Course Code CSE2003	Computer Architecture and Organization	Course Type LT	Credits 4

Course Objectives:

The objectives of this course are:

- to provide basic concepts of computer architecture and organization
- to impart the knowledge of implementation of arithmetic operations in the computer.
- to develop a deeper understanding of the hardware environment upon which all processing are carried out.
- to provide knowledge about internals of memory system, interfacing techniques and subsystem devices.

Course Outcomes:

A student who successfully fulfills the course requirements will be able to:

1. Identify and explain the building blocks of computer.
2. Recognize addressing modes, and data/instruction formats.
3. Perform the arithmetic operations using various algorithms and number systems.
4. Design the single cycle data path for an instruction format for a given architecture.
5. Compare various cache memory mapping techniques.
6. Explain memory control, direct memory access, interrupts, and memory organization.

Student Outcomes (SO): a, b, c

a. An ability to apply the knowledge of mathematics, science and computing appropriate to the discipline

b. An ability to analyze a problem, identify and define the computing requirements appropriate to its solution.

c. An ability to design, implement and evaluate a system / computer-based system, process, component or program to meet desired needs

Unit No	Unit Content	No. of hours	SOs
1	**Introduction to Computer Architecture** Introduction to computer systems - Overview of Organization and Architecture -Functional components of a computer -Registers and register files-Interconnection of components- Organization of the von Neumann machine and Harvard architecture-Performance of processor Introduction to ISA (Instruction Set Architecture)-Instruction formats- Instruction types and addressing modes- Instruction execution (Phases of instruction cycle)- Assembly language programming-Subroutine call and return mechanisms-Single cycle	9 + 3	a

	Data path design-Introduction to multi cycle data path-Multi cycle Instruction execution. Tutorial on Assembly Language Programming		
2	**Data Representation and Computer Arithmetic** Fixed point representation of numbers-algorithms for arithmetic operations: addition- subtraction - multiplication - division (restoring and non-restoring)- Floating point representation with IEEE standards and algorithms for common arithmetic operations – conversion between integer and real numbers. Tutorial on Fixed and floating point arithmetic operations	**7 + 3**	**a**
3	**Memory System** Memory systems hierarchy-Main memory organization-Types of Main memory : SRAM , DRAM and its characteristics and performance – latency –cycle time -bandwidth- memory interleaving Cache memory: Address mapping-line size-replacement and policies- coherence Virtual memory: Paging (Single level and multi level) – Page Table Mapping – TLB Reliability of memory systems: Error detecting and error correcting systems. Tutorial on design aspects of memory system	**8 + 3**	**b, c**
4	**External storage systems and Pipelining** Organization and structure of disk drives: Electronic- magnetic and optical technologies, RAID Architectures. Pipelining – Data Hazards – Instructional hazards – Performance Case Study on RAID architectures used in Industry	**9 + 2**	**a, b**
5	**Interfacing and Communication** I/O fundamentals: handshaking, buffering - I/O techniques: programmed I/O, interrupt-driven I/O, DMA- Interrupt structures: vectored and prioritized-interrupt overhead- Buses: Bus Protocols - Arbitration.	**7**	**a,b**
6	**Multiprocessor Architectures** Introduction – Characteristics – Multi core Architecture – Parallel Processing - Flynn Classification – Inter Connection Structures – Memory Organization	**7**	
7	**Guest Lecture on Contemporary Topics**	**2**	**a**
	Total Hours:	**60**	
Mode of Teaching and Learning: *Flipped Class Room, Activity Based Teaching/Learning,*			

Digital/Computer based models, wherever possible to augment lecture for practice/tutorial and minimum 2 hours lectures by industry experts on contemporary topics				
Mode of Evaluation and assessment: *The assessment and evaluation components may consist of unannounced open book examinations, quizzes, student's portfolio generation and assessment, and any other innovative assessment practices followed by faculty, in addition to the Continuous Assessment Tests and Term End Examinations.*				
Text Books:				
1.	Carl Hamacher, Zvonko Vranesic, Safwat Zaky, "Computer organization", Mc Graw Hill, Fifth edition , 2011, ISBN: 9781259005275.			
2.	W. Stallings, "Computer organization and architecture: Designing for Performance", Prentice-Hall, 9th edition, 2013, ISBN: 978-9332518704.			
Reference Books:				
1.	David A. Patterson and John L. Hennessy "Computer Organization and Design-The Hardware/Software Interface", Morgan Kaufmann, 5th edition, 2011.			
2.	James P Hayes, "Computer Architecture and Organization", Mc Graw Hill, 3rd Edition, 2012, ISBN:9781259028564.			
Recommendation by the Board of Studies on				25.06.2018
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Compiled by				*Dr S Raju and Dr R Ganesan*