BME 372 – Biomedical Electronics I

3 Credits
3 Contact hours
Instructor: Joel Schesser, Ph.D.

Textbook(s)/Materials Required:

Electronics, 2nd Edition, Hambley

Description:

The first of a two-semester sequence. It covers the design of electronic circuits for Biomedical applications. This course covers basic operational amplifier circuits as well as the operation of semiconductor diodes and transistors. An introduction to digital logic circuits is also provided. Hands-on breadboarding of electronic circuits are used throughout the course to supplement the lectures.

Prerequisites by topic: BME 301

Objectives:

1. **Fundamental Electronics:** Understand the fundamental principles electronics**.** In particular, gain knowledge in circuit analysis, amplifiers, operational amplifiers, diodes and transistors. Apply knowledge of engineering and science to identify, formulate, and solve problems in these areas.
2. **Data Interpretation:** Learn to design, test, and analyze electronic circuits using oscilloscopes and other electronics test equipment. Apply knowledge of engineering and science to interpret data. Develop an understanding of and develop the skills necessary to communicate findings and interpretations in an effective laboratory report.
3. **Electronic circuits for Biomedical Applications:** Apply knowledge of engineering and science to understand the principle of biomedical electronic circuits. Understand how to apply, measure circuit performance, and solve problems in the areas of biomedical signals.

4. **Work in Multi-disciplinary teams:** Learn to work and communicate effectively with peers on multi-disciplinary teams to attain a common goal.

Student Learning Outcomes:

BME 372 Course Learning Outcome (CLO) is – Apply foundations of math, science, engineering.
ABET Student Outcome 1 - an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
Related CLO – 1

BME 372 Course Learning Outcome (CLO) is – Ability to design and conduct experiments, as well as to analyze and interpret data
ABET Student Outcome 6 - an ability to develop and conduct appropriate experimentation, analyze and interpret data, and **use engineering judgment to draw conclusions**
Related CLO – 2

BME 372 Course Learning Outcome (CLO) is – ability to function on multidisciplinary teams
ABET Student Outcome 5 - an ability to function effectively on a team whose memberstogether provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
Related CLO – 4

BME 372 Course Learning Outcome (CLO) is – ability to identify, formulate and solve engineering problems
ABET Student Outcome 1 - an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
Related CLO – 3

BME 372 Course Learning Outcome (CLO) is – ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
ABET Student Outcome 1 - an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
Related CLO – 3

Program Specific Criteria:

C - the capability to apply advanced science and engineering to solve the problems at the interface of engineering and biology
Related CLO – 3

Topics:

1. Basic Circuit Analysis: Passive and active components, Independent and dependent voltage and current sources, Kirchkoff's voltage and current laws, Voltage and current division, Mesh and Nodal Analysis, Superposition, and Thevenin's and Norton's equivalent circuits
2. Electronic Systems and Amplifiers
3. Ideal Amplifiers
4. Operational Amplifiers
5. Medical Instrumentation Amplifiers
6. Feedback
7. Diodes and Ideal Diodes
8. Bipolar Junction Transistors and BJT amplifiers
9. Laboratory experiments: Operation of an oscilloscope, Operation of a multi-meter, Measurement of circuit parameters, and Design of a BJT amplifier

Professional Component:

Biomedical Engineering Track Topics in Bioinstrumentation