UNIVERSITY of NICOSIA

Course Syllabus

Course Code	Course Title	ECTS Credits
ECE-210	Electronics I	6
Prerequisites	**Department**	**Semester**
ECE-100 or MENG-100	Engineering	Fall, Spring
Type of Course	**Field**	**Language of Instruction**
Required	Engineering	English
Level of Course	**Lecturer(s)**	**Year of Study**
1st Cycle	Prof. Anastasis Polycarpou	1st
Mode of Delivery	**Work Placement**	**Corequisites**
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:

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

Recommended Textbooks / Readings:

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