# COURSE DESCRIPTION FORM

**INSTITUTION** National University of Computer and Emerging Sciences (NUCES-FAST)

**PROGRAM (S) TO BE EVALUATED** BS(CS)

## A. Course Description

(Fill out the following table for each course in your computer science curriculum. A filled out form should not be more than 2-3 pages.)

| | |
|---|---|
| **Course Code** | EE227 |
| **Course Title** | Digital Logic Design (DLD) |
| **Credit Hours** | 3+1 |
| **Prerequisites by Course(s) and Topics** | (EE117) Applied Physics |
| **Assessment Instruments with Weights** (homework, quizzes, midterms, final, programming assignments, lab work, etc.) | **Assessment Tools (AT) & Criteria** |

| AT | Description | Weight |
|---|---|---|
| **1** | Mid Term I and II | 30 |
| **2** | Assignments | 10 |
| **3** | Project Presentation/ Quizzes | 10 |
| **4** | Final Examination | 50 |

**AT to CLO Mapping**

| | AT 1 | AT 2 | AT 3 | AT 4 | Weight |
|---|---|---|---|---|---|
| **CLO 1** | 10 | 2 | | 5 | 17 |
| **CLO 2** | 10 | 2 | | 10 | 22 |
| **CLO 3** | 10 | 3 | 5 | 10 | 28 |
| **CLO 4** | | 3 | 5 | 25 | 33 |

**AT to PLO Mapping**

| | AT1 | AT 2 | AT 3 | AT 4 | Weight |
|---|---|---|---|---|---|
| **PLO 1** | | | | | |
| **PLO 2** | 15 | 5 | 3 | 10 | 33 |
| **PLO 3** | 15 | 5 | 3 | 40 | 63 |
| **PLO 4** | | | | | |
| **PLO 5** | | | | | |
| **PLO 6** | | | | | |
| **PLO 7** | | | | | |
| **PLO 8** | | | | | |
| **PLO 9** | | | 4 | | 4 |
| **PLO 10** | | | | | |
| **PLO 11** | | | | | |
| **PLO 12** | | | | | |

| | |
|---|---|
| **Course Coordinator** | Rabia Tabassum |
| **URL (if any)** | |
| **Current Catalog Description** | The goal of this course is to introduce concepts & tools for the design of digital electronic circuits using sequential and combinational logic to the freshmen computer science students. |
| **Textbook** (or **Laboratory Manual** for Laboratory Courses) | Digital Fundamentals , 11th Edition, Floyd and Jain |
| **Reference Material** | 1. Digital Systems Principles and Applications 8th Ed, Tocci, Widmer and Moss<br>2. Digital Design by Moris Mano |

**Course Goals**

**Course Learning Outcomes (CLO)**

| No. | Course Learning Outcomes (CLO) | Domain | Taxonomy Level | PLO |
|---|---|---|---|---|
| **1** | Identify and explain fundamental concepts of digital logic design including basic and universal gates, number systems, binary coded system, basic components of combinational and sequence circuits. | Cognitive | **2** | **2** |
| **2** | Demonstrate the acquired knowledge to apply techniques related to the design and analysis of digital electronics circuits , including Boolean Algebra and Multi-variable Karnaugh map methods. | Cognitive | **3** | **2** |
| **3** | Analyze small –scale combinational digital circuits. | Cognitive | **3** | **2,3,9** |
| **4** | Design small-scale combinational and synchronous sequential digital circuit using Boolean Algebra and K-map. | Cognitive | **3** | **2,3,9** |

## Relevant Program Learning Outcomes (PLOs):

| | | |
|---|---|---|
| **PLO 1** | Computing Knowledge | Apply knowledge of mathematics, natural sciences, computing fundamentals, and a computing specialization to the solution of complex computing problems. |
| **PLO 2** | Problem Analysis | Identify, formulate, research literature, and analyse complex computing problems, reaching substantiated conclusions using first principles of mathematics, natural sciences, and computing sciences. |
| **PLO 3** | Design/Develop Solutions | Design solutions for complex computing problems and design systems, components, and processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. |
| **PLO 4** | Investigation & Experimentation | Conduct investigation of complex computing problems using research based knowledge and research based methods |
| **PLO 5** | Modern Tool Usage | Create, select, and apply appropriate techniques, resources and modern computing tools, including prediction and modelling for complex computing problems. |
| **PLO 6** | Society Responsibility | Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal, and cultural issues relevant to context of complex computing problems. |
| **PLO 7** | Environment and Sustainability | Understand and evaluate sustainability and impact of professional computing work in the solution of complex computing problems |
| **PLO 8** | Ethics | Apply ethical principles and commit to professional ethics and responsibilities and norms of computing practice. |

| | | |
|---|---|---|
| **PLO 9** | Individual and Team Work | Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings. |
| **PLO 10** | Communication | Communicate effectively on complex computing activities with the computing community and with society at large. |
| **PLO 11** | Project Mgmnt and Finance | Demonstrate knowledge and understanding of management principles and economic decision making and apply these to one's own work as a member or a team. |
| **PLO 12** | Life Long Learning | Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological changes. |

**Relation between CLOs and PLOs**
(CLO: Course Learning Outcome, PLOs: Program Learning Outcomes)

| | | PLOs | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| **CLOs** | 1 | | ✔ | | | | | | | | | | |
| | 2 | | ✔ | | | | | | | | | | |
| | 3 | | ✔ | ✔ | | | | | | ✔ | | | |
| | 4 | | ✔ | ✔ | | | | | | ✔ | | | |

**Topics Covered in the Course, with Number of Lectures on Each Topic** (assume 15-week instruction and one-hour lectures)

| Week No. | Course Contents/Topics | Chapter | CLOs | Tools |
|---|---|---|---|---|
| 1 | **INTRODUCTORY CONCEPTS** Digital and Analog Quantities, Binary Digits, Logic Levels, and Digital Waveforms, Basic Logic Functions, Combinational and Sequential Logic Functions | 1 | 1 | M1, F |
| 2 | **NUMBER SYSTEMS, OPERATIONS, AND CODES** Decimal Numbers, Binary Numbers, Decimal-to-Binary Conversion, Binary Arithmetic, Complements of Binary Numbers, Signed Numbers, Arithmetic Operations with Signed Numbers, Hexadecimal Numbers, Octal Numbers , Binary Coded Decimal (BCD), Digital Codes ( Gray code with conversion ) | 2 | 1 | A1,M1,F |

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|---|---|---|---|---|---|---|
| | | 3 | **LOGIC GATES**<br>The Inverter, The AND Gate, The OR Gate, The NAND Gate, The NOR Gate, The Exclusive-OR and Exclusive- NOR Gates | 3 | 2 | A2,P,M1,F |
| | | 4-5 | **BOOLEAN ALGEBRA AND LOGIC SIMPLIFICATION**<br>Boolean Operations and Expressions, Laws and Rules of Boolean Algebra, DeMorgan's Theorems, Boolean Analysis of Logic Circuits, Logic Simplification Using Boolean Algebra, Standard Forms of Boolean Expressions, Boolean Expressions and Truth Tables, The Karnaugh Map, Karnaugh Map SOP Minimization,<br>Karnaugh Map POS Minimization | 4 | 2 | A2,P,M1,F |
| | | 6 | **Mid-Term I** | | | |
| | | 7-8 | **COMBINATIONAL LOGIC ANALYSIS**<br>Basic Combinational Logic Circuits, Implementing Combinational Logic, The Universal Property of NAND and NOR gates, Combinational Logic Using NAND and<br>NOR Gates, Pulse Waveform Operation | 5 | 3 | A3,M2,P,F |
| | | 9-10 | **FUNCTIONS OF COMBINATIONAL LOGIC**<br>Half and Full Adders, Parallel Binary Adders, Ripple Carry, Comparators, Decoders, Encoders, Code Converters, Multiplexers, Demultiplexers | 6 | 3 | A4,M2, P,F |
| | | 11 | **Mid-Term II** | | | |
| | | 12 | **LATCHES, FLIP-FLOPS, AND TIMERS**<br>Latches, Flip-Flops, Flip-Flop Operating Characteristics, Flip-Flop Applications, One-Shots, The Astable Multivibrator | 7 | 4 | A5,P,F |
| | | 13 | **SHIFT REGISTERS**<br>Shift Register Operations, Types of Shift Register Data<br>I/Os, Bidirectional Shift Registers, Shift Register Counters, Shift Register Applications | 8 | 4 | A6,P,F |

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|---|---|---|---|---|---|
| | 14-15 | **COUNTERS** Finite State Machines, Asynchronous Counters, Synchronous Counters, Up/Down Synchronous Counters, Design of Synchronous Counters, Cascaded Counters, Counter Decoding | 9 | 4 | A7,P,F |
| | **16** | **Presentations** | | | |
| | | **Final Examination** | | | |

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|---|---|---|---|---|
| **Laboratory Projects/Experiments Done in the Course** | | | | |
| **Programming Assignments Done in the Course** | | | | |
| **Class Time Spent on** (in credit hours) | **Theory** | **Problem Analysis** | **Solution Design** | **Social and E** |
| | 30 | 10 | 5 | |
| **Oral and Written Communications** | Every student is required to submit at least __1__ written report of typically _2__ pages and to make _1__ oral presen typically __10__ minute's duration. Include only material that is graded for grammar, spelling, style, and so forth, as technical content, completeness, and accuracy. | | | |

**Instructor Name __Rabia Tabassum**

**Instructor Signature _____**

**Date __26th January, 2022**