



University of Nicosia, Cyprus

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| <b>Course Code</b><br>ECE-210                   | <b>Course Title</b><br>Electronics I    | <b>ECTS Credits</b><br>6                      |
| <b>Department</b><br>Engineering                | <b>Semester</b><br>Fall, Spring         | <b>Prerequisites</b><br>ECE-100               |
| <b>Type of Course</b><br>Required               | <b>Field</b><br>Engineering             | <b>Language of Instruction</b><br>English     |
| <b>Level of Course</b><br>1 <sup>st</sup> Cycle | <b>Year of Study</b><br>1 <sup>st</sup> | <b>Lecturer(s)</b><br>Dr Anastasis Polycarpou |
| <b>Mode of Delivery</b><br>Face-to-face         | <b>Work Placement</b><br>N/A            | <b>Co-requisites</b><br>None                  |

**Objectives of the Course:**

The main objectives of the course are to:

- Provide students with a basic background on semiconductor materials and semiconductor physics.
- Introduce the characteristics and operation of electronic devices such as p-n junctions, bipolar-junction transistors and field-effect transistors.
- To analyze and design electronic circuits involving diodes, BJT, JFET and MOSFET.
- Apply electronic circuits for common devices such as rectifiers, power supplies, stabilizers, logic gates and others.
- Develop skills for troubleshooting and simulating electronic circuits.

**Learning Outcomes:**

After completion of the course students are expected to:

- Comprehend basic semiconductor theory.
- Explain the I-V characteristics of a diode, its regions of operation, obtain the bias point.
- Solve problems on large and small signal diode circuits by making sensible decisions on which models to use.
- Draw and analyze diode applications circuits such as rectifiers, regulators, power supplies, limiter circuits.
- Explain the basic operation, input/output characteristics and regions of operation of the BJT (npn and pnp) in the common-base, common-emitter and common-collector configurations.
- Perform dc analysis (algebraically and graphically using current-voltage curves with superimposed load lines) and design of CB, CE and CC transistor circuits.
- Describe the operation and structure of field effect transistors (JFET/MOSFET) and perform dc circuit analysis.

- Apply circuit-analysis software to analyze the dc and small-signal operation of fundamental electronic circuits.

**Course Contents:**

- Basic semiconductor concepts: crystal structure, energy bands, electron and hole carrier current, p- and n-type semiconductors
- Semiconductor diode construction, diffusion and drift currents, barrier potential, forward and reverse biased p-n junctions, breakdown
- Ideal and real diodes, I-V curves, diode current equations, models, ac and dc resistance, temperature effects, power dissipation, zener diode, breakdown, ratings and specifications
- Analysis of dc diode circuits, dc load line, bias point, analysis of small-signal diode circuits, half and full wave rectifiers, capacitive filtering, switching and wave-shaping circuits, zener regulator analysis and design
- Bipolar junction transistor types and structure, regions of operation, common base, common emitter, and common collector input/output characteristics, bias circuit analysis and design, dc load lines, algebraic and graphical quiescent point determination, BJT as a switch
- JFET and MOSFET (enhancement type) transistor construction and operation, characteristic curves, bias circuit analysis, JFET current source, JFET as an analog switch

**Learning Activities and Teaching Methods:**

Lectures, in-class examples and exercises.

**Assessment Methods:**

Homework, exams, final exam.

**Required Textbooks/Reading:**

| Authors                             | Title                                    | Publisher            | Year | ISBN       |
|-------------------------------------|--|----------------------|------|------------|
| Robert Boylestad<br>Louis Nashelsky | Electronic Devices and<br>Circuit Theory | Pearson<br>Education | 2009 | 0136064639 |

**Recommended Textbooks/Reading:**

| Authors  | Title                              | Publisher        | Year | ISBN       |
|--|------------------------------------|------------------|------|------------|
| Theodore F. Bogart<br>Jeffrey S. Beasley<br>Guillermo Rico | Electronic Devices and<br>Circuits | Prentice<br>Hall | 2004 | 0131111426 |