

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: COMPUTER ORGANIZATION AND ARCHITECTURE
(Code: 3340705)

Diploma Programmes in which this course is offered	Semester in which offered
Computer Engineering	4 th Semester

1. RATIONALE

This course provides detail of computer system's functional components, their characteristics, performance and interactions including system bus, different types of memory and input/output organization and CPU. This course also covers the architectural issues such as instruction set program and data types. On top that, the students are also introduced to the increasingly important area of parallel organization. This course also serves as a basic to develop hardware related projects. And hence it is an important course for all students of computer engineering branch.

2. COMPETENCIES

The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competencies:

- **Apply computer architecture theory to solve the basic functional computer problem.**
- **Show and assemble basic computer components.**

3. COURSE OUTCOMES

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

- i. Describe the organization of a computer system in terms of its main components.
- ii. Identify various parts of a system memory hierarchy.
- iii. Interface digital circuits to microprocessor systems.
- iv. Relate design principles in instruction set design including RISC architectures.

4. Teaching and Examination Scheme

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
3	0	0	3	70	30	00	00	100

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** – Credit **ESE** - End Semester Examination; **PA** - Progressive Assessment.

5. COURSE DETAILS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I Computer Architecture & Register- Transfer and Micro- operations	1a. Describe different types of Flip Flops.	1.1 Overview of computers and basics of Digital Electronics-Flip Flops, Registers, Shift registers
	1b. Explain registers and register transfers language.	1.2 Register - Transfer-Language 1.3 Register Transfer 1.4 Bus Transfer and Memory Transfer
	1c. Describe various arithmetic micro operations.	1.5 Arithmetic Micro-Operations Addition, Subtraction, Complements, Negation, Increment and Decrement
	1d. List various logic micro operations.	1.6 Logic micro operations
	1e. List various shift operations	1.7 Shift Micro operation. 1.8 Arithmetic Logic Shift Unit
Unit – II Basic Computer Organization	2a. Discuss the various fields of instruction code.	2.1 Instruction Codes
	2b. Define registers and state the role of each register in a basic computer.	2.2 Computer Registers AC or Accumulator, Data Register or DR, the AR or Address Register, program counter (PC), Memory Data Register (MDR), Index register, Memory Buffer Register.
	2c. List the types of computer instruction format.	2.3 Computer Instructions 2.4 Timing and Control
	2d. Develop a control timing signals diagram for the given instruction.	
	2e. Explain phases of instruction cycle.	2.5 Instruction Cycle 2.6 Memory Reference Instructions
	2f. Describe interrupt.	2.7 Input-Output and Interrupt
	2g. Draw functional block diagram of the hypothetical BASIC computer.	2.8 Complete Computer Description
Unit – III Central processor organization & Pipeline processing	3a. Draw General Register organization.	3.1 General Register Organization
	3b. Define stack. Explain the stack organization of CPU.	3.2 Stack Organization
	3c. Define instruction and instruction format.	3.3 Instruction Formats
	3d. Discuss various addressing	3.4 Addressing Modes

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	modes used in computers.	
	3e. Explain data transfer and data manipulation instruction.	3.5 Data Transfer and manipulation:
	3f. Discuss program control instructions.	3.6 Program Control
	3g. Compare RISC and CISC Architecture.	3.7 RISC 3.8 CISC Characteristics 3.9 RISC Characteristics
	3h. Describe pipelining in CPU Design.	3.10 Parallel Processing
Unit – IV Memory Organization	4a. Classify various types of Memory.	4.1 Memory classifications 4.2 RAM,ROM,PROM,EPROM
	4b. Understand memory hierarchy and interleaving.	4.3 Memory Hierarchy
	4c. Discuss different types of main memory.	4.4 Main Memory and 4.5 Auxiliary Memory
	4d. Discuss different types of auxiliary memory.	
	4e. Define Associative Memory.	4.6 Associative Memory
	4f. Describe cache and virtual memory.	4.7 Cache Memory 4.8 Virtual memory
	4g. List advantages and disadvantages of using cache memory.	
Unit – V Input/output Organization	5a. Define I/O interface.	5.1 Input-Output Interface
	5b. Explain methods of Asynchronous Data transfer.	5.2 Asynchronous Data Transfer 5.3 Strobe Control 5.4 Handshaking
	5c. Describe Asynchronous Serial Transfer.	5.5 Asynchronous Serial Transfer
	5d. Name different modes of data transfer.	5.6 Modes of Data Transfer
	5e. Discuss Input Output processor and its organization.	5.7 Input-Output Processor (IOP)

6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Computer Architecture & Register Transfer and Micro-operations	11	7	10	0	17
II	Basic Computer Organization	6	2	7	2	11
III	Central processor organization & Pipeline processing	10	6	8	2	16
IV	Memory Organization	8	5	10	0	15
V	Input/output Organization	7	3	8	0	11
	Total	42	23	43	4	70

Legends: R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

7. SUGGESTED LIST OF EXERCISES/PRACTICALS

There are no practical in this course and hence it is not applicable

8. SUGGESTED LIST OF STUDENT ACTIVITIES

Group Seminars presentations (Group of max. 3 students) on different topics.

9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

Teachers should organize tutorials to implement the curriculum effectively.

10. SUGGESTED LEARNING RESOURCES**A) List of Books**

S. No.	Title of Book	Author	Publication
1.	Computer system Architecture	Mano ,M. Morris	Pearson publication, Latest Edition ISBN: 978-81-317-0070-9
2.	Computer Architecture and Organization	Ghoshal, Subrata	Pearson publication, Latest Edition
3.	Computer Architecture	Parhami, Behrooz	Oxford publication, Latest Edition ISBN: 978-0-19-808407-5

B) List of Major Equipment/ Instrument with Broad Specifications

There are no practical in this course and hence equipment/instruments are not required as such.

C) List of Software/Learning Websites

1. <http://www.ddegjust.ac.in/studymaterial/msc-cs/ms-07.pdf>
2. <http://www.iitg.ernet.in/asahu/cs222/Lects/>
3. http://www.srmuniv.ac.in/downloads/computer_architecture.pdf

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE**Faculty Members from Polytechnics**

- **Prof. R. M. Shaikh**, H.O.D Computer Department, K. D. Polytechnic, Patan
- **Prof. K. N. Raval**, H.O.D Computer Department, R. C. Technical Institute, Ahmedabad
- **Prof. R. K. Vaghela**, Lecturer Computer Department, R. C. Technical Institute, Ahmedabad

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. M A Rizvi** Associate Professor, Dept. of Computer Engineering and Applications
- **Dr. R K Kapoor** Associate Professor, Dept. of Computer Engineering and Applications