University of Asia Pacific (UAP)
Department of Computer Science and Engineering (CSE)

Course Outline

Program:	Computer Science and Engineering (CSE)
Course Title:	Digital Logic & System Design
Course Code:	CSE 209
Semester:	Fall 2021
Level:	**4**th Semester
Credit Hour:	4.0
Name & Designation of Teacher:	**Dr. Aloke Kumar Saha**, Professor
Office/Room:	**701** (7th Floor)
Class Hours:	**Monday 11 am to 12:20 pm; Wednesday 12:30 pm to 1:50 pm; Thursday 2 pm to 3:20 pm**
Consultation Hours:	**Tuesday 11 am to 12:20 pm**
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Rationale: Required course and a pre-requisite to Computer Architecture (CSE 317) and Peripheral & Interfacing (CSE 315) in the CSE program. This knowledge is very important for the Robotics and Embedded system.

Pre-requisite (if any)**:** **N/A**

Course Synopsis:

Boolean algebra: Truth tables, canonical and standard forms of functions, logic operations.

Simplification of functions: Karnaugh map, SOP and POS methods, nondegenarate terms, don't care conditions, tabulation method.

Logic gates: AND, OR, NOT and universal gates, NAND, NOR, wired-OR and wired-AND implementation.

Combinational logic: Half and full adder and subtractor, binary parallel adder, BCD adder, encoder and decoder, multiplexer and demultiplexer, Boolean function implementation using decoder and multiplexer; design and implementation of logic circuits.

Sequential logic: Latches, flip flops, flip flop excitation table.

Registers: SISO, SIPO, PISO, PIPO and universal shift register, combinational shift register.

Counters: Asynchronous and synchronous binary and BCD counters, Johnson counters and ring counters.

Synchronous sequential circuits: State diagrams, state tables, state equations, Mealy and Moore type circuits, state reduction, state assignment, incompletely specified diagrams.

Asynchronous Sequential circuits: Fundamental and pulse mode circuits, race and cycles, methods of secondary assignment.

Design the various Components of Computer: Flag Registers, Shift and Parallel Registers, Memory Units, Control Units.

Design of Simple Microprocessors (SAP1 & SAP2): Architecture, Instructions Set, Instructions Cycle, Programming Model.

Course Objectives: The objectives of this course are to:

1. **Provide** knowledge and understanding on principles of digital logic operation and different types of logic gates.
2. **Introduce** the concept of different types of combinational logic, sequential circuits, registers and counters.
3. **Learn** the operation of different types of combinational logic, sequential circuits, registers and counters.
4. **Enable** the student to gain Application of different types of logic gates and flip flops.
5. **Emphasize** the Design and Implement of different types of combinational & sequential logic circuits and counters.

Course Outcomes (CO) and their mapping with Program outcomes (PO) and Teaching-Learning Assessment methods:

CO No.	CO Statements: Upon successful completion of the course, students should be able to:	Corresponding POs (Appendix-1)	Bloom's taxonomy domain/level (Appendix-2)	Delivery methods and activities	Assessment Tools
CO1	**Describe** the concept of digital logic operation and different types of logic gates.	1	1/Remember	Lecture, multimedia,	Written Examination, Assignment
CO2	**Recognize** the concept of different types of combinational logic, sequential circuits, registers and counters.	1	1/Analyze	Lecture, Group discussion	Quiz, Written Examination
CO3	**Understand** the operation of different types of combinational	4	1/Understand	Lecture, Problem Solving,	Quiz, Presentation,

	logic, sequential circuits, registers and counters.			Group discussion	Viva, Written Examination
CO4	**Apply** different types of logic gates and flip flops.	5	1/Apply	Problem Solving	Quiz, Assignment, Written Examination
CO5	**Design** and **Implement** different types of combinational & sequential logic circuits and counter.	5	1/Create	Multimedia	Quiz, Written Examination

Weighting COs with Assessment methods:

Assessment Type	% weight	CO1	CO2	CO3	CO4	CO5
Final Exam	**50%**		10	20	10	10
Mid Term	**20%**	6.67		6.67		6.67
Class performance, Quiz, Presentation, Assignment, Project, Others.	**30%**	2	5	5	13	5
Total	**100%**	8.67	15	31.67	23	21.67

Grading Policy: As per the approved grading policy of UAP (Appendix-3)

Course Content Outline and mapping with COs

Weeks	Topics / Contents	Course Outcome	Delivery methods and activities	Reading Materials
1	Logic gates and Boolean Algebra	CO1	Lecture	Digital Systems: Principles and Applications, Chapter 3
2	Combinational Logic Circuits, Quiz 1	CO2	Lecture	Digital Systems: Principles and Applications, Chapter 4; Other Materials to be delivered during lecture
3	Digital Arithmetic: Operations and Circuits	CO2	Lecture, Problem Solving	Digital Systems: Principles and Applications, Chapter 6
4 & 5	Flip Flops and their applications	CO3	Lecture, Problem Solving	Digital Systems: Principles and Applications, Chapter 5
6 & 7	Counters and Registers, Quiz 2	CO5	Lecture, Group discussion	Digital Systems: Principles and Applications, Chapter 7; Other Materials to be delivered during lecture
8 & 9	MSI Logic Circuits, Quiz 3	CO5	Lecture, Group discussion	Digital Systems: Principles and Applications, Chapter 9; Other Materials to be delivered during lecture
10	Synchronous sequential Circuits	CO4	Lecture, Problem Solving	Digital Systems: Principles and Applications, Chapter 5 & 7
11	Asynchronous sequential Circuits, Quiz 4	CO4	Lecture, Group discussion	Digital Systems: Principles and Applications, Chapter 5 & 7
12	Design the various Components of Computer	CO3	Lecture, multimedia	To be assigned during lecture.
13 & 14	Design of Simple Microprocessors(SAP1 & SAP2), Quiz 5	CO5	Lecture, multimedia	To be assigned during lecture.

Required References: Digital Systems: Principles and Applications – Ronald J. Tocci & Neal S. Widmer

Recommended References: Digital Logic and Computer Design – M. Morris Mano
Digital Fundamentals – Thomas L. Floyd

Special Instructions:

Students must come to the class prepared for the course material covered in the previous classes.
They must submit their assignments on time.
No late or partial assignments will be acceptable. There will be no make-up quizzes.

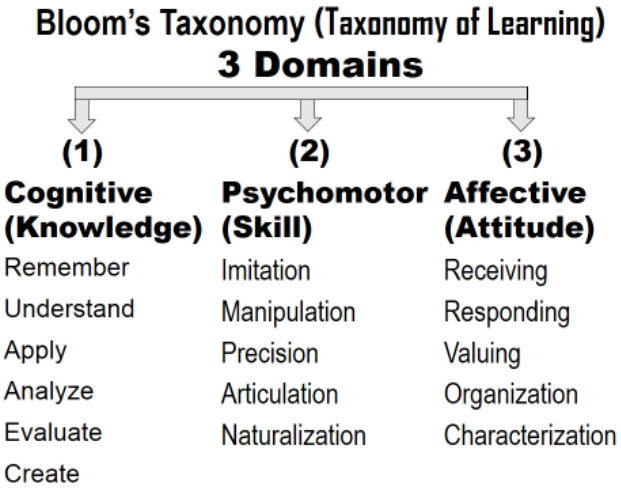
Prepared by	Checked by	Approved by
Course Teacher	Chairman, PSAC committee	Head of the Department

Appendix-1:

Washington Accord Program Outcomes (PO) for engineering programs:

No.	PO	Differentiating Characteristic
1	Engineering Knowledge	Breadth and depth of education and type of knowledge, both theoretical and practical
2	Problem Analysis	Complexity of analysis
3	Design/ development of solutions	Breadth and uniqueness of engineering problems i.e. the extent to which problems are original and to which solutions have previously been identified or codified
4	Investigation	Breadth and depth of investigation and experimentation
5	Modern Tool Usage	Level of understanding of the appropriateness of the tool
6	The Engineer and Society	Level of knowledge and responsibility
7	Environment and Sustainability	Type of solutions.
8	Ethics	Understanding and level of practice
9	Individual and Team work	Role in and diversity of team
10	Communication	Level of communication according to type of activities performed
11	Project Management and Finance	Level of management required for differing types of activity
12	Lifelong learning	Preparation for and depth of Continuing learning.

Appendix-2



Appendix-3: Grading Policy

Numeric Grade	Letter Grade	Grade Point
80% and above	A+	4.00
75% to less than 80%	A	3.75
70% to less than 75%	A-	3.50
65% to less than 70%	B+	3.25
60% to less than 65%	B	3.00
55% to less than 60%	B-	2.75
50% to less than 55%	C+	2.50
45% to less than 50%	C	2.25
40% to less than 45%	D	2.00
Less than 40%	F	0.00