CE258: Microprocessor and Computer Organization

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	2	0	6	**5**
Marks	100	50	0	150	

Pre-requisite courses:

- Digital Electronics

Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction to digital logic Circuit	03
2.	Register Transfer and Microoperations	09
3.	Basic Computer Organization and Design	08
4.	Central Processing Unit	05
5.	Pipeline and Vector Processing	05
6.	Computer Arithmetic	06
7.	Memory Organization	06
8.	8086,80186, 80286 Processor	06
9.	80386 Processors	10
10.	Current Era of Microprocessors	02
	Total hours (Theory) :	60
	Total hours (Lab) :	30
	Total hours :	90

Detailed Syllabus:

1.	**Introduction to digital logic Circuit**	03 Hours	05%
	Digital Computers, Logic Gates, Combinational Circuits (Half adder, Full Adder), Flip-Flops(SR, D, JK, T, Edge-Triggered)		

2.	**Register Transfer and Microoperations**	09 Hours	15%
	Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Microoperation, Logic Microoperations, Shift Microoperation, Arithmetic Logic Shift Unit.		
3.	**Basic Computer Organization and Design**	08 Hours	13%
	Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory Reference, Instructions, Input-Output and Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic.		
4.	**Central Processing Unit**	05 Hours	09%
	Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes.		
5.	**Pipeline and Vector Processing**	05 Hours	09%
	Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors.		
6.	**Computer Arithmetic**	06 Hours	10%
	Introduction: Binary, Octal, Decimal, Hexadecimal representation, Integer Numbers: Sign-Magnitude,1's complement,2's complement, Addition and Subtraction, Multiplication Algorithm.		
7.	**Memory Organization**	06 Hours	10%
	Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.		
8.	**8086, 80186, 80286 Processor**	06 Hours	10%
	Architectural differences of 8086, 80186 and 80286 Processors.		
9.	**80386 Processors**	10 Hours	16%
	System Architecture, Registers, Memory management: Segment Translation, Page Translation, Combining Segment and Page Translation.		
10.	**Current Era of Microprocessors**	02 Hours	03%
	Comparison of AMD and Intel Architecture, Features of current era of AMD and Intel processors; Tick-Tock: manufacturing pattern of Intel.		

Course Outcome (COs):

At the end of the course, the students will be able to:

CO1	Understand and Design of Arithmetic circuit, Logic circuit, Shift circuit and Control Unit circuit by using elements of digital logic.
CO2	Visualize and understand the working of CPU, different instruction formats, addressing modes, pipeline and vector processing. Evaluate the performance of pipeline approach.
CO3	Understand and apply r's and r-1's complement in Addition, Subtraction and Multiplication of signed and unsigned numbers.
CO4	Describe the memory hierarchy and requirements of different memory. Compare and evaluate different cache memory mapping techniques.
CO5	Understand and differentiate processors development from history to current era.

Course Articulation Matrix:

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	-	-	-	1	1	-	-	1	2	-
CO2	3	3	3	1	-	-	-	1	1	-	-	-	2	-
CO3	2	2	3	-	-	-	-	1	1	-	-	-	2	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	2	-
CO5	3	3	3	3	-	-	-	-	-	-	-	-	3	-

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

Recommended Study Material:

- **Text book:**
  1. Computer System Architecture, Morris Mano (3rd Edition) Prentice Hall.
  2. 80386 Programmer's reference manual from MIT.
  3. Microprocessors and Interfacing: Experiments Manual: Programming and Hardware by Douglas V. Hall.
- **Reference book:**
  1. William Stalling, Computer Organization & Architecture-Designing for Performance, Pearson Prentice Hall (8th Edition).

2. A.S. Tananbum, Structured Computer Organization, Pearson Publisher.
3. The Essentials of Computer Organization and Architecture Linda Null, Julia Lobur.
4. John P Hayes, Computer Architecture & Organization, McGraw-Hill.
5. Computer Architecture: Pipelined and Parallel Processor Design Michael J. Flynn (4th edition).

❖ **Web material:**

1. Computer Organization and Architecture: A Pedagogical Aspect: https://onlinecourses.nptel.ac.in/noc21_cs37/course
2. https://css.csail.mit.edu/6.858/2014/readings/i386.pdf (80386 Programmer Reference Material)

❖ **Software:**

1. 8085 &8086 Simulator.
2. Logisim : http://www.cburch.com/logisim/
3. Little Man Computer
   a. https://peterhigginson.co.uk/LMC/
   b. https://www.101computing.net/LMC/
   c. https://www.youtube.com/watch?v=fXMCnzdNemc
   d. https://www.youtube.com/watch?v=sEFnRDgkaWA