Annexure-5(b)

Syllabi of
Departmental Courses (DC) Courses
B.Tech III Semester
For batch admitted 2020-21
(Computer Science & Design)
Under Flexible Curriculum
[Item-13]

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR-474005
(A Govt. Aided UGC Autonomous Institute Affiliated to RGPV, Bhopal)
Department of Computer Science and Engineering

COMPUTER SYSTEM ORGANIZATION
290304 (DC)

COURSE OBJECTIVES

- To provide the fundamental knowledge of a computer system and its processing units.
- To provide the details of input & output operations, memory management and performance measurement of the computer system.
- To understand how computer represents and manipulate data.

Unit -I

Introduction: Von-Neumann Model, Various Subsystems, CPU, Memory, I/O, System Bus, CPU and Memory Registers, Program Counter, Accumulator, Register Transfer and Micro Operations: Register Transfer Language, Register Transfer, Tree-State Bus Buffers, Bus and Memory Transfers, Arithmetic Micro-Operation, Logic Micro-Operation, Shift Micro- Operation Register Transfer Micro Operations, Arithmetic Micro-Operations, Logic Micro- Operations and Shift Micro-Operations.

Unit- II

Computer Arithmetic: Addition and Subtraction with Signed-Magnitude, Multiplication Algorithm, Division Algorithm, Division Algorithms, Floating-Point Arithmetic Operations.

Central Processing Unit (CPU): General Purpose Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC).Hardwired and Micro programmed Control.

Unit -III

Microprocessors: Introduction of 8085 Microprocessor: Architecture, Instruction Set, Addressing Modes, Interrupts and Basic Assembly Language Programming.

Unit -IV

Input-Output Organization: Peripheral Devices, I/O Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, DMA (DMA Controller, DMA Transfer),

Input-Output Processor (IOP), Data Transfer- Serial/Parallel, Simplex/ Half Duplex/ Full Duplex.

Unit-V

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory- Organization and Mappings, Memory Management Hardware, Introduction to Pipelining & Multiprocessors.

RECOMMENDED BOOKS

- Computer System Architecture, Morris Mano, PHI.
- Microprocessor Architecture, Programming and Applications with the 8085, Gaonkar,
- Computer Organization, Carl Hamacher, THM.
- Computer Architecture and Organization, J P Hayes, Mc-Graw Hills, New Delhi.

COURSE OUTCOMES

After completion of the course students would be able to:

CO1. Recall the basic building blocks of computer Architecture.
CO2. Explain different memories and the functional units of a processor.
CO3. Explain the concept of working of microprocessor, multiprocessor and pipelining.
CO4. Analyze various modes of Input-Output data transfer.
CO5. Evaluate the arithmetic related to the number system.
CO6. Develop the skill of writing low level programming.

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Department of Computer Science and Engineering

OPERATING SYSTEMS
290303 (DC)

COURSE OBJECTIVES

- Provide basic knowledge of computer operating system structures and functioning.
- Compare several different approaches to memory management, file management and process management
- Understand various problems related to concurrent operations and their solutions.

Unit- I

Basics of operating systems: Generations, Types, Structure, Services, System Calls, System Boot, System Programs, Protection and Security.

Process management: Process Concepts, Process States, Process Control Block, Scheduling-Criteria, Scheduling Algorithms and their Evaluation, Threads, Threading Issues.

Unit-II

Process synchronization: Background, Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors.

Deadlock: System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery form Deadlock.

Unit-III

Memory management: Main Memory, Swapping, Contiguous Memory Allocation, Paging, Structure of Page Table, Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing.

Unit-IV

Storage management: Mass-Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, RAID Structure.

Unit-V

File system interface: File Concept, Access Methods, Directory Structure, File System Structure, Allocation Methods, and Free-Space Management.
System Protection: Goals, Principles, Domain of Protection, Access Matrix, Access Control.

RECOMMENDED BOOKS

- Operating System Concepts, Silberschatz, Ninth Edition, Willey Publication.
- Operating Systems, Internals and Design Principles, Stallings, Seventh Edition, Pearson Publication.
- Modern Operating Systems, Tanenbaum, Fourth Edition. Pearson Publication.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to:

CO1. Outline the basic concept of operating systems
CO2. Analyze the working of operating system
CO3. Examine the working of various scheduling/allocation approaches
CO4. Measure the performance of various scheduling/allocation approaches
CO5. Analyze the various operating system problems/issues
CO6. Develop the Solution of various operating system problems/issues

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COMPUTER GRAPHICS AND ANIMATION
290305(DC)

COURSE OBJECTIVES

- To provide an introduction to the theory and practice of computer graphics.
- To give a good exposure related to Computer Graphics algorithms and to design various graphics primitives.
- To enhance the proficiency in programming skills related to animation and graphics object Design

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Unit-I

Introduction to Computer Graphics: Interactive Computer Graphics, Application of Computer Graphics, Random and Raster Scan Displays, Storage Tube Graphics Display, Calligraphic Refresh Graphics Display, Flat Panel Display, Refreshing, Flickering, Interlacing, Resolution, Bit Depth, Aspect Ratio etc.

Unit-II

Scan Conversion Technique: Image representation, Line drawing: DDA, Bresenham's Algorithm. Circle Drawing: General Method, Mid-Point, DDA, Bresenham's Circle Generation Algorithm, And Ellipse Generation Algorithm, Curves: Parametric Function, Bezier Method, B-Spline Method.

Unit-III

2D & 3D Transformations: Translation, Rotation, Scaling, Reflection, Shearing, Inverse Transformation, Composite Transformation, World Coordinate System, Viewing Transformation, Representation of 3D object on Screen, Parallel and Perspective Projections.

Unit-IV

Clipping: Point clipping, Line Clipping, Simple Visibility Line Clipping Algorithm, Cohen Sutherland Line Clipping Algorithm etc., Polygon Clipping, Convex and Concave Polygon, Sutherland Hodgeman Polygon Clipping Algorithm etc., Area Filling, Hidden Surface Elimination: Z- Buffer algorithm and Painter's Algorithm.

Unit-V

Color Models: RGB, YIQ, CMY, HSV. **Computer Animation**: Introduction, Uses, key frames and tweening, types of animation, 2D and 3D animation, Principles and techniques of Animation.

Image Manipulation and Storage: Introduction to Digital Image Processing (DIP), Fundamental Steps and Components of DIP, Digital image enhancement, contrast stretching, Histogram Equalization, smoothing and median Filtering.

RECOMMENDED BOOKS

- Computer Graphics, Donald Hearn and M.P. Becker, PHI Publication.
- Computer Graphics principle and Practice, FoleyVandam, Feiner, Hughes.
- Principles of Computers Graphics, Rogers, TMH.
- Computer Graphics, Sinha and Udai, TMH.
- Digital Image Processing, Gonzalez.
- Principle of multimedia Ranjan Parekh,TMH.

COURSE OUTCOMES

After completion of the course students will be able to:

CO1. Explain interactive Computer Graphics, various display devices and explore applications of computer graphics.
CO2. Illustrate various line generations, circle generation, curve generation and shape Generation algorithms.
CO3. Apply various 2-Dimensional and 3-Dimensional transformations and projections on Images.
CO4. Classify methods of image clipping and various algorithms for Line and Polygon clipping.
CO5. Choose appropriate filling algorithms, Hidden Surface Elimination algorithm and apply on various images.
CO6. Analyis various color models, shading methods, animation and Digital Image Processing.

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COMPUTER GRAPHICS AND ANIMATION
290305(DC)

List of Experiments

1. Installation and Introduction to OpenGL basics, graphic functions, commands for compiling and executing an OpenGL Program.
2. Write a Program to create an output window, to plot a point with given coordinates and other basic demonstrations.
3. Write a Program to implement DDA Line Drawing Algorithm.
4. Write a Program to implement Bresenham Line Algorithm.
5. Write a Program to implement Mid-Point Circle Algorithm.
6. Write a Program to implement following 2D transformations:
   i. Translation of a point, line and polygon.
   ii. Scaling of a line and polygon.
   iii. Rotation of a line and polygon around origin.
7. Write a Program to implement:
   i. Flood Filling Algorithm using polygon.
   ii. Boundary Filling Algorithm using polygon.
8. Write a Program

COURSE OUTCOMES
After completion of the course students will be able to:

CO1. Demonstrates the fundamental concepts of Computer Graphics and its applications.
CO2. Explain and use hardware's and software's component of computer graphics
CO3. Apply various image generation, manipulations and color model techniques in coding.
CO4. Implement algorithms for create and manipulate image in programs.
CO5. Develop the ability to write computer programs for create image and animation using graphics concepts.
CO6. Develop application programs and projects in terms of image and animation using computer graphics.

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DESIGN & ANALYSIS OF ALGORITHMS
290302 (DC)

COURSE OBJECTIVE:

- To introduce the topic of algorithms as a precise mathematical concept.
- To demonstrate the familiarity with major algorithm design paradigms and methods of analysis.
- To design efficient algorithms for common computer engineering problems.
- To enhance the skills using well-known algorithms and data structures for solving real-life problems.

Unit-I

Introduction to Computational Model: RAM model, Algorithms and its importance, Recurrences and Asymptotic Notations, Growth of function, Mathematical Analysis of Non-Recursive and Recursive Algorithm, Review of Sorting & Searching Algorithms, Basic Tree and Graph Concept: Binary Search Trees, Height Balanced Tree, B-Trees and Traversal Techniques.

Unit-II

Divide and Conquer Method: Introduction and its Examples such as Finding the maximum and minimum, Binary Search, Merge Sort, Quick Sort and Strassen's Matrix Multiplication.

Unit-III

Greedy Method: Introduction, Characteristics, greedy activity selection. **Minimum Cost Spanning Trees**: Prim's and Kruskal's Algorithm, knapsack Problem, Single Source Shortest Path: Dijkstra's single source shortest path algorithm, Huffman Coding.

Unit-IV

Dynamic Programming: Introduction, The principle of Optimality, Examples of Dynamic Programming Methods such 0/1 Knapsack, Travelling salesman problem, Floyds All Pairs Shortest Path, Longest Common Subsequence and Reliability Design.

Unit-V

Backtracking: Concept and its Examples like 4-Queen's Problem, Knapsack problem Hamiltonian Circuit Problem, Graph Coloring Problem etc. **Branch and Bound**: Introduction and its Examples like – Travelling
Salesperson Problem etc. **NP Completeness**: Introduction, Class P and NP, Polynomial Reduction, NP-Hard and NP-Complete problem.

RECOMMENDED BOOKS:

- Fundamentals of Computer Algorithms, Horowitz & Sahani, Universities press
- Introduction to Algorithms, Coreman Thomas, Leiserson CE, Rivest RL, PHI.
- Design & Analysis of Computer Algorithms, Ullman, Pearson.
- Algorithm Design, Michael T Goodrich, Robarto Tamassia, Wiley India.

COURSE OUTCOMES:
After Completion of this course, the students would be able to:

CO1: Tell the basic features of an Algorithms.
CO2: Outline major Algorithms and Data Structures.
CO3: Apply various algorithmic design paradigms.
CO4: Analyze the asymptotic performance of Algorithms.
CO5: Compare different design techniques to develop algorithms for computational problems.
CO6: Design algorithms using greedy strategy, divide and conquer approach, dynamic programming, backtracking, branch and bound approach.

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DESIGN AND ANALYSIS OF ALGORITHM
290302(DC)

List of Programs

1. WAP to implement the following using array as data structure and analyze its time Complexity.
   a. Insertion sort b. Selection sort c. Bubble sort d. Quick sort
   e. Bucket sort f. Radix sort g. Heap sort h. Merge sort
2. WAP to implement Linear and Binary Search and analyze its time complexity.
3. WAP to implement Matrix Chain Multiplication and analyze its time complexity.
4. WAP to implement Longest Common Subsequence Problem and analyze its time Complexity.
5. WAP to implement Optimal Binary Search Tree Problem and analyze its time complexity.
6. WAP to implement Huffman Coding and analyze its time complexity.
7. WAP to implement Dijkstra's Algorithm and analyze its time complexity.
8. WAP to implement Bellman Ford Algorithm and analyze its time complexity.
9. WAP to implement DFS and BFS and analyze their time complexities.
10. WAP to Implement 0/1 knapsack using dynamic programming**.**

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. Relate the principles of algorithm design in solving problems.
CO2. Demonstrate basic algorithms and different problem solving strategies.
CO3. Build creativeness and confidence to solve non-conventional problems.
CO4. Analyze running times of algorithms using asymptotic analysis.
CO5. Compare various algorithm design approaches for solving real world problems.
CO6. Design and implement optimization algorithms in specific applications

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Digital Circuit Design Lab
290306 (DLC)

COURSE OBJECTIVES

- To study and verify the truth tables of various logic gates
- To study and design various combinational circuits
- To study and design various sequential circuits
- To perform the analysis and design of various digital electronic circuits.

Logic Gates:

Study of various logic gates. Realization of various logic gates using universal logic gates.

Combinational Circuit:

Half Adder, Full Adder, Half-subtractor, Full Subtractor, Multiplexer & Demultiplexer , word comparator and parity checker etc.

Sequential Circuit:

RS, D, JK, Master slave flip flops, flip flops with various triggering methods and timing diagram.

Counters and Registers:

Asynchronous and Synchronous, Up/Down, Johnson Counter, MOD N, BCD counter using Decade counter, Ring counters, Shift registers, and Universal Shift Register etc.

RECOMMENDED BOOKS

- Digital Design, Morris Mano M. and Michael D. Ciletti, IV Edition, Pearson Education.
- Digital Electronics: Principles, Devices and Applications, Anil K. Maini, Wiley.

COURSE OUTCOMES

After completion of the course students would be able to:

CO1: Understand the truth tables and functions of various logic gates.
CO2: Understand the importance of logic circuits
CO3: Design basic combinational logic circuits
CO4: Design various sequential logic circuits
CO5: Analyse and implement digital logic circuits.
CO6 : Develop and implement some basic Applications of digital electronics

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DIGITAL CIRCUIT DESIGN
290306 (DLC)

List of Experiments

1. To study and verify the truth table of various logic gates.
2. To realize Half Adder and Full Adder by using Basic logic gates
3. To realize Adder and Subtractor by using Basic logic gates
4. To design and set up 4:1 Multiplexer (MUX) using only NAND gates.
5. To design and set up 1:4 Demultiplexer (DE-MUX) using only NAND gates.
6. To realize One & Two Bit Comparator and study of 7485 magnitude comparator
7. To study and verify Truth Table of RS Flip Flop
8. To study and verify Truth Table of D type Flip Flop.
9. To study and verify Truth Table of JK type Flip Flop.
10. To study and verify Truth Table of T Flip Flop.
11. To study and verify Truth Table of JK Master Slave Flip Flop.

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SELF-LEARNING/PRESENTATION (SWAYAM/NPTEL/ MOOC)
150316 (SEMINAR / SELF STUDY)

S.No.	Course Name	Duration	Offered by	Course Link
1	C Programming and Assembly Language	4 Weeks	IIT Madras	https://onlinecourses.nptel.ac.in/noc21_cs81/preview

Note: Compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance, assignments and presentation