

III Semester

COMPUTER ORGANIZATION AND ARCHITECTURE

Course Code	21CS34	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning Objectives

- CLO 1. Understand the organization and architecture of computer systems, their structure and operation
- CLO 2. Illustrate the concept of machine instructions and programs
- CLO 3. Demonstrate different ways of communicating with I/O devices
- CLO 4. Describe different types memory devices and their functions
- CLO 5. Explain arithmetic and logical operations with different data types
- CLO 6. Demonstrate processing unit with parallel processing and pipeline architecture

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1

Basic Structure of Computers: Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement

Machine Instructions and Programs: Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes

Textbook 1: Chapter1 – 1.3, 1.4, 1.6 (1.6.1-1.6.4, 1.6.7), Chapter2 – 2.2 to 2.5

Teaching-Learning Process Chalk and board, Active Learning, Problem based learning

Module-2

Input/Output Organization: Accessing I/O Devices, Interrupts – Interrupt Hardware, Direct Memory Access, Buses, Interface Circuits

Textbook 1: Chapter4 – 4.1, 4.2, 4.4, 4.5, 4.6

Teaching-Learning Process Chalk and board, Active Learning, Demonstration

Module-3

Memory System: Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size, and Cost, Cache Memories – Mapping Functions, Virtual memories

Textbook 1: Chapter 5 – 5.1 to 5.4, 5.5 (5.5.1, 5.5.2)

Teaching-Learning Process Chalk and board, Problem based learning, Demonstration

maximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module. Marks scored out of 100 shall be reduced proportionally to 50 marks

Suggested Learning Resources:

Textbooks

1. Charles H Roth and Larry L Kinney, Raghunandan g H, Analog and Digital Electronics, Cengage Learning, 2019

Reference Books

1. Anil K Maini, Varsha Agarwal, Electronic Devices and Circuits, Wiley, 2012.
2. Donald P Leach, Albert Paul Malvino & Goutam Saha, Digital Principles and Applications, 8th Edition, Tata McGraw Hill, 2015.
3. M. Morris Mani, Digital Design, 4th Edition, Pearson Prentice Hall, 2008.
4. David A. Bell, Electronic Devices and Circuits, 5th Edition, Oxford University Press, 2008

Weblinks and Video Lectures (e-Resources):

1. Analog Electronic Circuits: <https://nptel.ac.in/courses/108/102/108102112/>
2. Digital Electronic Circuits: <https://nptel.ac.in/courses/108/105/108105132/>
3. Analog Electronics Lab: <http://vlabs.iitkgp.ac.in/be/>
4. Digital Electronics Lab: <http://vlabs.iitkgp.ac.in/dec>


Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

1. Real world problem solving - applying the design concepts of oscillator, amplifier, switch, Digital circuits using Opamps, 555 timer, transistor, Digital ICs and design a application like tone generator, temperature sensor, digital clock, dancing lights etc.


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Module-4	
Arithmetic: Numbers, Arithmetic Operations and Characters, Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers	
Basic Processing Unit: Fundamental Concepts, Execution of a Complete Instruction, Hardwired control, Microprogrammed control	
Textbook 1: Chapter 2-2.1, Chapter 6 – 6.1 to 6.3	
Textbook 1: Chapter 7 – 7.1, 7.2, 7.4, 7.5	
Teaching-Learning Process	Chalk& board, Problem based learning
Module-5	
Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, Vector Processing, Array Processors	
Textbook 2: Chapter 9 – 9.1, 9.2, 9.3, 9.4, 9.6, 9.7	
Teaching-Learning Process	Chalk and board, MOOC
Course Outcomes	
At the end of the course the student will be able to:	
CO 1. Explain the organization and architecture of computer systems with machine instructions and programs	
CO 2. Analyze the input/output devices communicating with computer system	
CO 3. Demonstrate the functions of different types of memory devices	
CO 4. Apply different data types on simple arithmetic and logical unit	
CO 5. Analyze the functions of basic processing unit, Parallel processing and pipelining	
Assessment Details (both CIE and SEE)	
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together	
Continuous Internal Evaluation:	
Three Unit Tests each of 20 Marks (duration 01 hour)	
1. First test at the end of 5 th week of the semester	
2. Second test at the end of the 10 th week of the semester	
3. Third test at the end of the 15 th week of the semester	
Two assignments each of 10 Marks	
4. First assignment at the end of 4 th week of the semester	
5. Second assignment at the end of 9 th week of the semester	
Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)	
6. At the end of the 13 th week of the semester	
The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50 marks (to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).	
CIE methods /question paper has to be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.	
Semester End Examination:	
Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours)	
1. The question paper will have ten questions. Each question is set for 20 marks.	
2. There will be 2 questions from each module. Each of the two questions under a module (with a	

maximum of 3 sub-questions), should have a mix of topics under that module.
The students have to answer 5 full questions, selecting one full question from each module. Marks scored out of 100 shall be reduced proportionally to 50 marks
Textbooks <ol style="list-style-type: none"> 1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization, 5th Edition, Tata McGraw Hill 2. M. Morris Mano, Computer System Architecture, PHI, 3rd Edition
Reference: <ol style="list-style-type: none"> 1. William Stallings: Computer Organization & Architecture, 9th Edition, Pearson
Weblinks and Video Lectures (e-Resources): <ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/106/103/106103068/ 2. https://nptel.ac.in/content/storage2/courses/106103068/pdf/coa.pdf 3. https://nptel.ac.in/courses/106/105/106105163/ 4. https://nptel.ac.in/courses/106/106/106106092/ 5. https://nptel.ac.in/courses/106/106/106106166/ 6. http://www.nptelvideos.in/2012/11/computer-organization.html
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning <ul style="list-style-type: none"> • Discussion and literature survey on real world use cases • Quizzes


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