Course: Electronics for Mechatronics - 0908222 (3 Cr. – Core Course)
Instructor: Dr. Hussam Khasawneh
Office: Water, Energy and Environment Center
Office Hours: Mon-Thu 1:00 PM – 3:00 PM
Email: h.khasawneh@gmail.com
Course Website: elearning.ju.edu.jo

Catalog Data: Solid state theory, semiconductors, PN junctions; basic diode circuits. Basic power supplies. Half wave and full wave basic rectifier circuits. Bipolar Junction transistor, types of BJTs, BJT transistor biasing. MOS Field Effect Transistors; N-type and P-type MOSFETs, biasing. Current Voltage characteristics and CMOS technology. Operational amplifiers and applications; Ideal Op Amp and different Op Amp configurations. Modern Applications of semiconductors devices: State of the art semiconductors applications

Prerequisites by Course: Electrical Circuits I (0903211).

Prerequisites by Topic: Students are assumed to have sufficient knowledge pertaining to the following:
1. Basic electrical elements.
2. Electrical circuit’s analysis.
3. Frequency domain and frequency response.
4. AC and DC power sources.


Schedule & Duration: 16 Weeks, 45 lectures (50 minutes each) plus exams

Minimum Student Material: Text book, class handouts and class notes.

Minimum College Facilities: Classroom with whiteboard and projection display facilities, library.

Course Objectives: The overall course objective is to introduce the student to semiconductor devices, specifically circuit analysis, design, and applications of:
1. Diodes circuits.
2. BJT basic structure and operation, DC biasing, small-signal circuit model, and possible amplifier configurations.
3. FET types, basic structure and operation, DC biasing, small-signal circuit model, and possible amplifier configurations.
5. Modern and state of the art semiconductors applications.
Course Learning Outcomes and Relation to ABET Student Outcomes:

Upon successful completion of this course, a student should:

1. Describe semiconductor materials, types and properties. (a)
2. Describe the operation of diodes, BJTs, FETs. (a)
3. Explain the concepts of small- and large-signal analyses. (a)
4. Analyze and design basic amplifier configurations. (a, e)
5. Analyze and design various Op-amp configurations. (a, e)

Mapping to Student Outcomes

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<th>ABET SO</th>
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Course Topics:

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<tr>
<th>Topic Description</th>
<th>Hrs</th>
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<tr>
<td>Introduction to semiconductor devices: introduction to semiconductor materials. To know the difference between intrinsic and extrinsic semiconductors. To study the PN junction and the PN junction diode and its characteristics.</td>
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<td>PN junction diode applications: study and design half wave and full wave rectifiers, bridges, filters, zener diodes, clipper and clamper circuits.</td>
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<td>Bipolar Junction Transistor (BJT): define the BJT and its mode of operations and to understand basing and small signal model.</td>
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<td>Field Effect Transistor (FET): to understand FETs and the different types of FETs, and to analyse different circuits containing FETs and MOSFETs.</td>
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<td>BJT amplifiers: to understand the analysis and design of BJT single-stage amplifiers.</td>
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<td>FET amplifiers: to understand the analysis and design of FET single-stage amplifiers.</td>
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<td>Operational Amplifiers: to understand the analysis and design Op-Amps circuits.</td>
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Ground Rules:

• Attendance: Students are expected to attend EVERY CLASS SESSION and they are responsible for all material, announcements, schedule changes, etc., discussed in class. The university policy regarding the attendance will be strictly adhered to.

• Make up Examinations: There will be no make up exams for any exam and quiz that will be taken during the course. Exceptions to this rule are restricted only to the following cases:
  1. Death of only first order relatives (father, mother, sister, or brother).
  2. Hospital entry (in-patient) during the time of the examination.
Any other cases will be given the zero mark in the corresponding exam.

• Special Notes
  1. Seating plan will be as given in the attendance sheet.
  2. Students’ creativity is welcomed and will receive additional marks

Assessments:

Exams.

Grading Structure:

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Last updated: Feb. 2017