GUJARAT TECHNOLOGICAL UNIVERSITY

Syllabus for Master of Computer Applications, 1st Semester
Subject Name: Basic Computer Concepts
Subject Code: 619406

With effective from academic year 2020-21

1. **Learning Objectives:**
   - **1)** To understand the fundamental concepts of Computers
   - **2)** To familiarize with components of computer systems
   - **3)** To understand working of computer and its application
   - **4)** To familiarize with modern Operating system concepts.

2. **Prerequisites:** Basic understanding of computer systems

3. **Course Contents:**

Unit	Course Content	Weightage Percentage
Unit I	**Introduction to Digital Logic:** Boolean algebra, Gates (AND,OR,NOT, NAND, NOR and XOR)	**3 (10%)**
Unit II	**Basics of Computer Architecture:** Organization and Architecture, Structure and Function, Evolution of the Intel x86 Architecture, Computer components, Computer Function, Interconnection Structures, Bus Interconnection, Point-to-Point Interconnect, USB, PCI Express	**5 (20%)**
Unit III	**Central Processing Unit :** Processor Organization, Register Organization, Instruction Cycle, CPU Bus Structure **Input and Output:** External devices, I/O Modules, Programmed I/O, Interrupt driven I/O, DMA	**7 (25%)**
Unit IV	**Introduction to Operating System and Systems Software's** Operating System Overview, Introduction to Scheduling Functions of Compilers / Interpreters, Linkers, Loaders, Cross Compilers (*)	**7 (25%)**
Unit V	**Computer Memory System Overview** Characteristics of Memory Systems, The Memory Hierarchy **Cache Memory:** Cache Memory Principles, Elements of Cache Design (Cache Addresses, Cache size, Mapping function, replacement algorithms, write policy, line size, number of caches) **Internal Memory:** Semiconductor Main Memory, Error correction, DDR DRAM, Flash memory, Newer non-volatile solid-state memory Technologies **External Memory:** Magnetic Disk, RAID, Solid State Drives, Optical Memory, Magnetic Tape	**6 (20%)**
	TOTAL	28 (100%)

Desirable:

- **Overview of Special-purpose Operating System:** Real Time Operating System (RTOS), Embedded Systems (Characteristics of Embedded Systems, TinyOS), Cloud Operating Systems, I oT Operating Systems

4. **Text Book:**
   - William Stallings, "Computer Organization and Architecture", 10th Edition, Pearson

5. Reference Books:

1. Morris Mano,Digital Logic and Computer Design, PHI
2. Andrew S. Tanenbaum, Todd Austin, Structured Computer Organization, 6th Edition, Pearson
3. Anita Goel,Computer Fundamentals, Pearson Education
4. William Stallings, "Operating Systems: Internals and Design Principles", 9th Edition, Pearson

6. Chapter wise Coverage from the Text Book:

Unit No.	Text Books	Topics/Subtopics
1	Book-I	Chapter 11 (11.1 to 11.2)
2	Book-I	Chapter 1 (1.1,1.2, 1.4), Chapter 3
3	Book-I	Chapter 14 (14.1 to 14.3), Chapter 7 (7.1 to 7.5)
4	Book I	Chapter 8 (8.1 to 8.3)
5	Book I	Chapter 4 (4.1 to 4.3), Chapter 5, 6
		Functions of Compilers / Interpreters, Linkers, Loaders, Cross Compilers - web sources

7. Accomplishment of the student after completing the course:

After completion of the course, students will be able to

- Explain the underlying processes of various topics and operations performed by them. For example,
  - When the system is started (booted), what happens;
  - Purpose of # include <stdio.h> in C and other libraries;
  - when the run command is given, what happens; etc
  - How arrays are internally stored?
- Utilize the internal architecture to understand the possibilities of optimizing the code and software

8. ACTIVE LEARNING ASSIGNMENTS:

- Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding of various
  - Operating Systems like Windows, LINUX, Ubuntu, Embedded Systems, Cloud OS, IoT OS, Mobile OS etc.
  - Topics from Book: Ron White, "How Computers Work", TechMedia Publications
- Compute the addition of array elements and calculate average using shared memory. Average will be calculated using barrier. Array is declared as shared resource.

- **Producer Consumer problem:**
  - Implement producer, consumer problem using bounde d buffer where array is shared. When producer will put the element in the array, consumer will wait until producer will release the array and same operation is applicable for consumer. Implement mutual conclusion using semaphore. When array

is full, producer will wait until consumer will consume at least one element. When buffer is e mpty, consumer will wait until producer will produce at least one element.

- Implement producer, consumer problem using un bounded buffer where array is shared. When producer will put the element in the array, consumer will wait until producer will release t he array and same operation is applicable for consumer. Implement mutual conclusion using semaphore. When buffer is empty, consumer will wait until producer will produce at least one element.

- **Reader Writer problem:**
  - More than one Reader can re ad from a file, but, when one writer will write, no other writer and readers can operate on the file. When one writer will write, whole file is locked by that writer. Implement these features using mutual exclusion.

- There is an array of elements of int. Generate histogram for calculating the occurrence of number of values within given range. Implement mutual exclusion and barrier in this application.

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