



## Course Syllabus

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

### Course Objectives:

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;
- Explain the analysis and design of electronic circuits that involve diodes, BJTs, JFETs and MOSFETs;
- Investigate the operation of fundamental electronic circuits such as rectifiers, clippers, voltage regulators, basic logic gates, amplifiers, buffers, and others;
- Develop skills for analysing, troubleshooting and simulating electronic circuits.

### Learning Outcomes:

After completion of the course students are expected to be able to:

- Explain basic semiconductor concepts and theory behind the operation of p-n junctions and transistors;
- Plot the I-V characteristics of a diode, identify its regions of operation, and obtain the quiescent point;
- Solve problems based on large- and small-signal diode circuits by making sensible decisions on which models to use;
- Analyze and design diode applications circuits such as rectifiers, voltage regulators, clippers, clampers, basic logic gates;

- 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;
- Perform small-signal analysis of BJT transistor networks;
- Describe the operation and structure of field effect transistors (JFET/MOSFET) and perform dc analysis for different circuit configurations;
- Apply circuit-analysis software to analyze the dc and small-signal operation of fundamental electronic circuits.

### Course Content:

- 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, equivalent 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, clippers, clampers, 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;
- Small-signal AC analysis of BJT circuits, transistor models, CE and CB configurations, voltage and current gains, input and output impedances, effect of load impedance on gain;
- FET and MOSFET transistor construction and operation, types, and transfer characteristic curves;
- FET biasing: fixed-bias configuration, voltage-divider biasing.

### Learning Activities and Teaching Methods:

Lectures, in-class examples and exercises.

### Assessment Methods:

Homework, exams, final exam.

**Required Textbooks / Readings:**

<b>Title</b>	<b>Author(s)</b>	<b>Publisher</b>	<b>Year</b>	<b>ISBN</b>
Electronic Devices and Circuit Theory	Robert Boylestad, Louis Nashelsky	Pearson Education	2012	978- 0132622264

**Recommended Textbooks / Readings:**

<b>Title</b>	<b>Author(s)</b>	<b>Publisher</b>	<b>Year</b>	<b>ISBN</b>
Electronic Devices and Circuits	Theodore F. Bogart, Jeffrey S. Beasley, Guillermo Rico	Pearson Education	2003	978- 0131111424