Course unit title:	Digital Logic
Course unit code:	CSC213
Type of course unit: **(Compulsory/optional)**	Compulsory
Level of course unit: **(First, second or third cycle)**	Bachelor (1st cycle)
Year of study:	2
Semester when the unit is delivered:	3
Number of ECTS credits allocated:	5
Name of lecturer(s):	TBA

Learning outcomes of the course unit:

Upon succesful completion of this course students should be able to:

- Describe the concepts of binary numbers and binary logic
- Describe theorems and axioms of Boolean Algebra, and apply them in practical circuit design problems
- Analyze, design and implement digital combinational and sequential circuits
- Design and implement register and counter circuits
- Explain the concept of memory in digital systems, and design basic memory modules

Mode of delivery:	Face- to- face
Prerequisites and co-requisites:	CSC120
Recommended optional program components:	None

Course Contents:
Objective:

To provide a solid foundation in Boolean algebra, Boolean functions, truth tables, Karnaugh maps, prime implicants, minimization of combinational circuits and design and analysis of sequential circuits (i.e. registers, counters, memory).

Description:

Introduction:
Digital Computers and Digital Systems, Binary numbers; Binary Storage and registers, Binary logic, Definition of Binary logic, Switching circuits and Binary systems, logic gates.

Boolean Algebra:
Basic Definitions - Closure, Associative law, Cumulative law, Identity element, Inverse and Distributive law. Axiomatic Definition of Boolean algebra, Two-valued Boolean Algebra Basic Theorems and Properties of Boolean Algebra: Duality, Basic theorem, Operator Procedure. Boolean Functions, Truth tables, Algebraic Manipulation; Complement of a Function, Canonical and standard Forms. Midterms and maxterms, Sum of Midterms. Product of Maxterms. Conversion between Canonical forms, Standard forms, sum of products, product of sums. The AND, OR, NAND, NOR, exclusive-OR, equivalence inhibition, and implication, Extension to Multiple inputs. Positive and Negative Logic.

Specification of Boolean Functions:
The Map method, Two and Three-Variable Maps. Representation of functions in the Map, simplifying Boolean functions.

Four-variable Map, Product of Sums simplification, NAND and NOR Implementation. Other two-Level Implementation such as AND-OR-INVERT and OR-AND-INVERT. Don't care Conditions using the Map method. Determination of Prime-Implicants. Selection of Prime-Implicants.

Combinational Logic:
Design Procedures, adders, half-adder, full adder, substructures, half-subtracter, full-subtracter, code Conversion, Multilevel NAND circuits, Boolean functions. Implementation-Block diagram method. Derivation of Boolean function by Algebraic manipulation, Derivation of the truth table. Block Diagram Transformation. Multilevel NOR circuits, Exclusive-OR and EQUIVALENCE functions.

Synchronous Sequential Logic:
Flip-Flops, Basic Flip-Flop Circuit, Clocked RS Flip-Flop, D Flip-Flop, JK Flip-Flop. Triggering of Flip-Flops, Master-slave flip-flop, Analysis of Clocked Sequential Circuits, State Table, State Diagram, State Equations, State Equations for flip-flops, Flip-Flop Input functions, State Reduction and Assignment, Reducing the State table. Flip-Flop Excitation table for RS-flip-flop, Flip-Flop Excitation table for JK-flip-flop. Flip-Flop Excitation table for D-flip-flop and other Flip-Flops. Design procedure, Design with Unused States, Design of Counters, Design with state equations.

Registers, Counters and Memory Unit BCD Ripple Counter, Synchronous Counters, Memory Registers.

Recent developments and contemporary issues pertaining to the subject-matter of the course.

Recommended or required reading:	Morris Mano, DIGITAL DESIGN, Prentice Hall Victor P. Nelson, et al.. DIGITAL LOGIC CIRCUIT ANALYSIS AND DESIGN, Prentice Hall

	Brown and Vranesic, FUNDAMENTALS OF DIGITAL LOGIC WITH VHDL DESIGN, McGraw Hill Morris Mano, DIGITAL LOGIC AND COMPUTER DESIGN Prentice Hall Holdsworth, B.,DIGITAL LOGIC DESIGN, Butteworth & Co.
Planned learning activities and teaching methods:	Class Instruction 42 Hours Consultation 15 Hours
Assessment methods and criteria:	Examinations 80% Assignments/ Class Participation 20% 100%
Language of instruction:	English
Work placement(s):	No
Place of Teaching:	Theoretical Part: Regular Classroom European University Cyprus, Nicosia Practical Part: Computer Laboratory European University Cyprus, Nicosia