Course Code	18CSC203J	Course Name	COMPUTER ORGANIZATION AND ARCHITECTURE	Course Category	C	*Professional Core*	L	T	P	C
							3	0	2	4

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*	Progressive Courses	*18CSC207J*
Course Offering Department	*Computer Science and Engineering*	Data Book / Codes/Standards	*Nil*		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	*Utilize the functional units of a computer*
CLR-2 :	*Analyze the functions of arithmetic Units like adders, multipliers etc.*
CLR-3 :	*Understand the concepts of Pipelining and basic processing units*
CLR-4 :	*Study about parallel processing and performance considerations.*
CLR-5 :	*Have a detailed study on Input-Output organization and Memory Systems.*
CLR-6 :	*Simulate simple fundamental units like half adder, full adder etc*

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	*Identify the computer hardware and how software interacts with computer hardware*	*2*	*80*	*70*
CLO-2 :	*Apply Boolean algebra as related to designing computer logic, through simple combinational and sequential logic circuits*	*3*	*85*	*75*
CLO-3 :	*Analyze the detailed operation of Basic Processing units and the performance of Pipelining*	*2*	*75*	*70*
CLO-4 :	*Analyze concepts of parallelism and multi-core processors.*	*3*	*85*	*80*
CLO-5 :	*Identify the memory technologies, input-output systems and evaluate the performance of memory system*	*3*	*85*	*75*
CLO-6 :	*Identify the computer hardware, software and its interactions*	*3*	*85*	*75*

Program Learning Outcomes (PLO)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	*H*	*H*	-	-	-	-	-	-	*M*	*L*	-	*M*	-	-	-
CLO-2 :	*H*	*H*	*H*	-	*H*	-	-	-	*M*	*L*	-	*M*	-	-	-
CLO-3 :	*H*	*H*	*H*	*H*	-	-	-	-	*M*	*L*	-	*M*	-	-	-
CLO-4 :	*H*	-	-	*H*	-	-	-	-	*M*	*L*	-	*M*	-	-	-
CLO-5 :	*H*	-	*H*	*H*	-	-	-	-	*M*	*L*	-	*M*	-	-	-
CLO-6 :	*H*	*H*	*H*	*H*	*H*	-	-	-	*M*	*L*	-	*M*	-	-	-

Duration (hour)		15	15	15	15	15
S-1	**SLO-1**	*Functional Units of a computer*	*Addition and subtraction of Signed numbers*	***Fundamental concepts of basic processing unit***	*Parallelism*	***Memory systems -Basic Concepts***
	SLO-2	*Operational concepts*	***Problem solving***	***Performing ALU operation***	*Need, types of Parallelism*	*Memory hierarchy*
S-2	**SLO-1**	*Bus structures*	***Design of fast adders***	***Execution of complete instruction, Branch instruction***	*applications of Parallelism*	*Memory technologies*
	SLO-2	*Memory locations and addresses*	***Ripple carry adder and Carry look ahead adder***	***Multiple bus organization***	*Parallelism in Software*	***RAM, Semiconductor RAM***
S-3	**SLO-1**	*Memory operations*	*Multiplication of positive numbers*	***Hardwired control***	*Instruction level parallelism*	***ROM,Types***
	SLO-2	*Memory operations*	***Problem Solving***	***Generation of control signals***	*Data level parallelism*	***Speed,size cost***
S 4-5	**SLO-1**	*Lab 1: To recognize various components of PC-**Input Output systems***	*Lab4:Study of TASM*	*Lab-7: Design of Half Adder*	*Lab-10: Study of Array Multiplier*	*Lab-13: Study of Carry Save Multiplication*
	SLO-2	*Processing and Memory units*	*Addition and Subtraction of 8-bit number*	*Design of Full Adder*	*Design of Array Multiplier*	*Program to carry out Carry Save Multiplication*
S-6	**SLO-1**	*Instructions, **Instruction sequencing***	*Signed operand multiplication*	***Micro-programmed control-***	***Challenges in parallel processing***	*Cache memory*
	SLO-2	*Addressing modes*	***Problem solving***	***Microinstruction***	***Architectures of Parallel Systems - Flynn's classification***	*Mapping Functions*

S-7	SLO-1	***Problem solving***	*Fast multiplication- Bit pair recoding of Multipliers*	***Micro-program Sequencing***	***SISD,SIMD***	***Replacement Algorithms***
	SLO-2	*Introduction to Microprocessor*	***Problem Solving***	***Micro instruction with Next address field***	***MIMD, MISD***	***Problem Solving***
S-8	SLO-1	*Introduction to Assembly language*	*Carry Save Addition of summands*	***Basic concepts of pipelining***	***Hardware multithreading***	***Virtual Memory***
	SLO-2	*Writing of assembly language programming*	***Problem Solving***	***Pipeline Performance***	***Coarse Grain parallelism, Fine Grain parallelism***	*Performance considerations of various memories*
S 9-10	SLO-1	*Lab-2:To understand how different components of PC are connected to work properly Assembling of System Components*	*Lab 5: Addition of 16-bit number Subtraction of 16-bit number*	*Lab-8: Study of Ripple Carry Adder Design of Ripple Carry Adder*	*Lab-11: Study of Booth Algorithm*	*Lab-14: Understanding Processing unit Design of primitive processing unit*
	SLO-2					
S-11	SLO-1	*ARM Processor: The thumb instruction set*	*Integer division – Restoring Division*	***Pipeline Hazards-Data hazards***	***Uni-processor and Multiprocessors***	*Input Output Organization*
	SLO-2	*Processor and CPU cores*	***Solving Problems***	*Methods to overcome Data hazards*	***Multi-core processors***	*Need for Input output devices*
S-12	SLO-1	***Instruction Encoding format***	*Non Restoring Division*	*Instruction Hazards*	***Multi-core processors***	*Memory mapped IO*
	SLO-2	***Memory load and Store instruction in ARM***	***Solving Problems***	*Hazards on conditional and Unconditional Branching*	***Memory in Multiprocessor Systems***	*Program controlled IO*
S-13	SLO-1	*Basics of IO operations.*	*Floating point numbers and operations*	*Control hazards*	***Cache Coherency in Multiprocessor Systems***	*Interrupts-Hardware, Enabling and Disabling Interrupts*
	SLO-2	*Basics of IO operations.*	***Solving Problems***	*Influence of hazards on instruction sets*	***MESI protocol for Multiprocessor Systems***	*Handling multiple Devices*
S 14-15	SLO-1	*Lab -3To understand how different components of PC are connected to work properly Disassembling of System Components*	*Lab-6: Multiplication of 8-bit number Factorial of a given number*	*Lab-9: Study of Carry Look-ahead Adder Design of Carry Look-ahead Adder*	*Lab-12: Program to carry out Booth Algorithm*	*Lab-15: Understanding Pipeline concepts* ***Design of basic pipeline.***
	SLO-2					

Learning Resources	1. *Carl Hamacher, ZvonkoVranesic, SafwatZaky, Computer Organization, 5th ed., McGraw-Hill, 2015* 2. *Kai Hwang, Faye A. Briggs, Computer Architecture and Parallel Processing", 3rd ed., McGraw Hill, 2016* 3. *Ghosh T. K., Computer Organization and Architecture, 3rd ed., Tata McGraw-Hill, 2011* 4. *P. Hayes, Computer Architecture and Organization, 3rd ed., McGraw Hill, 2015.*	5. *William Stallings, Computer Organization and Architecture – Designing for Performance, 10th ed., Pearson Education, 2015* 6. *David A. Patterson and John L. Hennessy Computer Organization and Design - A Hardware software interface, 5th ed., Morgan Kaufmann,2014*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		-	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
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