American University of Sharjah | College of Engineering

### 1. Course Number and Course Title:

COE 221 – Digital Systems

2. Credit Hours:

3-3-4

### 3. Prerequisites and/or Co-Requisites:

Prerequisite: PHY 102 & PHY102L (General Physics II & Lab) or CMP 120 (Programming I)

### 4. Name and Contact Information of Instructor:

Dr. Fadi Aloul

### 5. Course Description (Catalog Description):

Covers number systems, representation of information, introduction to Boolean algebra, combinational circuits analysis and design, and sequential circuit analysis and design.

## 6. Textbook and other Supplemental Material:

Textbook:

• M. Mano and M. D. Ciletti, Digital Design 6th edition. Prentice Hall, 2018.

Supplemental material:

• None.

## 7. Course Learning Outcomes:

Upon completion of the course, students will be able to:

- 1. Convert decimal numbers to/from binary, octal, hexadecimal and carry out simple and signed arithmetic operations in these base systems.
- 2. Manipulate logic expressions using the theorems of Boolean Algebra and synthesize simple logic circuits using basic logic gates like AND, OR, NAND and NOR.
- 3. Minimize Boolean functions with 3, 4 variables using Karnaugh maps.
- 4. Use basic MSI components such as encoders, multiplexers and decoders in designing reasonably sized digital circuits.
- 5. Understand functional and timing properties of different kinds of latches and flip flops.
- 6. Translate verbal description of a given sequential system to a circuit design following procedures for designing synchronous sequential circuits.
- 7. Design a sequential circuit starting from a state diagram, using flip-flops and basic MSI sequential components such as shift registers and counters.
- 8. Build and test simple digital circuits using SSI/MSI/LSI components on logic breadboards, and to use schematic captures to create and simulate simple circuits using the Multisim software tool.

## 8. Teaching and Learning Methodologies:

Methods include lectures, labs, homeworks, quizzes, exams and class discussions.

# 9. Course Topics and Schedule:

Торіс	Weeks
Binary numbers, base conversion and binary codes	Week 1
Binary numbers, base conversion and binary codes	Week 2
Boolean Algebra and Logic gates	Week 3
Boolean Algebra and Logic gates	Week 4
Minimization Techniques	Week 5
Minimization Techniques	Week 6
Combinational Logic	Week 7
Combinational Logic	Week 8
Combinational Logic	Week 9
Synchronous Sequential Logic	Week 10
Synchronous Sequential Logic	Week 11
Synchronous Sequential Logic	Week 12
Counters and Register-Based design	Week 13
Counters and Register-Based design	Week 14
Review	Week 15
Final Exam	Week 16
Total:	16