FORMAT FOR COURSE CURRICULUM

L	T	P/S	SW/FW	No. of PSDA	TOTAL CREDIT UNITS
3	0	2	0		4

Course Title: Computer Architecture and Assembly Language **Credit Units: 4**

Course Level: **UG** **Course Code-[CSIT131]**

Course Objectives:

- Understand of the basic structure and operation of a digital computer.
- Understand the operation of the arithmetic unit including algorithms
- Implement fixed-point and floating-point addition, subtraction, multiplication & division.
- Understand the different ways of communicating with I/O devices and standard I/O interfaces.
- Study the hierarchical memory system including cache memories and virtual memory

Pre-requisites: Basic concepts of digital logic

Course Contents/Syllabus:

	Weightage (%)
Module I General Computer Architecture	**15%**
Descriptors/Topics Block Diagram of typical Computer, Memory Section, Input/Output Section, CPU, Registers, Arithmetic Unit, Micro operations: Register Transfer, Bus and Memory Transfer, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit,	
Module II : Basic Computer Organization and Design	**15%**
Descriptors/Topics Instruction Codes, Operation code, Timing and Control, Instruction Cycle, Memory Reference Instructions, Input Output Instructions and Interrupts	
Module III : Central processing Unit	**15%**
Descriptors/Topics General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, RISC, CISC. Control Memory: Control Word, Microinstruction, Microprogramming	
Module IV : Pipelining and Vector Processing	**15%**
Descriptors/Topics Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, Vector Processing, Array Processor,	
Module V: Input Output Organization	**15%**

Descriptors/Topics **I**/O devices: Accessing, I/O interfaces, Asynchronous data transfer: Strobe control, handshaking, Modes of transfer: programmed I/O, Interrupt-initiated I/O, DMA, Interrupts: types, interrupt hardware and priority I/O processors.	
Module VI: Memory Organization	**15%**
Descriptors/Topics Memory Hierarchy, Main memory (RAM and ROM chips), Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware	
Module VII: Introduction to Microprocessor	**10%**
Descriptors/Topics Machine Language, Assembly Language, Assembler, High Level Language, Compiler, Interpreter, Pin diagram and Internal Architecture 8086	

Course Learning Outcomes:

- Explain the basic knowledge of the design of digital logic circuits and apply to computer organization.
- Understand the digital components like flip flops, registers, counters.
- Describe the functional units of the processor such as the register file and arithmetic-logical unit.
- Analyze the representation of data, addressing modes, instructions sets and the computer arithmetic.
- Apply the concepts of the basic parallel, pipelined, superscalar, and RISC/CISC architectures.
- Explore the cost-performance issues and design trade-offs of computer arithmetic.
- Designing and constructing a computer processor including memory.

Pedagogy for Course Delivery:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Attendance is compulsory in lecture (in blended mode) and laboratory which carries 5 marks in overall evaluation.
- One internal exam will be conducted as a part of internal theory evaluation. Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.
- Surprise tests/Quizzes/Seminar/tutorial will be conducted having a share of five marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments shall be performed in the laboratory related to course contents.

List of Professional Skill Development Activity

i. Project 1- Design a circuit using Multiplexers
ii. Project 2- Design a circuit using Registers

iii. Project 3- Design a circuit using Flip flops
iv. Project 4- Design a circuit using Encoders and Decoders
v. Project 5- Design a circuit showing Memory architeture

Lab/ Practicals details, if applicable:

List of Experiments:

1. Write a program to addition, subtract, and compare two numbers.
2. Write a program to find the sum of two BCD numbers stored in memory.
3. Write a program to find maximum and minimum of numbers in an array.
4. Write a program to add ten numbers and find their average.
5. Write a program to perform binary arithmetic operations on two 32 bit numbers.
6. Write a program to convert lowercase string to upper case and vice versa.
7. Write a program to arrange numbers in ascending order.
8. Write a program for introduction to Interrupts used for user interaction through keyboard and screen:
9. Write a program to clear the screen, setting cursor, display string on the screen, Taking user input.
10. Write a program to find last occurrence of a character in a string and replace the same character with any other character entered by user.
11. Write a program to input a string from user and display the string on the center of the screen.
12. Write a program to reverse a string entered by the user.
13. Write a program to find substring from a given string.
14. Write an assembly language program to find whether two strings, stored in memory, match or not.
15. Write an assembly Language program to sort an array using bubble sort method.
16. Write an assembly language program checks an input string against a password string stored in the memory and outputs an appropriate message if the string is not equal.
17. Write an assembly language program to compute the Greatest Common divisor (GCD) of two 16-bit unsigned integers, and store the result in world location.

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)
80	20

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment (____ %)					End Term Examination (---%)
Components (Drop down)	Mid Term	Self Work/PSDA	Viva	Attendance	

Linkage of PSDA with Internal Assessment Component, if any	**10**	**20**	**5**	**5**	
Weightage (%)		10			60%

Lab/ Practical/ Studio Assessment:

	Continuous Assessment/Internal Assessment (____ %)					**End Term Examination (____ %)**		
Components (Drop down	**Mid Term**	**Lab Record**	**Performance**	**Viva**	**Attendance**	**Practical**	**Viva**	**Total**
Weightage (%)	10	10	10	5	5	40	20	60

Text Books

· Computer System Architecture, M. Morris Mano, 3 rd Edition, PHI, 2003
· Computer Organization and Architecture, William Stallings, 7th edition, PHI, 2004
· Microprocessor Architecture Programming and applications with 8085, Ramesh S. Gaonkar, Fourth Edition
· Structured computer Organization, Tanenbaum, PHI, 4 th edition, Pearson, 2006

References:

John L. Hennessy & David A, Patterson, A Quantative Approach, Computer Architecture, Elsevier, 3rd edition Web References: · www.cs.iastate.edu/~prabhu/Tutorial/title.html · www.tutorialspoint.com/computer_logical_organization/

Any other Study Material:

- **NPTEL online**
- **Youtube Lectures**