their choice (details will be provided later).
  - **Ethics paper**: Each student writes a short paper (4 pages or so) describing their "case study" of a medical device recall (details will be provided later).

- **Labs**: There will be six labs and one lab practical exam.
  - Each lab (100 pts each) involves three parts: PreLab (30 pts) + Lab session (40 pts) + Report (30 pts).
    - **Prelabs are due by the end of the lab session**. You may work together, BUT YOU MUST TURN IN YOUR OWN WORK.
    - The lab session requires each student to build and test his/her own circuit. You are encouraged to work together, BUT YOU MUST DEMO YOUR OWN WORK.
    - **Each student must submit a short lab report** (see course website for report template).
  - The lab practical exam (100 pts) tests your proficiency in hardware and software.

- **Quizzes**: There will be six quizzes.
  - Each quiz will cover material from the most recently completed prelab/homework.
  - On a quiz day, the quiz will take place during the first 30 minutes of class.

- **Grading**: The final grade for the course will be calculated as follows:

Homeworks	10%	(5 problem sets, 2 exam "re-dos", 1 team presentation, 1 ethics paper)
Labs	20%	(6 labs + 1 lab practical)
Quizzes	10%	(5 quizzes)
Exam 1	17.5%	(Curved)
Exam 2	17.5%	(Curved)
Final	25%	(Cumulative)

The final course grade will follow the schedule shown below. The instructor reserves the right to lower these standards, but he will not raise them.

A	93-100	B	83-86	C	73-76		
A-	90-92	B-	80-82	C-	70-72		
B+	87-89	C+	77-79	D	60-69	F	<60

- **Course Topics:**

Strain gauge (theory, bridge, diff amp)
Load cells
Lab 1: Load Cell Measurement System

Temperature (thermistor)
Temperature (thermocouple, IR thermometry)
Lab 2: Temperature

ECG (Physiology)
ECG (instrumentation)
Lab 3a: ECG
Instrumentation amplifier
ECG electrodes
Lab 3b: Wrap up ECG (if necessary)

EXAM 1 (Strain, Temperature, ECG)

EMG, EEG
Lab 4: Optical Heart Rate Monitor
Blood pressure (non-invasive)
Blood pressure (invasive)

Lab 5: Blood pressure
Respiration (physiology)
Respiration (instrumentation)

Lab 6: Spirometer
Electrical Safety
Medical Device Regulation

Field trip to Ellis Hospital
EXAM 2 (Heart rate monitor, blood pressure, respiration)

Medical imaging
Student presentations
Lab Practical Exam

FINAL EXAM