**COURSE DESCRIPTION FORM: EE-1005: Digital Logic Design**

**INSTITUTION:**FAST School of Computing, National University of Computer and Emerging Sciences, Islamabad

BS(DS): **Fall-2024**

**PROGRAM TO BE EVALUATED**

**Course Description**

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| --- | --- | --- | --- | --- |
| **Course Code** | EE-1005 | | | |
| **Course Title** | Digital Logic Design | | | |
| **Credit Hours** | 3+1 | | | |
| **Course Instructor** | Muhammad Sohail Abbas | | | |
| **Prerequisites by Course(s) and Topics** | None | | | |
| **Grading policy** | Absolute Grading | | | |
| **Policy about missed assessment items in the course** | Retake of missed assessment items (other than midterm/ final exam) will not be held.  For a missed midterm/ final exam, an exam retake/ pretake application along with necessary evidence are required to be submitted to the department secretary. The examination assessment and retake committee decides the exam retake/ pretake cases. | | | |
| **Course Plagiarism Policy** | Plagiarism in project or midterm/ final exam may result in F grade in the course.  Plagiarism in an assignment will result in zero marks in the whole assignments category. | | | |
| **Assessment Instruments with Weights** (homeworks, quizzes, sessional exams, final exam, assignments, etc.) | Assessment with the weight (theory part).   |  |  |  | | --- | --- | --- | | **Assessment Item** | **Number** | **Weight (%)** | | Assignments | 4 | 10 | | Quizzes | >5 | 15 | | Sessional Exam | 2 | 30 | | Final Exam | 1 | 45 | | | | |
| **Lab Instructors (if any)** | Nabeelah Maryam | | | |
| **Course Coordinator** | Mehreen Javaid | | | |
| **URL (if any)** | https://classroom.google.com/c/NzA5NDkxNjgwMTE4?cjc=tbxkea2 | | | |
| **Current Catalog Description** | Introduction to Number Systems; Binary Logic and Gates; Combinational Circuits; Sequential Circuits; Registers and Counters; Programmable Logic Technologies and Emerging Trends | | | |
| **Textbook** | **Digital Design,** M. Morris Mano, Michael Ciletti, Pearson, 5th Edition | | | |
| **Reference Material** | **Digital Fundamentals,** Thomas L. Floyd, PEARSON, 10th Edition | | | |
| **Course Goals** | |  | | --- | | **A. Course Learning Outcomes (CLOs)** | | |  |  |  |  | | --- | --- | --- | --- | | **EE-1005 Digital Logic Design** | | | | | Course Learning Outcomes (CLOs) | | | | | At the end of the course the students will be able to: | | PLOs | BT Level\* | | 1. | Explain the concept of digital Number systems | 1 | C-2 | | 2. | Analyze combinational and sequential logic circuits | 2 | C-4 | | 3. | Design combinational and sequential circuits for real world problems | 3 | C-5 | | 4. | Practice prototype digital systems using different tools. | 5 | P-3 | | | **B. Program Learning Outcomes (PLOs)** | | |  |  |  | | --- | --- | --- | | **PLO 1** | Computing and Artificial Intelligence Knowledge | Apply knowledge of mathematics, natural sciences, computing fundamentals, and a computing specialization to solve complex computing problems using artificial intelligence techniques. | | **PLO 2** | Problem Analysis | Identify, formulate, research literature, and analyze complex computational problems, reaching substantiated conclusions using first principles of mathematics, natural sciences, computing, and artificial intelligence. | | **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 and artificial intelligence 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 and artificial intelligence work in solving complex computing problems. | | **PLO 8** | Ethics | Apply ethical principles and commit to professional ethics and responsibilities and norms of computing and artificial intelligence 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 and AI activities with the computing and artificial intelligence community and with society at large. | | **PLO 11** | Project Management 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. |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **C. Mapping of CLOs to 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) | |  |  |  |  | | --- | --- | --- | --- | | **Topics to be covered:** | | | | | List of Topics | No. of Weeks | Contact Hours | CLO(s) | | Introduction, Number Systems (Binary, Octal and hexadecimal), Number Ranges, Arithmetic Operations, Conversion from Decimal to Other Bases, Negative number representations – Chapter 1 | **2** | **6** | **1** | | Binary Logic and Gates, Boolean Algebra, Standard Forms, Map Simplification (SOP & POS), Map Manipulation, Don’t-Care Conditions, NAND, NOR & Exclusive-OR Gates & Circuits, Integrated Circuits, Positive & Negative Logic – Chapter 2 & 3 | **4** | **12** | **1,2** | | Sessional 1 | **1** | **1** |  | | Combinational Circuits, Analysis Procedure, Design Procedure, Decoders, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Binary Adders (Half, Full, Ripple Carry, Carry Lookahead), Binary Subtraction, Signed Binary Numbers, Overflow – Chapter 4 | **2** | **6** | **2,3** | | Sessional 2 | **1** | **1** |  | | Sequential Circuits, Latches, Flip-Flops, Sequential Circuit Analysis, State Diagram, Sequential Circuit Design (with D Flip-Flops, JK Flip-Flops, T flip flops), word problems – Chapter 5 | **3** | **6** | **2,3** | | Registers and Counters, Register with Parallel Load, Shift Registers, Shift Register with Parallel Load, Bidirectional Shift Register, Ripple Counter, Synchronous Binary Counters, Serial and Parallel Counters, Up-Down Binary Counter, Binary Counter with Parallel Load – Chapter 6 | **2** | **6** | **2,3** | | Revision | **1** | **3** |  | | Total | **16** | **45** |  | | | | |
| **Laboratory Projects/Experiments Done in the Course** | Introduction to Trainer Board and Integrated Circuits.  Hands-on experience with basic logic gates and other logical components used in embedded systems.  Understanding of Datasheets of ICs.  Debugging of ICs and combinational circuits. | | | |
| **Programming Language for Assignments** | None | | | |
| **Class Time Spent** (in percentage) | **Theory** | **Problem Analysis** | **Solution Design** | **Social and Ethical Issues** |
| 40 | 25 | 30 | 5 |
| **Oral and Written Communications** | Every student is required to submit at least \_\_4\_\_\_ written reports of typically \_\_\_5-10\_\_\_\_ pages each. | | | |