Mandsaur University

Bachelor of Technology (Computer Science and Engineering)

Semester-V

L-3 T-1 P-0 C-4

25CSE2900T: Computer Architecture and Organization

Course Objectives

- To know the background of internal communication of computer.
- To have better idea on how to write assembly language programs.
- To be clear with memory management techniques, I/O communication.
- To Summarize the Instruction execution stages.
- To notice how to perform computer arithmetic operations using different types of serial communication techniques.

Course Outcomes (COs)

1. Understand the theory and architecture of the central processing unit. architecture and functionality of central processing unit, I/O and memory organization.
2. Understand the organization, design, and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.
3. Analyze cost performance and design trade-offs in designing and constructing a computer processor including memory.
4. Apply the concepts of parallel processing, pipelining and inter-processor.
5. Analyze the design issues in terms of speed, technology, cost, performance.

Articulation Matrix

(Program Articulation Matrix is formed by the strength of correlation of COs with POs and PSOs. The strength of correlation is indicated as 3 for substantial (high), 2 for moderate (medium) correlation, and 1 for slight (low) correlation)

CO/PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	-	1	1	-	1	-	-	-	-	-	-	-	-
CO3	2	-	3	-	-	1	2	1	1	-	-	-	-	1	1
CO4	-	3	2	2	2	-	1	1	-	-	-	1	1	-	1
CO5	3	2	1	2	2	1	1	1	-	-	-	1	1	1	1

High-3 Medium-2 Low-1

UNIT I: Basic Structure of Computer 7Hours

Structure of Desktop Computers, CPU: GeneralRegister Organization- Memory Register, Instruction Register, Control Word, StackOrganization, Instruction Format, ALU, I/O System,bus, CPU and Memory ProgramCounter, Bus Structure, Register Transfer Language- Bus and Memory Transfer,addressing modes.

UNIT II: Control Unit Organization 11Hours

Basic Concept of Instruction, Instruction Types, Micro Instruction Formats, Fetch andExecution cycle, Hardwired control unit, Micro-programmed Control unit- microprogramsequencer Control Memory, Sequencing and Execution of Micro Instruction. ComputerArithmetic: Addition and Subtraction, Tools Compliment Representation, Signed Additionand Subtraction, Multiplication and division, Booths Algorithm, Division Operation.

UNIT III: Floating Point Arithmetic Operation 11Hours

Design of Arithmetic unit, Instruction set architecture, CISC Scalar Processors, RISC Scalar Processors,

Linearpipeline processor, Nonlinear pipeline processor, Instruction pipeline design, Mechanismsfor instruction pipelining, pipeline hazards, Dynamic instruction scheduling – scoreboarding and Tomsula'salgorithm, Branch handling techniques, Arithmetic Pipeline.

UNIT IV: Multifunctional Architecture Pipelines **7 Hours**

Design, Static arithmetic pipeline, Multifunctional arithmetic pipelines, Flynn's Classification, System Attributes to Performance, Parallel computer modelsMultiprocessors and multicomputer, Multivector and SIMD Computers. Data and resourcedependences, Hardware and software parallelism, Program partitioning and scheduling,Grain size and latency, Control flow, data flow and Demand driven mechanisms. Staticinterconnection networks, Dynamic interconnection Networks: Bus Systems, CrossbarSwitch, Multistage and Combining Networks.

UNIT V: SharedMemory model **9 Hours**

Main memory- RAM, ROM, Secondary Memory – Magnetic Tape, Disk, Optical Storage,Cache Memory: Cache Structure and Design, Mapping Scheme, Replacement Algorithm,Improving Cache Performance, Virtual Memory, memory management hardware, Cachecoherence, Snoopy protocols, Directory based protocols, distributed memory model.

Total: 45 Hours

Reference(s):

1. Morris Mano, "Computer System Organization" PHI.
2. C. Hamacher, Z. Vranesic and S. Zaky, "Computer Organization", McGraw-Hill, 2002.
3. Kai Hwang, "Advanced computer architecture", TMH. 2013 – 14.
4. William Stallings: Computer Organization & Architecture, 9th Edition, Pearson, 2015.
5. Kain, Advance Computer Architecture: - A System Design Approach", PHI Learning.

List of e-Learning Resources:

1. https://nptel.ac.in/
2. https://www.coursera.org/

Subject Tr. **Academic Coordinator** **HoD** **Sr. Faculty Nominated by DOAA**