Description of Course CSE 205

PART A: General Information

1	**Course Title**	: DIGITAL LOGIC DESIGN
2	**Type of Course**	: THEORY
3	**Offered to**	: DEPARTMENT OF CSE
4	**Pre-requisite Course(s)**	: NONE

PART B: Course Details

1. Course Content (As approved by the Academic Council)

Digital logic: Boolean algebra, De Morgan's Theorems, logic gates and their truth tables, canonical forms, combinational logic circuits, minimization techniques; Arithmetic and data handling logic circuits, decoders and encoders, multiplexers and demultiplexers; Combinational circuit design; Flip-fops; race around problems; Counters: asynchronous and synchronous counters and their applications; Asynchronous and synchronous logic design: State diagram, Mealy and Moore machines; State minimizations and assignments; Pulse mode logic; Fundamental mode design; PLA design; Design using MSI and LSI components.

2. Course Objectives

The students are expected to:

i. Understand and formulate different number systems, binary logic, and circuits.
ii. Design combinational and sequential circuits.
iii. Develop state-machines circuits with flip-flops.

3. Knowledge required

Technical

- N/A

Analytical

- N/A

4. Course Outcomes (COs)

CO No.	CO Statement After undergoing this course, students should be able to:	Corresponding PO(s)*	Domains and Taxonomy level(s)**	Delivery Method(s) and Activity(-ies)	Assessment Tool(s)
CO1	**Understand** and **formulate** different number systems, binary logic, and circuits.	PO1 and PO2	C4	Lecture and Demonstration	Class Tests or Assignments or Projects, and Final Exam
CO2	**Design** combinational and sequential circuits.	PO3 and PO4	A4	Lecture and Demonstration	Class Tests or Assignments or Projects, and Final Exam
CO3	**Develop** state-machines circuits with flip-flops.	PO2 and PO3	C6	Lecture and Demonstration	Class Tests or Assignments or Projects, and Final Exam

***Program Outcomes (POs)**

PO1: Engineering knowledge; PO2: Problem analysis; PO3: Design/development of solutions; PO4: Investigation; PO5: Modern tool usage; PO6: The engineer and society; PO7: Environment and sustainability; PO8: Ethics; PO9: Individual work and teamwork; PO10: Communication; PO11: Project management and finance; PO12: Life-long learning.

****Domains**

C-Cognitive: C1: Knowledge; C2: Comprehension; C3: Application; C4: Analysis; C5: Synthesis; C6: Evaluation
A-Affective: A1: Receiving; A2: Responding; A3: Valuing; A4: Organizing; A5: Characterizing
P-Psychomotor: P1: Perception; P2: Set; P3: Guided Response; P4: Mechanism; P5: Complex Overt Response; P6: Adaptation; P7: Organization

5. Mapping of Knowledge Profile, Complex Engineering Problem Solving and Complex Engineering Activities

COs	K1	K2	K3	K4	K5	K6	K7	K8	P1	P2	P3	P4	P5	P6	P7	A1	A2	A3	A4	A5
CO1		√	√						√	√						√				
CO2		√	√						√	√					√		√			
CO3		√	√		√	√			√	√	√							√		√

K-Knowledge Profile:

K1: A systematic, theory-based understanding of the natural sciences applicable to the discipline; **K2:** Conceptually based mathematics, numerical analysis, statistics and the formal aspects of computer and information science to support analysis and modeling applicable to the discipline; **K3:** A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline; **K4:** Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline; **K5:** Knowledge that supports engineering design in a practice area; **K6:** Knowledge of engineering practice (technology) in the practice areas in the engineering discipline; **K7:** Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline: ethics and the engineer's professional responsibility to public safety; the impacts of engineering activity; economic, social, cultural, environmental and sustainability; **K8:** Engagement with selected knowledge in the research literature of the discipline

P-Range of Complex Engineering Problem Solving:

P1: Cannot be resolved without in-depth engineering knowledge at the level of one or more of K3, K4, K5, K6 or K8 which allows a fundamentals-based, first principles analytical approach; **P2:** Involve wide-ranging or conflicting technical, engineering and other issues; **P3:** Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models; **P4:** Involve infrequently encountered issues; **P5:** Are outside problems encompassed by standards and codes of practice for professional engineering; **P6:** Involve diverse groups of stakeholders with widely varying needs; **P7:** Are high level problems including many component parts or sub-problems

A-Range of Complex Engineering Activities:

A1: Involve the use of diverse resources (and for this purpose resources include people, money, equipment, materials, information and technologies); **A2:** Require resolution of significant problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues; **A3:** Involve creative use of engineering principles and research-based knowledge in novel ways; **A4:** Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation; **A5:** Can extend beyond previous experiences by applying principles-based approaches

6. Lecture/ Activity Plan

Week	Lecture Topics	Corresponding CO(s)
Week 1	Introduction to Digital Logic Design Boolean Algebra De Morgan's Theorems Logic gates and their truth tables	CO1
Week 2	Canonical forms	CO1

Week	Lecture Topics	Corresponding CO(s)
	Number Systems	
Week 3	Minimization techniques	CO1 and CO2
Week 4	Minimization techniques	CO1 and CO2
Week 5	Combinational Logic Arithmetic and data handling logic circuits	CO1 and CO2
Week 6	Decoders and Encoders	CO1 and CO2
Week 7	Multiplexers and Demultiplexers, PLA Design	CO1 and CO2
Week 8	Flip-flops and their construction	CO2
Week 9	Synchronous Sequential Logic	CO2 and CO3
Week 10	Registers and Counters	CO2 and CO3
Week 11	Circuit Design with Flip-flops, Registers and Counters	CO2 and CO3
Week 12	State minimization and state machines	CO2 and CO3
Week 13	Asynchronous Sequential Logic	CO2 and CO3
Week 14	Asynchronous Sequential Logic	CO2 and CO3

7. Assessment Strategy

- Class Attendance: Class attendance will be recorded in every class.
- Class Tests/Assignments/Projects: There will be a minimum of 4 (four) Class Tests/Assignments/Projects, out of which the best 3 (three) will be considered in final evaluation.
- Final exam: A comprehensive Final exam will be held at the end of the semester as per the institutional ordinance.

8. Distribution of Marks

Attendance:	10 %
Class Tests/Assignments/Projects:	20%
Final Exam:	70%
Total:	100%

9. Textbook/ Reference

a. Digital Design (5th edition), M. Morris Mano, Michael D. Ciletti
b. Digital Design: A Pragmatic Approach, Everett L. Johnson, Mohammad A. Karim
c. Digital Logic Circuit Analysis and Design, Nelson, Victor, Nagle, H., Carroll, Bill, Irwin, David

d. Switching and Finite. Automata Theory, Zvi Kohavi.