



King Saud University
College of Applied Medical Sciences
Biomedical Technology Department

BMT212: BIOMEDICAL ELECTRONICS II 4 (3-1-0)

Current Instructor: Dr. Mohamed Souheil Alabed
Course Coordinator: Dr. Mohamed Souheil Alabed
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Textbook(s) and/or Other Required Materials: Robert L. Boylestad, "Electronic Devices and Circuit Theory", 9th Edition, Printice Hall, 2007

Extra references: Schaum's Outline of Electronic Devices and Circuits, Second Edition by Jimmie J. Cathey, Publisher: McGraw-Hill | 2 edition (June 5, 2002).

Course Description (catalog): This is a required course for students of fourth level at BMT. The objective of this course is to introduce students to the basic physics and operation of semiconductor devices as well as some simple applications. Students will gain good background for more advanced courses. By the end of the course the student will be able to analyze and design the basic diode, BJT and JFET circuits.

Prerequisites: BMT211

Co-requisite: None

Course Type: Mandatory

Course Learning Outcomes: This course is intended to provide basic knowledge and understanding of basic electronic semiconductor devices.

- The student should develop the ability to solve problems on basic electronic circuits.
- The student should develop the ability to design simple electronic circuits (ex. BJT, JFET, MOSFET amplifiers).
- The student should develop the ability to analyze electronic systems using acquired basics.
- This course is aligned with the laboratory work, which is typically taken in the same semester.

Student Outcomes Covered by Course:

a. an ability to select and apply the knowledge, techniques, skills, and modern tools of biomedical technology to include the application of circuit analysis, analog and digital electronics, microcomputers, biomechanics, biomedical instrumentation systems, and safety in the building, testing, operation, and maintenance of biomedical equipment.

Students will demonstrate an understanding of basic semiconductor theory, including the concepts of resistivity, conductivity, intrinsic semiconductor, doping, majority and minority carriers, energy band diagram, drift and diffusion, . Students will demonstrate an understanding of the internal semiconductor characteristics of diodes and BJT/MOSFET transistors, Students can apply electric network theory to semiconductor circuits: diodes, transistors, amplifiers and diode logic gates

b. an ability to select and apply a knowledge of mathematics, chemistry, physics, and biological

sciences, engineering, and technology to building, testing, operation, and maintenance of biomedical equipment and the ability to utilize statistics/probability, transform methods, discrete mathematics, or applied differential equations in support of biomedical systems.

Students can apply knowledge of electric network theory to semiconductor circuits: diodes, transistors, amplifiers and diode logic gates. The student will be able to use principles of maintenance and troubleshooting of semiconductor devices in biomedical systems.

c. an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes.

In laboratory, students develop capabilities in both hand assembling basic diode, BJT and JFET circuits as well as using computer to simulate and explore the behavior of semiconductor circuits.

d. an ability to analyze, design, and implement biomedical systems, components or processes for broadly-defined engineering technology problems appropriate to program educational objectives. Student will demonstrate a basic understanding of the application of the transistor (BJT & MOSFET) as an amplifier or switch and design simple BJT & MOSFET circuits.

e. an ability to function effectively as a member or leader on a technical team.

f. an ability to identify, analyze, and solve broadly-defined biomedical technology problems.

g. an ability to apply written, oral, and graphical communication in both technical and nontechnical environments; and an ability to identify and use appropriate technical literature.

h. an understanding of the need for and an ability to engage in self-directed continuing professional development.

i. an understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity.

j. a knowledge of the impact of engineering technology solutions in a societal and global context and an understanding of the clinical application of biomedical equipment.

k. a commitment to quality, timeliness, and continuous improvement.

Major Topics covered and schedule in weeks:

1. Semiconductor Diodes, Diode applications
2. Bipolar Junction Transistor, DC Biasing BJT, BJT Transistor Modeling, BJT small signal analysis,
3. Field- Effect Transistor, FET Biasing, FET small signal analysis,
4. System approach, effects of source and load resistors,
5. BJT and JFET frequency-response,
6. Power supplies and voltage regulators.