MANNAR THIRUMALAI NAICKER COLLEGE

PASUMALAI, MADURAI– 625 004

(An Autonomous Institution Affiliated to Madurai Kamaraj University)

(Re-accredited with 'A' Grade by NAAC)

M.Sc., Computer Science

SYLLABUS AND REGULATIONS

UNDER
CHOICE BASED CREDIT SYSTEM (CBCS)
(For those who joined during 2018-2019 and after)

Eligibility for Admission

Candidate for admission to Master's degree course in Computer Science should have Higher Secondary (+2) level Mathematics with Bachelor's degree in Computer Science/ Information Technology or BCA of Madurai Kamaraj University or any other University recognized by the Syndicate of Madurai Kamaraj University as equivalent thereto.

Candidate should have passed the Degree with a minimum of 55% marks in Part-III. In case of SC/ST candidates, they should have passed the degree with a minimum of 50% marks in Part-III.

Duration of the course

The duration of the course shall be two academic years comprising four semesters with two semesters in each academic year.

Subjects of Study

1. Core Subjects
2. Electives
3. Non Major Electives

The scheme of Examination

The components for continuous internal assessment are:

Two tests and their average	--15 marks
Seminar /Group discussion	--5 marks
Assignment	--5 marks
Total	--25 marks

Pattern of the questions paper for the continuous Internal Assessment

(For Part III , NME & Skilled Paper in Part IV)

The components for continuous internal assessment are:

Part –A

Six multiple choice questions (answer all) 6 x01= 06 Marks

Part –B

Two questions (‘either …. or ‘type) 2 x 07=14 Marks

Part –C

One question out of two 1 x 10 =10 Marks

Total 30 Marks

Pattern of the question paper for the Summative Examinations:

Note: Duration- 3 hours

Part –A

Ten multiple choice questions 10 x01 = 10 Marks

(No Unit shall be omitted; not more than two questions from each unit.)

Part –B

Five Paragraph questions (‘either …. or ‘type) 5 x 07 = 35 Marks

(One question from each Unit)

Part –C

Three Essay questions out of five 3 x 10 =30 Marks

(One question from each Unit)

Total 75 Marks

Minimum Marks for a Pass

50% of the aggregate (Internal +Summative Examinations).
No separate pass minimum for the Internal Examinations.
34 marks out of 75 is the pass minimum for the Summative Examinations.

PROGRAMME SPECIFIC OUTCOMES

PSO1: To understand, analyze and develop software in the areas related to system software, multimedia, web design, big data analytics, networking, and algorithms for efficient design of computer-based systems of varying complexities.

PSO2: To apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

PSO3: To employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, with zest for research.

PSO4: To study, experiment, interpret, analyze and explore the solutions to the real time problems which are effective, efficient, optimized and feasible.

MANNAR THIRUMALAI NAICKER COLLEGE(Autonomous)
DEPARTMENT OF M.Sc COMPUTER SCIENCE
(For those who joined in 2018-2019 and after)

COURSE PATTERN

Study Component	I Sem.	II Sem.	III Sem.	IV Sem.	Total Hrs/week	Total Credit	No.Of Papers	Total Marks
Core Subject	5(4) 5(4) 5(4) 5(4) 5(3) 5(3)	5(4) 5(4) 5(4) 5(3) 5(3)	5(4) 5(4) 5(3) 5(3)	6(6) 6(4) 6(4) 12(10)	105	78	19	1900
Elective	-	5(4)	4(4)	-	9	8	2	200
Non-Major Elective	-	-	6(4)	-	6	4	1	100
Total	30 (22)	30 (22)	30 (22)	30 (24)	120	90	22	2200

SEMESTER – I							
Subject Code	**Subjects**	**No.of Papers**	**Hours/ Week**	**Credits**	**Maximum Marks**		
					Int.	**Ext.**	**Tot.**
18PCSC11	**Core Subject** Computer System Architecture	1	5	4	25	75	100
18PCSC12	Wireless Communications and Networks	1	5	4	25	75	100
18PCSC13	Advanced Data Structures	1	5	4	25	75	100
18PCSC14	Relational Data Base Management System	1	5	4	25	75	100
18PCSCP1	Advanced Data Structures – Lab	1	5	3	40	60	100
18PCSCP2	Visual Programming and RDBMS – Lab	1	5	3	40	60	100
	Total	**6**	**30**	**22**	**180**	**420**	**600**

SEMESTER – II							
Subject Code	**Subjects**	**No.of Papers**	**Hours/ Week**	**Credits**	**Maximum Marks**		
					Int.	**Ext.**	**Tot.**
18PCSC21	**Core Subject** Resource Management Techniques	1	5	4	25	75	100
18PCSC22	Distributed Operating System	1	5	4	25	75	100
18PCSC23	Advanced Java Programming	1	5	4	25	75	100
18PCSCP3	Linux and Shell Programming – Lab	1	5	3	40	60	100
18PCSCP4	Advanced Java Programming – Lab	1	5	3	40	60	100
18PCSE21 18PCSE22 18PCSE23 18PCSE24	**Elective Subject - I** (Any one from List-A) List A Cloud Infrastructure and Services Software Testing and Quality Assurance Digital Image Processing Mobile Computing	1	5	4	25	75	100
	Total	**6**	**30**	**22**	**180**	**420**	**600**

SEMESTER - III							
Subject Code	**Subjects**	**No.of Papers**	**Hours/ Week**	**Credits**	**Maximum Marks**		
					Int.	**Ext.**	**Tot.**
18PCSC31	Soft Computing	1	5	4	25	75	100
18PCSC32	Analysis of Algorithm	1	5	4	25	75	100
18PCSCP5	Design and Analysis of Algorithms - Lab	1	5	3	40	60	100
18PCSCP6	Web Programming – Lab	1	5	3	40	60	100
	Elective Subject **Elective –II** (Any one from List-B) **List B**						
18PCSE31	Big Data Analytics	1	4	4	25	75	100
18PCSE32	Information Security						
18PCSE33 18PCSE34	Computational Intelligence Data mining and Warehousing						
18PCSN31	Multimedia Lab	1	6	4	40	60	100
	TOTAL	**6**	**30**	**22**	**195**	**405**	**600**

SEMESTER - IV							
Subject Code	**Subject**	**No.of Papers**	**Hours/ Week**	**Credits**	**Maximum Marks**		
					Int.	**Ext.**	**Tot.**
18PCSC41	Internet of Things	1	6	5	25	75	100
18PCSCP7	Python Programming Lab	1	6	4	40	60	100
18PCSPR1	Project Work and Viva-Voce	1	18	15	40	60	100
	TOTAL	**3**	**30**	**24**	**105**	**195**	**300**

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Programme	**: M.Sc (CS)**	**Part III**	**: Core**
Semester	**: I**	**Hours**	**: 05**
Sub code	**: 18PCSC11**	**Credits**	**: 04**

COMPUTER SYSTEM ARCHITECTURE

Course Outcomes:

CO1: To understand the basic structure and operation of digital computer and the hardware-software interface.

CO2: To familiarize with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations and hierarchical memory system including cache memories and virtual memory.

CO3: To expose with different ways of communicating with I/O devices and standard I/O interfaces and the concept of pipelining.

CO4: To provide the skill about the basic architecture of the computer

Unit-I :

Digital Logic Circuits: Digital Computers- Logic Gates- Boolean Algebra- Map Simplification- Combinational Circuits- Flip flops- Sequential Circuits- Digital Components: Integrated Circuits- Decoders-Multiplexers-Registers-Binary Counters.

Unit- II:

Data Representation: Data types – Complements-Fixed Point and Floating Point Representation- Other Binary Codes- Error Detection Codes-Basic Computer Organisation and Design: Instruction Codes – Computer Registers – Computer Instructions – Timing and Control – Instruction Cycle – Memory Reference Instructions – Input-Output and Interrupt.

Unit- III:

Micro - programmed Control: Control Memory-Address Sequencing-Central processing unit: General Register and Stack Organizations- Instruction Formats - Addressing Modes- Data Transfer and Manipulation - Program Control.

Unit-IV:

Pipeline and Vector Processing: Parallel Processing-Pipelining- Arithmetic and Instruction Pipeline-Computer Arithmetic: Addition and subtraction, Multiplication and Division algorithm- Floating Point Arithmetic Operations.

Unit-V:

Input-Output Organization: Peripheral Devices – Input Output Interface - Asynchronous Data Transfer - Modes of Transfer -Priority Interrupt - Direct Memory Access –Input Output Processor - Serial Communication-Memory Organization: Memory Hierarchy - Main Memory - Auxiliary Memory – Associative Memory- Cache Memory-Virtual Memory.

Text Book:

1. M. Morris Mano, **Computer System Architecture**, 3rd Edition, Prentice Hall India, New Delhi, 2007.

Unit I	:	Chapter 1 (Full) Chapter 2 Section: 2.1 to 2.4, 2.6
Unit II	:	Chapter 3 (Full) Chapter 5 Section: 5.1 to 5.7
Unit III	:	Chapter 7 Section : 7.1 to 7.2 Chapter 8 Section : 8.1 to 8.7
Unit IV	:	Chapter 9 Section 9.1 to 9.4 Chapter 10 Section 10.1 to 10.5
Unit V	:	Chapter 11 (Full) Chapter 12 Section 12.1 to 12.6

Reference Book(s):

1. V.CarlHamacher, Zvonko, G.Vranesic.Safwat, G.Zaky, **Computer Organization,** 4th Edition, Mcgraw Hill, New Delhi, 2002.
2. V. Raja Raman, T. Radhakrishnan, **Digital Logic and Computer Organization**, PHI, New Delhi, 2009.
3. Dr. S.P.S. Saini, Computer System Architecture and Organization, 2nd Edition, SK Kataria and Sons, 2012.

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Programme	**: M.Sc (CS)**	**Part III**	**: Core**
Semester	**: I**	**Hours**	**: 05**
Sub code	**: 18PCSC12**	**Credits**	**: 04**

WIRELESS COMMUNICATIONS AND NETWORKS

Course Outcomes:

CO1: To be familiar with the transmission media and tools.
CO2: To study the functions of OSI layers.
CO3: To learn about IEEE standards in computer networking and also familiarized with different protocols and network components.
CO4: To provide the skill on wireless communications and networks and support for employability.

Unit – I:

Technical Background: Transmission fundamentals – Signals for Conveying Information – Analog and Digital Data Transmission – Channel capacity – Transmission media – Multiplexing. Communication Networks: LANs, MANs and WANs – Switching techniques – Circuit Switching – Packet Switching – ATM. Protocols and TCP/IP suite: The Need for Protocol Architecture – TCP/IP Protocol Architecture – OSI Model - Internetworking.

Unit – II:

Wireless Communication Technology: Cellular Wireless Networks – Principles of cellular Networks – First-Generation Analog – Second Generation TDMA – Second Generation CDMA - Third Generation Systems. Multiple Access in Wireless System: Multiple Access Scheme – Frequency Division Multiple Access – TDMA – CDMA – SDMA. Packet Radio Access – Multiple Access with Collision Avoidance.

Unit - III:

Wireless Networking: Satellite Communications: Satellite parameters and Configurations – Frequency Division – Capacity Allocation - Time Division. Wireless Mobile IP and Wireless Application Protocol: Mobile IP – WAP.

Unit – IV:

Wireless LANS: Overview – Infrared LANs – Spread Spectrum LANs – Narrowband Microwave LANs. Wi-Fi and IEEE 802.11: IEEE 802 Architecture – IEEE 802.11 Architecture and Services – IEEE 802.11 Medium Access Control - IEEE 802.11 Physical Layer – Other IEEE 802.11 Standards - Wi-Fi Protected Access.

Unit – V:

Bluetooth and IEEE 802.15: Overview – Radio Specification – Baseband Specification – Link manager Specification – Logical Link Control and Adaptation protocol – IEEE 802.15.538

Text Book:

1. William Stallings, **Wireless Communications & Networks**, Pearson, New Delhi, 2009.

   Unit I : Chapter 2 to Chapter 4 (Full)

   Unit II : Chapter 5 and 9 (Full)

   Unit III : Chapter 10 and 12 (Full)

   Unit IV: Chapter13 and 14 (Full)

   Unit V : Chapter 15.

Reference Book(s):

1. Behrouz Forouzan, **Data Communications and Networking**, 4th Edition, TMH, New Delhi, 2012.
2. S. Achyut Godbole, **Data Communications and Networks**, TMH, New Delhi, 2007.
3. Gary J. Mullett, Introduction to Wireless Telecommunications Systems and Networks, 1st Edition, Cengage Learning, New Delhi, 2006.

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Programme	**: M.Sc (CS)**	**Part III**	**: Core**
Semester	**: I**	**Hours**	**: 05**
Sub code	**: 18PCSC13**	**Credits**	**: 04**

ADVANCED DATA STRUCTURES

Course Outcomes:

CO1: To study various data structure concepts like Stacks, Queues, Linked List, Trees and Graphs.
CO2: To be familiar with utilization of data structure techniques in problem solving.
CO3: To have a comprehensive knowledge of data structures.
CO4: To provide the skill in advanced data structures.

Unit –I:

Introduction and Overview: Definition – Concept of Data Structures – Overview of Data Structures – Implementation of Data Structures. Arrays: Definition – Terminology – One dimensional array – Multidimensional arrays.

Unit –II:

Linked List: Definition – Single linked list – Circular Linked list – Double Linked lists – Circular Double Linked List – Applications of Linked Lists.

Unit –III:

Stacks: Introduction – Definition – Representation of a stack – Operations on stacks – Applications of stacks. Queues: Introduction – Definition – Representation of Queues – Various Queue Structures – Application of Queues.

Unit –IV:
Trees: Basic Terminologies – Definition and Concepts – Representation of Binary Tree – Operations on a Binary Tree – Types of Binary Trees – B Trees. Graph: Introduction – Graph Terminologies – Representation of Graphs – Operations on Graphs - Application of Graph Structure.

Unit –V:
Sorting: Basic Terminologies – Sorting Techniques – Sorting by insertion: Straight Insertion sort – Sorting by Selection: Straight selection sort – Sorting by Exchange: Bubble sort – Sorting by Distribution: Radix sort – Sorting by Merging: Merge Sort. Searching: Basic Terminologies – Linear search Techniques: Linear search with Array – Binary Search – Non-linear search Techniques: Binary tree searching.

Text Books:

1. Debasis Samanta, **Classic Data Structures**, 2nd Edition, PHI, New Delhi, 2013.
   Unit I : Chapter 1 (Full)
   Chapter 2 (Full)
   Unit II : Chapter3:(Full)
   Unit III : Chapter 4 (Full)
   Chapter 5 (Full)
   Unit IV: Chapter 7: Section – 7.1 to 7.5, 7.7
   Chapter 8; Section – 8.1 to 8.5
   Unit V: Chapter 10: Section – 10.1, 10.2, 10.3.1, 10.4,1, 10.5.1, 10.6.1, 10.7.3
   Chapter 11: Section – 11.1, 11.2.1, 11.2.4, 11.3.1

Reference Book(s):

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, **Fundamentals of Computer Algorithms**, 2nd Edition, Universities Press, New Delhi, 2007.
2. Yedidyah Langsam, Moshe J. Augenstein, Aaron M. Tenenbaum, **Data Structure using C and C++**, Second Edition, PHI, New Delhi, 2006.
3. A.A.Puntambekar, Advanced Data Structures and Algorithms, 1st Edition, Technical Publications, Pune, 2008

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Programme	**: M.Sc (CS)**	**Part III**	**: Core**
Semester	**: I**	**Hours**	**: 05**
Sub code	**: 18PCSC14**	**Credits**	**: 04**

RELATIONAL DATABASE MANAGEMENT SYSTEM

Course Outcomes:

CO1: To study the basic concepts of database and its preliminary features.

CO2: To make the students understand the security issues in databases.

CO3: To expose the students to SQL.

CO4: To provide the skill in relational database management and supports for employability.

Unit – I:

Overview of Database Systems: Managing Data – A Historical Perspective – File Systems versus a DBMS – Advantages of a DBMS – Describing and Storing Data in a DBMS – Queries in a DBMS – Transaction Management – Structure of a DBMS – People who work with Data bases - Introduction to Database Design: Database Design and ER Diagrams – Entities, Attributes, and Entity Sets – Relationships and Relationship Sets – Additional Features of the ER Model – Conceptual Design with the ER Model - Conceptual design for large Enterprises – The Unified Modeling Language.

Unit – II:

The Relational Model: Introduction to the Relational Model – Integrity Constraints over Relations – Enforcing Integrity Constraints – Querying Relational Data - Logical Database Design: ER to Relational – Introduction to Views – Destroying /Altering Tables and Views. Relational Algebra and Calculus: Preliminaries – Relational Algebra – Relational Calculus – Expressive Power of Algebra and Calculus. SQL: Queries, Constraints, Triggers: The Forms of a Basic SQL Query – UNION, INTERSECT, and EXCEPT – Nested Queries – Aggregate Operators – Null Values – Complex Integrity Constraints in SQL- Triggers and Active Databases

Unit – III:

Overview of Storage and Indexing: Data on External Storage – File Organizations and Indexing – Index Data structures – Comparison of File Organizations – Indexes and Performance Tuning. Storing Data: Disks and Files: The Memory Hierarchy – Redundant Arrays of Independent Disk – Disk Space Management – Buffer Manager – Files of Records – Page Formats – Record Formats.

Unit – IV:

Overview of Transaction Management: The ACID Properties – Transactions and Schedules – Concurrent Execution of Transactions – Lock-Based Concurrency Control – Performance of Locking – Transaction Support in SQL – Introduction to Crash Recovery. Crash Recovery**:** Introduction to ARIES – The log – Other Recovery-Related Structures – The Write-Ahead Log Protocol – Check pointing - Recovering from a System Crash – Media Recovery – Other Approaches and Interaction with Concurrency Control

Unit – V:

Schema Refinement and Normal Forms: Introduction to Schema Refinement – Functional Dependencies Reasoning about FDs –Normal Forms – Properties of Decompositions - Normalization – Schema Refinement in Database Design - Other kinds of Dependencies. Physical Database Design and Tuning: Introduction to Physical Database Design – Guidelines for Index Selection – Basic Examples of Index Selection – Clustering and Indexing – Indexes that Enable of Index selection – Tools to Assist in Index Selection - Overview of Database Tuning – Choices in Tuning the Conceptual Schema – Choices in Tuning Queries and Views – Impact of Concurrency.

Text Books:

1. Raghu Ramakrishnan and Johnannes Gehrke, **Database Management Systems**,3rd Edition, Tata McGraw-Hill, New Delhi, 2014.

Unit I :	Chapter 1 Section 1.1 to 1.9
	Chapter 2 Section 2.1 to 2.7
Unit II :	Chapter 3 Section 3.1 to 3.7
	Chapter 4 Section 4.1 to 4.4
	Chapter 5 Section 5.2 to 5.8
Unit III:	Chapter 8 Section 8.1 to 8.5
	Chapter 9 Section 9.1 to 9.7
Unit IV:	Chapter16Section 16.1 to 16.7
	Chapter18 Section 18.1 to 18.8
Unit V:	Chapter 19 Section 19.1to 19.8
	Chapter 20 Section 20.1 to 20.10

Reference Book(s):

1. Silberschatz, Henry F.Korth, S.Sudarshan, **Database System Concepts**, 3rd Edition, Tata McGraw-Hill, New Delhi, 1997.
2. C. J. Date, **An Introduction to Database Systems**, 8th Edition, Pearson Education, New Delhi, 2007.
3. Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems, 7th Edition, Pearson India, New Delhi, 2016.

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Programme	**: M.Sc (CS)**	**Part III**	**: Core**
Semester	**: I**	**Hours**	**: 05**
Sub code	**: 18PCSCP1**	**Credits**	**: 03**

ADVANCED DATA STRUCTURES – Lab

Course Outcomes:

CO1: To develop and practice problem solving abilities.

CO2: To understand the data structure concepts practically.

CO3: To implement data structures like Stacks Queues, Linked Lists, Trees and Graphs practically.

CO4: To provide skill about data structures.

Implement the following concept

1. Using Control statements
2. Manipulating Array
3. Representing String
4. Demonstrating Function
5. Write programs to implement the following using an array.

   a) Stack ADT b) Queue ADT

6. Write programs to implement the following using a single linked list.

   a) Stack ADT b) Queue ADT

7. Write a program to perform the following operations:

   Insert an element into an Array.
   Delete an element from an Array.
   Search for a key element in an Array.

8. Write a program to perform the following operations on SLL.

   a) Insertion. b) Deletion.

9. Write a program to perform the following operations on DLL.

   a) Insertion. b) Deletion.

10. Write a program to perform the following operations on CLL.

    a) Insertion. b) Deletion.

11. Write a program to solve the Single Source Shortest Path Problem. (Note: Use Dijkstra‟s algorithm).

12. Write a program that uses non-recursive functions to traverse a binary tree in:
    a) Pre-order b) In-order c) Post-order
13. Write a program for sorting a given list of elements in ascending order using the following sorting methods:
    a) Quick sort. b) Merge sort. c) Bubble sort.
14. Write a program for searching an element in a given list of elements using binary search.

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DEPARTMENT OF COMPUTER SCIENCE
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Programme	**: M.Sc (CS)**	**Part III**	**: Core**
Semester	**: I**	**Hours**	**: 05**
Sub code	**: 18PCSCP2**	**Credits**	**: 03**

VISUAL PROGRAMMING AND RDBMS – Lab

Course Outcomes:

CO1: To learn write and debug programs using an IDE

CO2 : To develop Application oriented projects and practice problem solving abilities using VB.

CO3: To develop and practice Database concepts and to practice the database connectivity

CO4: To provide the skill about visual programming and RDBMS, supports employability in IT industry and provides entrepreneur skill

VISUAL PROGRAMMING APPLICATION

1. Inventory control.
2. Banking.
3. Students mark list.
4. Library maintenance.
5. Payroll.
6. Invoice.
7. Railway reservation.
8. College Admission.

PL/SQL Programs Using Table

1. Creating the Database (DDL Commands).
2. Manipulating and Querying the Database (DML Commands).
3. Using Built-in Functions.
4. Processing of Sub Queries.
5. Applying Joins.
6. Applying Grouping and Ordering.
7. Programs using Control Statements.
8. Programs using Exception Handling.
9. Programs using Triggers.
10. Programs using Functions.
11. Programs using Procedures.
12. Programs using Packages.

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DEPARTMENT OF COMPUTER SCIENCE
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Programme	**: M.Sc (CS)**	**Part III**	**: Core**
Semester	**: II**	**Hours**	**: 05**
Sub code	**: 18PCSC21**	**Credits**	**: 04**

RESOURCE MANAGEMENT TECHNIQUES

Course Outcomes:

CO1: To learn to solve problems in linear programming and Integer programming.

CO2: To understand Network problems and queuing theory.

CO3: To be exposed to CPM and PERT.

CO4: To understand the Dulaity in linear programming.

Unit - I:

Operations research (OR) – Origin and development – Features of OR – Scientific method in OR – Modeling in OR – Methodology of OR – Applications of OR – Linear Programming problem – Graphical solution method – General form of LPP – Canonical and standard forms

Unit - II:

The Simplex method - Duality in Linear programming: General Primal – Dual Pair – Formulation – Matrix form - Duality and Simplex Method – Dual Simplex method.

Unit -III:

Transportation Problem: North West Corner Method – Least Cost Method – Vogel's Approximation Method – Test for optimality: MODI Method - Assignment Problem: Hungarian Method.

Unit-IV:

Network Models- Introduction and Definitions – Network notations – Minimal Spanning Tree problems – Shortest Route Problems

Unit - V:

Network scheduling: CPM and PERT – Introduction - Network basic components – Network diagrams – Critical Path Computation –Construction of the Time Schedule - Probability considerations in PERT

Text Book:

1. Kanti Swarup, P.K. Gupta, Man Mohan, **Operations Research**,17th Edition, Sultan Chand and Sons, New Delhi, 2014.

Unit I : Chapter 1 – Section : 1.1 to 1.5, 1.8, 1.10

Chapter 3 – Section : 3.1 to 3.3

Unit II : Chapter 4 – Section : 4.1, 4.3

Chapter 5 – Section 5.1 to 5.5, 5.7, 5.9

Unit III : Chapter 10 – Section 10.1 to 10.3, 10.5 to 10.10, 10.12, 10.13
Chapter 11 – Section 11.1 to 11.3

Unit IV: Chapter 24 - Section : 24.1 to 24.5

Unit V : Chapter 25- Section : 25.1 to 25.7

Reference Books:

1. Taha Hamdy.A., **Operations Research an Introduction**, 8th Edition, Pearson Education, New Delhi, 2011.
2. R. Pannerselvam, **Operations Research**, 2nd Edition, PHI, New Delhi, 2010.
3. V.Sundharesan, Resource Management Techniques, 1st Edition, AR Publications, Chennai, 2015.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
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Programme	**: M.Sc (CS)**	**Part III: Core**	
Semester	**: II**	**Hours**	**: 05**
Sub code	**: 18PCSC22**	**Credits**	**: 04**

DISTRIBUTED OPERATING SYSTEM

Course Outcomes:

CO1: To understand the structure and functions of OS.
CO2: To study I/O management, Memory Management and File System and Distributed Systems.
CO3: To understand the system level and support required for Distributed System.
CO4: To provide the skill in distributed operating system concept and supports for employability

Unit – I:

Introduction: What Operating Systems Do? - Computer-System Organization - Computer-System Architecture - Operating-System Structure - Operating-System Operations - Process Management - Memory Management - Storage Management - Protection and Security - Distributed Systems – Special Purpose Systems – Computing environment.

Unit - II:

Distributed Operating Systems: Motivation - Types of Distributed Operating Systems - Network Structure - Network Topology - Communication Structure - Communication Protocols – Robustness - Design Issues - An Example: Networking.

Unit –III:

Distributed File Systems: Background - Naming and Transparency - Remote File Access - Stateful Versus Stateless Service - File Replication - An Example - Distributed Coordination: Event Ordering - Mutual Exclusion – Atomicity - Concurrency Control - Deadlock Handling - Election Algorithms - Reaching Agreement.

Unit – IV:

Real-Time Systems: Overview - System Characteristics - Features of Real-Time Kernels - Implementing Real-Time Operating Systems - Real-Time CPU Scheduling - Multimedia Systems: What Is Multimedia? - Compression - Requirements of Multimedia Kernels - CPU Scheduling - Disk Scheduling - Network Management - An Example.

Unit –V:

The Linux System: Linux History - Design Principles - Kernel Modules - Process Management - Scheduling - Memory Management – File Systems - Input and Output – Inter process Communication - Network Structure – Security - Windows XP: History - Design Principles - System Components -Environmental Subsystems - File System - Networking - Programmer Interface.

Text Book:

1. Silbersehatz A., Galwin P.B., Greg Gagne, **Operating System Principles, 7th** Edition, John Wiley Sons, New Delhi, 2005.

   Unit I : Chapter 1 (Full)

   Unit II : Chapter 14 (Full)

   Unit III : Chapter 15 (Full)

   Chapter 16 (Full)

   Unit IV: Chapter 19 (Full)

   Chapter 20 (Full)

   Unit V : Chapter 21 (Full)

   Chapter 22 (Full)

Reference Books:

1. A.S.Tanenbaum, **Modern Operating System**, 2nd Edition, PHI, New Delhi, 2007.

2. A.S.Tanenbaum, **Distributed Operating System**, Pearson Education, New Delhi, 2005.

3. Pradeep k Sinha, Distributed Operating System, 1st Edition, PHI Learning, New Delhi, 2009

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Programme	**: M.Sc (CS)**	**Part III**	**: Core**
Semester	**: II**	**Hours**	**: 05**
Sub code	**: 18PCSC23**	**Credits**	**: 04**

ADVANCED JAVA PROGRAMMING

Course Outcomes:

CO1: To know about the basics of Java.
CO2: To learn Java Applets and AWT Components.
CO3: To work with Swings and to understand Servlet, session and cookies.
CO4: To provide the skill in Java programming and supports for employability in IT industry.

Unit- I:

The Genesis of Java: Java's Lineage - Why java is important to Internet - Java's Magic - The Java Buzz words. An overview of Java: Object-Oriented Programming - Data types, Variables and Arrays: Simple type - Variables - Type conversion and casting - Arrays. - Operators: Arithmetic - bit wise - relational - Logical - Assignment – '?' Operator – Operator Precedence. - Control statements - Selection - Iteration - Jump statements.

Unit –II:

Introducing Classes: Class fundamentals - Declaring objects - Introducing methods - Constructors - this keyword - Garbage collection - finalize method. Inheritance: Basics - Using super - Multilevel Hierarchy - Method overriding - Abstract classes - final with inheritance. Packages and Interfaces: Packages - Access protection - Importing Packages - Interfaces. Exception Handling: Fundamentals - types - Uncaught exception - Nested try - throw - throws - finally.

Unit –III:

Multithreaded Programming: Java Thread model - Main thread - creating a thread - Multiple threads - priorities - Synchronization - I/O basics - reading/writing console – PrintWriter class - reading and writing files - The Applet class: Applet Basics – Applet Architecture - Applet Skeleton - Applet display methods - Requesting - repainting - Status window - HTML APPLET tag – Passing parameter to Applets.

Unit –IV:

Using AWT Controls, Layout managers and Menus: Control fundamentals - labels, buttons, check boxes, choice controls, lists, scroll bar, textfield, textarea, layout manager, menubars and menus, dialog boxes - Handling events using AWT components. A tour of Swing: JApplet – Icons and Labels – Buttons – Combo Boxes – Trees – Exploring Swing.

Unit –V:

Java Beans: What is a Java Bean? – Advantages of Java Bean – Application Builder Tools – BDK – JAR Files – Introspection – Developing simple Bean Using BDK – Using Bound Properties – Using BeanInfo Interface – JavaBean API. Servlets: Background – Lifecycle of servlet – Simple servlet – The Servlet API – javax.servlet package – Reading servlet parameters – javax.servlet.http package – Handling HTTP requests and responses – Cookies – Session tracking.

Text Book:

1. Herbert Schildt, **Java 2 - The Complete Reference**, TMH, New Delhi, 5th Edition, 2005.

Unit I : Chapter 1 to Chapter 5.

Unit II : Chapter 6, Chapter 8 to Chapter 10.

Unit III : Chapter11 ,Chapter 12 ,Chapter 19.

Unit IV:Chapter 22 and Chapter 26.

Unit V : Chapter 25 and Chapter 27.

Reference Book(s):

1. E. Balagurusamy, **Programming with Java**, 3rd Edition, TMH, New Delhi, 2007.
2. C.Xavier, **Programming with Java 2**, Sci Tech Publication, Chennai, 2004.
3. Uttam K. Roy, Advanced Java Programming, 1stEdition, Oxford university press, New Delhi, 2015.
4. Website: www.spoken-tutorial.org

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF COMPUTER SCIENCE
(For those who joined in 2018-2019 and after)

Programme	**: M.Sc (CS)**	**Part III**	**: Core**
Semester	**: II**	**Hours**	**: 05**
Sub code	**: 18PCSCP3**	**Credits**	**: 03**

LINUX AND SHELL PROGRAMMING –Lab

Course Outcomes:

CO1:To Familiarize with the Linux environment.
CO2: To learn the fundamentals of shell scripting/programming.
CO3: To Familiarize with basic linux administration.
CO4: To provide the skill in Linux environment and supports for employability.

1. Execution of various Basic, file/directory handling and Utility commands.
2. Shell scripts to explore system variables such as PATH, HOME etc.
3. Execution of various system administrative commands.
4. Write a shell script to display list of users currently logged in.
5. Write a shell script that displays a list of all files in the current directory to which the user has read, write and execute permissions.
6. Write a shell script to delete all the temporary files.
7. Write a shell script that accepts a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers.
8. Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.
9. Write a shell script that receives any number of file names as its arguments, checks if every argument supplied is a file or a directory and reports accordingly. Whenever the argument is a file, the number of lines on it is to be reported.
10. Write a shell script that receives any number of file names as its arguments, counts and reports the occurrence of each word that is present in the first argument file on other argument files.
11. Write Simple shell script for basic arithmetic and logical calculations.
12. Write a shell script to find the factorial of a given number.
13. Write a shell script to perform various operations on given strings.
14. Write an awk script to find the number of lines in a file that do not contain vowels i or o.
15. Write an awk script to find the number of characters, words and lines in a file.
16. Write a shell script to search an element from an array using binary searching.
17. Write a C program that takes one or more file/directory names as command line input and reports the following information on the file:
    (a) File type (b) Number of links (c) Time of last access (d) Read, write and execute permissions
18. Write a C program that illustrates suspending and resuming processes using signals.

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Programme	**: M.Sc (CS)**	**Part III**	**: Core**
Semester	**: II**	**Hours**	**: 05**
Sub code	**: 18PCSCP4**	**Credits**	**: 03**

ADVANCED JAVA PROGRAMMING – Lab

Course Outcomes:

CO1: Design, write, and debug applets/programs in Java that include graphics components.
CO2: Design, write, and debug applets/programs in Java that include graphical user interfaces (GUIs) and components.
CO3: Design, write, and debug applets/programs in Java that use files and streams.
CO4: To provide the skill on development of Java programming and supports for employability in IT industry.

1. Programs to implement method overloading in java.
2. Programs illustrating the implementation of various forms of inheritance (single, hierarchical, multilevel).
3. Programs implementing exception handling.
4. Programs to illustrate interfaces in java.
5. Programs to create package in java
6. Design of multithreaded programs in java.
7. Programs to manipulate strings.
8. Programs to draw various shapes using java applets.
9. Programs to handle various mouse events using java applets.
10. Programs to handle various key events using java applets.
11. Programs to handle various controls (textbox, label, combo box, dialog box) using java applets.
12. Programs to implement networking in java.
13. Write a java program to prepare student details using JDBC.
14. Write a simple program using java script.
15. Write a simple Servlet and JSP program.

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Programme	**: M.Sc (CS)**	**Part III**	**: Elective**
Semester	**: II**	**Hours**	**: 05**
Sub code	**: 18PCSE21**	**Credits**	**: 04**

CLOUD INFRASTRUCTURE AND SERVICES

Course Outcomes:

CO1: To analyze the components of cloud computing and its business perspective.
CO2: To evaluate the various cloud development tools.
CO3: To collaborate with real time cloud services.
CO4: To provide the skill about the cloud infrastructure and supports for employability.

Unit – I:

Cloud Introduction: Introduction - Cloud computing definition - Characteristics – Cloud Models – Cloud services – Cloud- based Services & Applications. Cloud Concepts & Technologies: Virtualization – Load balancing – Scalability & Elasticity – Deployment – Replication – Monitoring – Software Defined Networking – Network Function Virtualization – MapReduce – Identity and Access Management – Service level agreement – Billing

Unit – II:

Cloud Services and Platforms: Compute service – Storage services – Database Services – Application Services – Content Delivery Services – Analytics Services – Deployment & Management Services – Identity & Access Management Services – Open Source Private Cloud Software.

Unit – III:

Cloud Computing Technology: Hardware and Infrastructure: Clients – Security – Network – Services. **Accessing The Cloud:** Platforms – Web Applications – Web APIs – Web Browsers.

Unit – IV:

Cloud Storage: Overview – Cloud Storage Providers – **Standards -** Application – Client – Infrastructure – Service.

Unit – V:

Cloud Security: Introduction – CSA Cloud security Architecture 0 Authentication – Authorization – Data Security – Key management – Auditing. **Cloud for Industry, Healthcare & Education**:

Cloud computing for Healthcare - Cloud computing for Transportation systems - Cloud computing for Manufacturing Industry - Cloud computing for Education.

Text Books:

1. Arshdeep Bahga, Vijay Madisetti, "**Cloud Computing – A Hands-On Approach"**, University Press, Calcuta, 2014.

   Unit I : Chapter 1 and 2 (Full)
   Unit II : Chapter 3 (Full)
   Unit V : Chapter 12 and 13 (Full)

2. T.Anthony Velte, J. Toby Velte, Robert Elsenpeter, "**Cloud Computing – A Practical Approach"**, TMH, New Delhi, 2010.

   Unit III : Chapter 5 and 6 (Full)

   Unit IV:Chapter 7 and 8 (Full)

Reference Book(s):

1. Barrie Sosinsky, "**Cloud Computing Bible"**, Wiley Publishing, New Delhi, 2014.
2. Ray Rafaels, "**Cloud Computing: From Beginning to End"**, Create Space Independent Publishing Platform, New Delhi, 2015.
3. Michael Miller, "**Cloud Computing: Web-Based Applications That Change the Way" You Work and Collaborate Online,** 1st Edition, Que Publishing, United states, 2008.

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Programme	**: M.Sc (CS)**	**Part III**	**: Elective**
Semester	**: II**	**Hours**	**: 05**
Sub code	**: 18PCSE22**	**Credits**	**: 04**

SOFTWARE TESTING AND QUALITY ASSURANCE

Course Outcomes:

CO1: To create awareness about the significance of software testing.

CO2: To study the basic concepts involving software testing.

CO3: To understand the quality control, quality assurance and testing issues.

CO4: To provide the skill about the software testing and supports for employability.

Unit – I:

Testing Objectives and Overview: Software structure and Software testing - Purpose of testing – Dichotomies – A model for testing – Testing and Levels – Testing levels – Unit testing – Component testing – Integration testing – System testing – Interoperability testing – Performance testing – Regression testing – Acceptance testing – Pilot or Field Testing – Installation or Production testing.

Unit – II:

The Taxonomy of Bugs: Mistakes, bugs and failures – Taxonomy of Bugs – Consequence of Bugs – Flow Graphs and Path Testing: Path testing Basics – Steps in Path Testing – Construct Control Flow Graph – Arrive at Test Paths – Providing appropriate Inputs – Path Sensitizing – Path Instrumentation – Application of path testing – Effectiveness of Path testing.

Unit – III:

Transaction Flow Testing: Control flow chart and structure, Data and Transaction testing – Software functionality and Transactions – Transaction flow testing techniques – Data flow testing: Basics of Data flow testing – Data flow graphs and their representation – Data object state and usage – Data Flow Anomalies – States off Data objects and Data Flow Anomalies – Static versus

Dynamic Anomaly detection – Data Flow graph testing Techniques – Strategies for Data flow testing – Test strategies – Application of Data flow testing.

Unit – IV:

Domain testing: Boundary value analysis – Equivalent partitioning - Boundary value analysis vs Equivalent partitioning – I/O Domain testing – Comparison testing – Domains and Interface testing – Domains and testability. Paths, Path Products and Regular Expression: Concepts – Procedure – Application – Regular Expression and Flow Anomaly Detection.

Unit – V:

Logic Based testing: Decision tables – Decision tables in Functional testing – Decision tables in Structural testing – Predicates and relational operators – Boolean algebra – Test case Design using Boolean algebra – Prime implicants. States, State Graphs and Transaction Testing: Object oriented systems and State graphs – State graph – General Properties – Good/Bad State Graph – Bugs in State graph – The Role of State graph – Strategies for State Graph based testing – State graph based test design- An example – Testability tips.

Text Book:

1. ArunkumarKhannur, **Software Testing – Techniques and Applications**, Pearson, New Delhi, 2011.

   Unit I : Chapter 1 and 2 (Full)
   Unit II : Chapter 3 and 4 (Full)
   Unit III : Chapter 5 and 6 (Full)
   Unit IV:Chapter 7 and 8 (Full)
   Unit V : Chapter 9 and 10 (Full)

Reference Books:

1. Boris Beizer, **Software Testing Techniques**, Dream Tech Press, New Delhi, 2005.
2. Aditya Mathur.P, **Foundations of Software Testing,** 2nd Edition, Pearson Education, New Delhi, 2013.
3. Nina S. Godbole, Software Quality Assurance: Principles and Practice, 1st Edition, Alpha Science, United Kingdom, 2004.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF COMPUTER SCIENCE
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Programme : M.Sc (CS) **Part III : Elective**
Semester : II **Hours : 05**
Sub code : 18PCSE23 **Credits : 04**

DIGITAL IMAGE PROCESSING

Course Outcomes:

CO1: Understand basic analytical methods which are widely used in image processing.
CO2: Understand the topics such as deterministic and stochastic modeling of images; linear and nonlinear filtering; and image transformations for coding and restoration.
CO3: Understand issues and technologies which are specific to images and image Process systems
CO4: To provide skill about the digital image processing and supports for employability

Unit -I :

Digital Image Fundamentals – Introduction: What is Digital Image Processing - Origin – Fundamental steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Basic Relationships between pixels.

Unit- II :

Intensity Transformations and spatial Filtering: Basics of Intensity Transformations and spatial Filtering – Histogram processing – Fundamentals of spatial Filtering - Smoothing and Sharpening Spatial Filtering – Filtering in the Frequency Domain: Introduction to Fourier series and Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.

Unit -III :

Image Restoration: Noise models– Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering

Unit -IV:

Image Compression and Segmentation: Compression: Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Wavelet Coding – Compression Standards – JPEG2000. Segmentation: Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation

Unit – V:

Representation and Description – Representation – Boundary Description – Regional Descriptors – Use of principal Components for description – Relational Descriptors – Object Recognition – Patterens and pattern classes – Recognition based on decision – theoretic methods – Structural methods.

Text Book:

1. C. Rafael Gonzalez, E. Richard Woods, **Digital Image Processing**, 3rd Edition, Pearson Education, New Delhi, 2012.
   Unit I : Chapter 1 and 2 (Full) – 2.1, 2.3, 2.4, 2.5
   Unit II : Chapter 3 and 4 (Full) – 3.1, 3.2, 3.4, 3.5, 3.6, 4.1, 4.8, 4.9.
   Unit III : Chapter 5 (Full) – 5.2, 5.3, 5.7, 5.8
   Unit IV:Chapter 8 and 10 (Full) – 8.1, 8.2, 10
   Unit V : Chapter 11 and 12 (Full) – 11.1, 11.2, 11.3, 11.4, 11.5, 12.1, 12.2, 12.3

Reference Books:

1. K. Anil Jain, **Fundamentals of Digital Image Processing**, PHI Learning Pvt. Ltd., New Delhi, 2011.
2. C. Rafae Gonzales, E. Richard Woods, L. Steven, **Digital Image Processing Using MATLAB**, Pearson Education, New Delhi, 2007.
3. Jayaraman, Digital Image Processing, 1st Edition, Tata McGraw-Hill Education, New Delhi, 2011

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Programme	**: M.Sc (CS)**	**Part III**	**: Elective**
Semester	**: II**	**Hours**	**: 05**
Sub code	**: 18PCSE24**	**Credits**	**: 04**

MOBILE COMPUTING

Course Outcomes:

CO1: To study the concepts of mobile computing including access control.

CO2: To understand Digital mobile phone systems and wireless LAN.

CO3: To learn the wireless application protocols.

CO4: To provide the skill about the mobile computing and supports for employability.

UNIT – I

Introduction: Applications – A Short history of wireless communication – A Market for Wireless communications – Some open research topics Simplified Reference Model. Wireless Transmission: Frequencies for Radio transmission – Signals – Antennas – Signal Propagation - Multiplexing – Modulation – Spread Spectrum and Cellular Systems.

UNIT – II

Medium Access Control: Motivation for a specialized MAC – SDMA – FDMA – TDMA - CDMA – Comparisons. Telecommunication Systems: GSM – DECT – TETRA – UMTS and IMT-2000.

UNIT – III

Satellite Systems: History – Applications - Basics – Routing - Localization – HandOver – Examples. Wireless LAN: Infrared vs radio transmission – Infrastructure and ad-hoc networks - IEEE 802.11 – Hiper LAN – Bluetooth.

UNIT – IV

Mobile network layer: Mobile IP – Dynamic host configuration protocol –Ad-hoc Networks. Mobile transport layer: Traditional TCP - Classical TCP.

UNIT – V

Support for Mobility: File systems – World Wide Web – Wireless Application Protocol.

Text Book(S)

1. Jochen Schiller, **"Mobile Communications"**, Pearson Education, Delhi, 2003.

Unit I - Chapter 1(Full), Chapter 2(Full).

Unit II - Chapter 3(Full), Chapter 4(Full).

Unit III- Chapter 5(Full), Chapter 7(Full).

Unit IV- Chapter 9 (Full), Chapter 10 (Full).

Unit V - Chapter 11(Full).

Reference Book(S)

1. William Stallings, **"Wireless Communications and Networks"**, 2nd Edition, Pearson Education, Delhi, 2004.
2. Asoke K Talukder, **"Mobile Computing – Technology, Applications and Service Creation",** 2/e, TMH, 2011.
3. Raj Kamal, Mobile Computing, 3rd Edition, Oxford Higher Education, New Delhi, 2018