Lesson Plan

S.E. (COMPS) DIV-A (Semester III)

Subject: Digital Logic & Computer Organization and Architecture

Subject code: CSC304

Teacher-in-charge: Prof. Heenakausar Pendhari

Academic Term: July – October 2022

Module		Detailed Content	Hours
1		**Computer Fundamentals**	**5**
	1.1	Introduction to Number System and Codes	
	1.2	Number Systems: Binary, Octal, Decimal, Hexadecimal,	
	1.3	Codes: Grey, BCD, Excess-3, ASCII, Boolean Algebra.	
	1.4	Logic Gates: AND, OR, NOT, NAND, NOR, EX-OR	
	1.5	Overview of computer organization and architecture.	
	1.6	Basic Organization of Computer and Block Level functional Units, Von-Neumann Model.	
2		**Data Representation and Arithmetic algorithms**	**8**
	2.1	Binary Arithmetic: Addition, Subtraction, Multiplication, Division using Sign Magnitude, 1’s and 2’s compliment, BCD and Hex Arithmetic Operation.	
	2.2	Booths Multiplication Algorithm, Restoring and Non-restoring Division Algorithm.	
	2.3	IEEE-754 Floating point Representation.	
3		**Processor Organization and Architecture**	**6**
	3.1	Introduction: Half adder, Full adder, MUX, DMUX, Encoder, Decoder(IC level).	
	3.2	Introduction to Flip Flop: SR, JK, D, T (Truth table).	
	3.3	Register Organization, Instruction Formats, Addressing modes, Instruction Cycle, Interpretation and sequencing.	
4		**Control Unit Design**	**6**
	4.1	Hardwired Control Unit: State Table Method, Delay Element Methods.	
	4.2	Microprogrammed Control Unit: Micro Instruction-Format, Sequencing and execution, Micro operations, Examples of microprograms.	
5		**Memory Organization**	**6**
	5.1	Introduction and characteristics of memory, Types of RAM and ROM, Memory Hierarchy, 2-level Memory Characteristic,	
	5.2	Cache Memory: Concept, locality of reference, Design problems based on	

Course Objectives:

1. To have the rough understanding of the basic structure and operation of basic digital circuits and digital computer.
2. To discuss in detail arithmetic operations in digital system.
3. To discuss generation of control signals and different ways of communication with I/O devices.
4. To study the hierarchical memory and principles of advanced computing.

Course Outcomes:

Upon completion of this course students will be able to:

CSC304.1: To learn different number systems and basic structure of computer system.
CSC304.2: To demonstrate the arithmetic algorithms.
CSC304.3: To understand the basic concepts of digital components and processor organization.
CSC304.4: To understand the generation of control signals of computer.
CSC304.5: To demonstrate the memory organization.
CSC304.6: To describe the concepts of parallel processing and different Buses.

CO-PO-PSO Mapping:

	PO1 (Engg Know)	PO2	PO3 (De sign)	PO4)	PO5 (tools)	PO6 (engg Soci)	PO7 (Env)	PO8 (Eth)	PO9 (ind Team)	PO10 (com.)	PO11 (PM)	PO12 (life Long)	PS O1	PS O2
CSC304.1	2													
CSC304.2	2	1												
CSC304.3	2		1											
CSC304.4	2													
CSC304.5	2	1												
CSC304.6	2													
Course To PO	2	1	1											

Provide justification of PO to CO mapping

Course Outcome	**Competency**	**Performance Indicator**
CSC304.1	1.2 Demonstrate competence in basic sciences	1.2.1 Apply laws of natural science to an engineering problem
	1.3 Demonstrate competence in engineering fundamentals	1.3.1 Apply engineering fundamentals
	3.4 Demonstrate an ability to	3.4.3 Able to verify the functionalities and

	advance an engineering design to defined end state	validate the design.
CSC304.2	1.3 Demonstrate competence in engineering fundamentals	1.3.1 Apply engineering fundamentals
	1.4 Demonstrate competence in specialized engineering knowledge to the program	1.4.1 Apply theory and principles of computer science and engineering to solve an engineering problem
	2.4 Demonstrate an ability to execute a solution process and analyze results	2.4.1 Applies engineering mathematics to implement the solution. .
CSC304.3	1.3 Demonstrate competence in engineering fundamentals	1.3.1 Apply engineering fundamentals
	1.4 Demonstrate competence in specialized engineering knowledge to the program	1.4.1 Apply theory and principles of computer science and engineering to solve an engineering problem
	3.2 Demonstrate an ability to generate a diverse set of alternative design solutions	3.2.1 Able to explore design alternatives.
CSC304.4	1.3 Demonstrate competence in engineering fundamentals	1.3.1 Apply engineering fundamentals
CSC304.5	1.3 Demonstrate competence in engineering fundamentals	1.3.1 Apply engineering fundamentals
	1.4 Demonstrate competence in specialized engineering knowledge to the program	1.4.1 Apply theory and principles of computer science and engineering to solve an engineering problem
	2.3 Demonstrate an ability to formulate and interpret a model	2.3.1 Able to apply computer engineering principles to formulate modules of a system with required applicability and performance.
CSC304.6	1.3 Demonstrate competence in engineering fundamentals	1.3.1 Apply engineering fundamentals
	1.4 Demonstrate competence in specialized engineering knowledge to the program	1.4.1 Apply theory and principles of computer science and engineering to solve an engineering problem

CO Assessment Tools:

Course Outcomes					***Indirect Method (20%)***				
	Unit Tests		Assignments		Quizzes			End Sem Exam	Course exit survey
	1	2	1	2	1	2	3		
CSC304.1	20%	--	20%	--	10%	--	----	50%	100%
CSC304.2	----	20%	20%	--	10%	--	-----	50%	100%
CSC304.3	20%	----	--	20%	10%	--	----	50%	100%
CSC304.4	--	20%	--	20%	--	10%	-----	50%	100%
CSC304.5	--	20%	--	20%	--		10%	50%	100%
CSC304.6	--	----	--	25%	--	25%	-----	50%	100%

CO calculation= (0.8 *Direct method + 0.2*Indirect method)

Rubrics for assessing Course Outcome with each assessment tool:

Assignment:

Rubrics for Assignment Grading:

Indicator				
Timeline (2)		More than one session late (0)	One sessions late (1)	On time (2)
Level of content (4)	Just Managed (1)	Major points are addressed minimally (2)	Only major topics are covered(3)	Most major and some minor criteria are included. Information is Adequate (4)
Reading and Understanding (4)	Just Managed (1)	Superficial at most (2)	Understood concepts but no related topics (3)	Understood concepts and related topics (4)

Curriculum Gap identified: (with action plan)

SOP and POS concepts , K-Maps. Extra lectures conducted.

Content beyond syllabus:

Practical on : Design of 3-bit Counter using JK Flipflops

Modes of content delivery

Modes of Delivery	Brief description of content delivered
Class room lecture	1. **Computer Fundamentals** 2. **Data Representation and Arithmetic algorithms** 3. **Processor Organization and Architecture** 4. **Control Unit Design** 5. **Memory Organization** 6. **Principles of Advanced Processor and Buses**
Assignments	Assignment 1: based on **Computer Fundamentals** Assignment 2: based on **Data Representation and Arithmetic algorithms** **Assignment3: 3,4,5,6**
Flip Classroom Activity	Module 5: Memory Organization
Quizzes	Quiz 1: on Module 1,2,3 Quiz 2: on 4,6 Quiz3: on 5

Textbooks:	
1	R. P. Jain, "Modern Digital Electronic", McGraw-Hill Publication, 4thEdition.
2	William Stalling, "Computer Organization and Architecture: Designing and Performance", Pearson Publication 10TH Edition.
3	John P Hayes, "Computer Architecture and Organization", McGraw-Hill Publication, 3RD Edition.
4	Dr. M. Usha and T. S. Shrikanth, "Computer system Architecture and Organization", Wiley publication.
References:	
1	Andrew S. Tanenbaum, "Structured Computer Organization", Pearson Publication.
2	B. Govindarajalu, "Computer Architecture and Organization", McGraw-Hill Publication.
3	Malvino, "Digital computer Electronics", McGraw-Hill Publication, 3rdEdition.
4	Smruti Ranjan Sarangi, "Computer Organization and Architecture", McGraw-Hill Publication.

Lesson Plan

CLASS	SE Computer Engineering (A), Semester III		
Academic Term	July- October 2022		
Subject	**Digital Logic & Computer Organization and Architecture(CSC304)**		
Periods (Hours) per week	***Lecture***	***3***	
	Practical		
	Tutorial		
Evaluation System		***Hours***	***Marks***
	Theory examination	3	80
	Internal Assessment	--	20
	Practical Examination	--	--
	Oral Examination	--	--
	Term work	--	--
	Total	--	100
Time Table	***Day***	***Time***	
	Monday	9:45am-10:45am	
	Tuesday	12-1pm	
	Friday	8.45-9.45am	

Course Content and Lesson plan

Week	Lecture No.	Date		Topic	
		Planned	Actual		Remarks
				Module 1: **Computer Fundamentals**	
1	1	26-07-22	26-07-22	Introduction to subject . Discussion on different Course outcomes Logic Gates: AND,OR,NOT,NAND,NOR,EX-OR	https://www.youtube.com/watch?v=SW2Bwc17_wA
	2	27-07-22	27-07-22	Derivation of basic gates from universal gates	
	3	29-07-22	29-07-22	Codes: Grey, BCD, Excess-3	
	4	1-08-22	1-08-22	ASCII, Boolean Algebra.	
	5	2-08-22	2-08-22	Problems on Boolean Algebra	
	6	5-08-22	3-08-22	SOP and POS form of logical equation Introduction to K-map	Content beyond Syllabus
	7		4-08-22	2 variable 4-variable K-map, problems on K-Map	Content beyond Syllabus

	Module 3: **Processor Organization and Architecture**				
2	8	8-08-22	8-08-22	Half adder Full adder design using K-map	
	9	9-08-22	12-08-22	Subtractor : Full, Half using K-map. Introduction to Multiplexer	Assignment-1
	10	12-08-22	17-08-22	Multiplexer tree, Design problems on Multiplexer,	
3	11	19-08-22	23-08-22	Realization of logical equation using Multiplexer, IC 74151	
	8	22-08-22	26-08-22	Introduction to Demultiplexer, Decoder,	
	9	23-08-22	29-08-22	Design Problems on Decoder IC 74138	
	12	26-8-22	30-8-22	Introduction to Flip Flop: SR, JK, D, T	
	13	29-08-22	8-09-22	Introduction to Flip Flop: SR, JK, D, T	
	14		8-09-22	Design of 2bit and 3bit counter using JK, T flipflop.	Content beyond Syllabus
				Module 1: **Computer Fundamentals**	
	15	30-8-22	30-08-22	Introduction to Number system Number Systems: Binary, Octal, Hexadecimal,	
4	16	12-09-22	12-09-22	Number Systems: Binary, Octal, Hexadecimal	
				Module 2: **Data Representation and Arithmetic algorithms.**	
5	17	13-9-22	12-09-22	Binary Arithmetic: Addition, Subtraction, using Sign Magnitude, 1's and 2's compliment, Operation.	
	18	16-9-22	13-9-22	BCD and Hex Arithmetic , problem based on it	
	19	19-9-22	16-9-22	Multiplication, Booths Multiplication Algorithm.	
	20	20-9-22	19-9-22	Booths Multiplication Algorithm	
	21	23-9-22	20-9-22	Division, Restoring and Non-restoring DivisionAlgorithm.	
	22	26-9-22	23-9-22	Division, Restoring and Non-restoring DivisionAlgorithm.	Assignment-2
	Module 3: **Processor Organization and Architecture**				
	23	27-9-22	26-9-22	Register Organization	

	24	30-9-22	27-9-22	Instruction Formats Addressing modes	
6					
7	25	3-10-22	28-9-22	InstructionCycle, Interpretation and	
	Module 4: **Control Unit Design**				
	26	4-10-22	30-9-22	Hardwired Control Unit: State Table Method,	
8	27	7-10-22	3-10-22	Hardwired Control Unit: Delay Element Methods	
	28	10-10-22	4-10-22	Microprogrammed Control Unit:	
	29	11-10-22	7-10-22	Instruction-Format, Sequencing and execution	
9	30	14-10-22	7-10-22	Micro operations, Examples of microprograms.	
10	*Module 5:* **Memory Organization**				
	31		8-10-22	Introduction and characteristics of memory, Types of RAM and ROM,	Flip classroom Activity
	32		8-10-22	MemoryHierarchy, 2-level Memory Characteristic,	
	33		10-10-22	Cache Memory: Concept, locality of reference	
11	34		11-10-22	Cache Mapping techniques: Fully Associative	
	35		11-10-22	Cache Mapping techniques:Direct	
	36		14-10-22	Cache Mapping techniques: Set Associative	
	30				
12	31		14-10-22	Cache coherence and write policies. Interleaved and Associative Memory.	
13	*Module 6:* **Principles of Advanced Processor and Buses**				
	32		20-10-22	Basic Pipelined Data path and control	
	33		20-10-22	data dependencies, data hazards	
14	34		21-10-22	Branch hazards, delayed branch	
15	35		21-10-22	Branch prediction	
	36		22-10-22	Introduction to buses: ISA, PCI, USB.	
Total					

***** Note Planned extra lectures to complete the syllabus**

Videos:

You tube: Video1 Transistors and Boolean logic https://www.youtube.com/watch?v=SW2Bwc17_wA

You tube :Video2 Animation RS Flip Flop https://www.youtube.com/watch?v=--pv3MZMoo0

You tube :Video3 Introduction to counter https://www.youtube.com/watch?v=iaIu5SYmWVM

Submitted By	**Approved By**
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Date of Submission:	**Date of Approval:** 26/08/2022
Remarks by DQAC (if any)	