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| **COMSATS University Islamabad, Abbottabad Campus** | Image result for comsats logo | **Electrical & Computer Engineering Department**  **FALL 2022** |

**Digital Logic Design**

**Course code: EEE-241 (3+1)**

**Prerequisites:**

Basic Knowledge of physics and mathematics.

**Course Instructor:** Dr. M. Shoaib Khaliq

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**Office:** Z-Block, Room 329

**Course Catalog Description:**

Introduction to Digital Computer and Systems, Number Systems, Binary Arithmetic, Boolean Algebra, Algebraic Manipulation, Canonical and Standard Form & Conversions, Logical Operations and Gates, Simplification of Functions, Karnaugh Map Methods, Two Level Implementations, Don’t Care Conditions, Prime Implicants, Combinational Logic Design, Arithmetic Operations and Circuits, Analysis Procedures, Multilevel NAND/NOR Circuits, Decoders, Encoders, Multiplexers, Demultiplexers, Memory Types, Read Only Memory, Random Access Memory, Programmable Logic Array (PLA), Sequential Logic, Flip-Flops, Clocked Sequential Circuits, State Machine Concept, Design of Sequential Circuits using State Machines, Counters and their Design, Synchronous Counters, Asynchronous Counters, Shift Registers etc.

**Textbook(s):**

1. Thomas L. Floyd, Digital Fundamentals (11th Edition)

**Reference Books**

1. Morris Mano Digital Design (3rd Edition, Prentice Hall)
2. M. Morris Mano & Charles R. Kime, Logic and Computer Design Fundamentals (2nd Edition Updated, Prentice Hall, 2000)

**Prerequisites/Co-requisites**None

**Course Requirements**

1. Active COMSIS account  
2. Frequent visit to COMSIS & CU portal for course updates  
3. Computer resources  
4. Valid CUI official email address

**Course Learning Objectives**1. Develop the ability to design both combinational and sequential digital logic circuits.  
2. Learn to design with common library hardware components.

**Assessment Plan:**

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| **Theory** | Quizzes (4) | 15% |
|  | Homework assignments | 10% |
|  | Midterm Exam | 25% |
|  | Terminal exam | 50% |
|  | Total (theory) | 100% |
| **Lab work** | Lab reports | 25% |
|  | Lab Midterm | 25% |
|  | Lab terminal | 50% |
|  | Total (lab) | 100% |
| **Final marks** | Theory marks \* 0.75 + Lab marks \* 0.25 |  |

**Course Outline: Tentative Lecture breakdown (32 Lectures)**

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| **Week**# | **Topics** |
| 1 | • Digital Computers and Information Digital computers and Binary Numbers Other base numbers (base-8, base-16 etc.) |
| 2 | • Number base conversions 1’s and 2’s Complements Unsigned and Signed numbers and Arithmetic operations (Addition, subtraction, Multiplication and Division) |
| 3 | • COMBINATIONAL LOGIC CIRCUITS Binary Logic and Introduction to Logic Gates Timing Diagrams Introduction to Boolean Algebra Standard forms |
| 4 | • Positive and Negative Logic Boolean Functions and their implementation Canonical and Standard Forms (Minterms, Maxterms, Conversions) Mini mization of Boolean functions using K-Map |
| 5 | • Don’t Care States Universal gates and implementation of Boolean functions using universal gates |
| 6 | • COMBINATIONAL LOGIC DESIGN Binary Subtractor Binary Adder/Subtractor Binary Multipliers |
| 7 | • Code Conversion Magnitude Comparator |
| 8 | • Parity Generators/ Checkers, Design Applications |
| 9 | • SEQUENTIAL CIRCUITS Introduction to Sequential Circuits Introduction to Latches Introduction to Flip Flops Type of Flip Flops Analysis of Sequential Circuits |
| 10 | • Design Procedures Introduction to develop state diagram and state table State reduction excitation tables |
| 11 | • REGISTERS AND COUNTERS, Registers |
| 12 | • Counters, Synchronous/Asynchronous |
| 13 | • Shift Registers Serial Shift Registers |
| 14 | • REGISTERS AND COUNTERS Loading Registers |
| 15 | • Parallel Registers Ripple Counters |
| 16 | • Synchronous Binary Counters Other Counters |

**Class Policy**

* Class attendance is mandatory. Student should come to the classroom before the instructor.
* Latecomers will not be allowed to enter the classroom. Students, who are absent over 20%  
  of the class time will not be allowed to enter the final examination
* Student should turn off cellular phone before entering the classroom. You should not leave  
  the classroom to make or take cellular phone calls
* Student should bring a notepad and/or a writing instrument to every class and take detailed notes
* Student should pay attention to the instructor and participate in class discussions
* Student should not do other work during class time