Course Code & Name	26CAPC1003 Digital Fundamentals & PC Hardware		
Teaching Hours /week (L:T:P: R)	3:1:0:0	Credits	4
CIE Marks	40	ESE Marks	60
Course Type	Theory (PCC)	Exam Hours	3
Prerequisites (if any)	-		

Course Objectives:

1. To understand the principles and applications of digital systems, number systems, and data representation techniques used in computing.
2. To explore the architecture, components, and working of a digital computer system including memory and storage systems.

Course Outcomes (COs)

At the end of the course students should be able to:

CO#	Course Outcomes	Bloom's Knowledge Level (KL)
CO 1	Apply the concepts of digital and analog systems, number systems, data representation techniques, and error detection and correction methods.	K3
CO 2	Analyze and design digital logic circuits using Boolean algebra, logic gates, combinational and sequential circuits.	K4
CO 3	Describe the architecture and functioning of digital computer systems, including CPU, motherboard, buses, registers, and input/output devices.	K2
CO 4	Apply the concepts of memory hierarchy and storage technologies to differentiate the features and performance of RAM, ROM, HDDs, and SSDs.	K3

Note: *K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

CO #	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	3	2	1	2	-	-	-	1
CO 2	3	3	3	3	1	-	-	2
CO 3	3	2	1	2	-	-	-	1
CO 4	3	2	1	2	-	-	-	2

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), - : No Correlation*

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE)

Attendance	Assignment/ Micro-project	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
8	12	10	10	40 Marks

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions.

PART A	PART B	TOTAL
■ 2 Questions from each module. ■ Total of 8 Questions, each carrying 3 marks **(8x3 =24 marks)**	■ Each question carries 9 marks. ■ Two questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 subdivisions. **(4x9 = 36 marks)**	**60 Marks**

SYLLABUS

Module #	Syllabus Description	Hours
1	**Introduction:** Digital and Analog systems. Logic levels and pulse waveforms. Functions of digital logic. Data transmission. Number systems: Binary, Octal, Decimal and Hexadecimal- Conversions. Binary Addition, subtraction, Representation of signed numbers - Complements - Representation of floating-point numbers - BCD representation. Error detection using parity bit, error detecting and correcting code, hamming code.	13

2	**Logic gates and Boolean Algebra:** Basic gates - AND, OR, NOT, NAND, NOR, Exclusive OR, Exclusive NOR gates - their symbols and truth tables. Boolean algebra -Basic laws and theorems, Boolean functions - truth table, Standard forms of Boolean Expressions – Sum of Products and Product of Sums, Minimization of Boolean function using K map method. Combinational circuits- Half adder, Full adder. Sequential Circuits: Flip-Flops - SR, D, T, JK Flip flops. Registers - Serial in serial out, Serial in parallel out, Parallel in serial out, parallel in parallel out.	**16**
3	**Basic components of a digital computer –** Block diagram, CPU, ALU, Control Unit & Registers **I/O devices:** Keyboards and Pointing Devices, Monitors, Video adapters, Audio adapter architecture **Motherboards:** Motherboard controllers and system resources, I/O system bus, on-board I/O devices, Chipsets, ROM BIOS, ROM POST, CMOS setup.	**8**
4	**Memory:** Primary Memory (RAM): SRAM vs DRAM, DDR4, DDR5, LPDDR4/LPDDR5. Read Only Memory (ROM): ROM, PROM, EPROM, EEPROM, Flash ROM, Memory hierarchy and performance parameters. **Hard Disk**: Hard disk drive components, disk platter, read/ write head, head arm/ head slider, spindle motor, logic board, air filter, head actuator mechanism. **Solid State Drive (SSD):** SSD concept and advantages, SATA SSD vs NVMe SSD, HDD vs SSD comparison.	**8**

Text Books				
Sl. No	**Title of the Book**	**Name of the Authors**	**Name of the Publisher**	**Edition & Year**
1	Digital Fundamentals	Floyd	Pearson Education	10th Edition 2011
2	PC Hardware - The Complete Reference	Craig Zacher, John Rourke	Tata McGraw-Hill	4th Edition 2012
3	Fundamentals of Digital Circuits	A. Anand Kumar	PHI Learning Pvt. Ltd.	4th Edition 2016

Reference Books				
Sl. No	**Title of the Book**	**Name of the Authors**	**Name of the Publisher**	**Edition & Year**
1	Digital Logic & Computer Design	M Mano	Tata McGraw-Hill	2nd Edition 2011
2	Modern Digital Electronics	R.P.Jain	McGraw Hill	4th Edition, 2009
3	Digital Principles & Applications	Malvino, Paul Albert, Leach, Donald P	Tata McGraw-Hill	4th Edition, 2000

Web References/ Video Links (NPTEL, SWAYAM…)	
Sl.No	**Link ID**
1	https://nptel.ac.in/courses/117/103/117103064/
2	https://nptel.ac.in/courses/106/105/106105163/
3	https://nptel.ac.in/courses/106/103/106103180/
4	https://www.tutorialspoint.com/digital_circuits/index.htm
5	https://www.javatpoint.com/digital-electronics

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Differentiate between digital and analog systems with suitable examples.
2. Convert the decimal number 255.25 to its binary and hexadecimal equivalents.
3. Perform the binary subtraction: $(110101)_2 - (10111)_2$ using 2's complement.
4. Describe the working of Hamming code for error detection and correction.
5. A communication system uses even parity for error detection. If the data word is 1011001, determine the parity bit and check if 1011011 is a valid received code.

Course Outcome 2 (CO2):

1. Simplify the Boolean expression F(A, B, C) = A'B + AB' + BC using Boolean laws.
2. Minimize F(A, B, C, D) = Σ(0,1,2,5,6,7,8,9,10,14,15) using Karnaugh Map.
3. Design a circuit for a Full Adder using two Half Adders and an OR gate.
4. Compare SR and JK flip-flops with truth tables.
5. Design a 4-bit SIPO shift register using appropriate flip-flops.

Course Outcome 3 (CO3):

1. Draw and explain the block diagram of a digital computer highlighting CPU, ALU, and CU.
2. Explain the functions of motherboard components such as chipset, BIOS, and CMOS setup.
3. Explain the sequence of operations during the Power-On Self-Test (POST).
4. Describe the working of keyboard and pointing devices.
5. Discuss the functions of different types of video adapters and audio adapters in a computer system.

Course Outcome 4 (CO4):

1. Compare SRAM and DRAM.
2. Explain DDR4, DDR5, LPDDR4 and LPDDR5 memories.
3. List different types of ROM and their applications.
4. Explain the working principles of HDD and SSD, highlighting their advantages and limitations.
5. Differentiate between SATA SSD and NVMe SSD.

Model Question Paper

Reg No.:_____ Name:_____

FEDERAL INSTITUTE OF SCIENCE AND TECHNOLOGY

MCA Integrated S1 (R) Examination, December 2026 (2026 Scheme)

Course Code: 26CAPC1003

Course Name: Digital Fundamentals & PC Hardware

Max. Marks: 60 Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

		CO	Marks
1	Convert $(145)_{10}$ into binary, octal, and hexadecimal number systems.	CO1	(3)
2	Perform the binary subtraction: $(110101)_2 - (10111)_2$ using 2's complement.	CO1	(3)
3	State De Morgan's theorems and verify them using truth tables.	CO2	(3)
4	Express F = A + BC in canonical SOP form.	CO2	(3)
5	What is POST? State its significance.	CO3	(3)
6	Define BIOS. Mention its two primary functions.	CO3	(3)
7	List two differences between SRAM and DRAM.	CO4	(3)
8	What is an IDE interface?	CO4	(3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

Module I

9	a) Discuss BCD and floating-point representation formats.	CO1	(5)
	b) Demonstrate Hamming code generation for the 4-bit data 1011.		(4)
	OR		
10	a) Convert $(325.625)_{10}$ to binary and hexadecimal.		(3)
	b) Explain data transmission errors and the use of parity bits.	CO1	(3)
	c) Express 3.465 in floating point representation		(3)

Module II

11	a) Describe the function of XOR and XNOR gates in digital logic.		(3)
	b) Simplify F(A,B,C) = A'B + AB' + BC using Boolean laws	CO2	(3)
	c) Define universal gates. Give examples.		(3)

OR

12	a) Minimize F(A,B,C,D) = Σ(0,1,2,5,6,7,8,9,10,14,15) using a K-map.		(4)
	b) Realize the minimized expression using logic gates.	CO2	(3)
	c) Define a Full Adder. Draw the circuit and truth table.		(2)

Module III

13	a) Draw and explain the block diagram of a digital computer. (5)	CO3	(5)
	b) Explain the audio adapter architecture		(4)

OR

14	a) Explain the role of any 5 motherboard components.	CO3	(5)
	b) Explain the working of a CRT Monitor		(4)

Module IV

15	a) Explain the structure and working of a Hard Disk Drive.	CO4	(5)
	b) Define seek time and access time and state their importance.		(4)

OR

16	a) Differentiate between magnetic, and optical technologies	CO4	(4)
	b) Discuss the role of cache memory in improving system performance.		(5)

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