UNIVERSITY of NICOSIA

Course Syllabus

Course Code	Course Title	ECTS Credits
ECE-310	Digital Integrated Circuits	6
Prerequisites	**Department**	**Semester**
ECE-110, ECE-212	Engineering	Fall
Type of Course	**Field**	**Language of Instruction**
Required	Engineering	English
Level of Course	**Lecturer(s)**	**Year of Study**
1st Cycle	Dr Stelios Neophytou	3rd
Mode of Delivery	**Work Placement**	**Corequisites**
Face-to-face	N/A	None

Course Objectives:

The main objectives of the course are to:

- Offer extensive knowledge and a broad foundation on the operation and design of digital integrated circuits
- Explain the DC and transient behaviour of a broad family of digital integrated circuits
- Provide the knowledge and tools needed for the analysis and design of digital integrated circuits
- Provide understanding of the major differences among the various families and designs of digital integrated circuits
- Introduce students to relevant software for modelling and analysis of digital integrated circuits
- Demonstrate the operation and design of basic digital blocks

Learning Outcomes:

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

- Explain the fabrication process and details of the internal operation of the various known families in digital integrated circuits
- Analyze a digital integrated circuit in terms of its Voltage Transfer Characteristic (VTC), Power Dissipation, maximum Fan-out, noise margins, transient characteristics, and power delay product
- Use commercial software for the analysis and design of digital integrated circuits
- Discuss the pros and the cons of the various families of digital integrated circuits including RTL, DTL, TTL, STTL, ECL, MOS, NMOS, CMOS
- Design basic logic gates using different types of technologies such as those based on BJT, Schottky-clamped BJT, MOS, NMOS, and CMOS transistors
- Evaluate the performance of digital integrated circuits and classify them according to their performance characteristics

Course Content:

- Properties, definitions and performance characteristics of digital integrated circuits
- Introduction to diodes and bipolar junction transistors
- Bipolar digital integrated circuits, Resistor-Transistor Logic (RTL), other logic gates, RTL fan-out, power dissipations, fan-out, etc
- Basic Diode-Transistor Logic (DTL) inverter, modified DTL, DTL NAND, fan-out, power dissipation, etc
- Basic Transistor-Transistor Logic (TTL) inverter, TTL NAND, multiple emitter BJT, standard TTL NAND gate, voltage transfer characteristic (VTC), power dissipation, fan-out, other TTL gates, transient analysis
- Schottky-clamped TTL (STTL), Low-Power STTL (LSTTL), Advance STTL (ASTTL), VTC, fan-out, power dissipation, transient analysis
- Emitter-Coupled Logic (ECL), NOR/OR gate using ECL technology, MECL NOR/OR gate, VTC, power dissipation, fan-out, transient analysis
- Metal Oxide Semiconductor Field Effect Transistor (MOSFET), N-Channel MOS (NMOS), PMOS, modes of operation, threshold voltage, capacitances
- MOS digital circuits, NMOS inverter, resistor-loaded NMOS invertir, saturated enhancement-only loaded NMOS inverter, fan-out, power dissipation, etc
- CMOS technology, operation of CMOS inverter, fan-out, power dissipation, VTC, capacitances

Learning Activities and Teaching Methods:

Lectures, in-class assignments, homework assignments, project.

Assessment Methods:

Homework, computer assignments, projects, exams, final exam.

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Thomas A. DeMassa and Zack Ciccone	Digital Integrated Circuits	John Wiley and Sons	2008	0471108057

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
John E. Ayers	Digital Integrated Circuits: Analysis and Design	CRC	2003	084931951X