SYLLABUS

MANONMANIAM SUNDARANAR UNIVERISTY, TIRUNELVELI-12

PG - COURSES – AFFILIATED COLLEGES

Course Structure for

M.Sc. Computer Science

(Choice Based Credit System)

(with effect from the academic year 2021- 2022 onwards)

Semester-I				
Part	**Subject Status**	**Subject Title**	**Subject Code**	**Credit**
III	Core-1	Design and Analysis of Algorithms	ZCSM11	4
	Core-2	Advanced Java Programming	ZCSM12	4
	Core-3	Mathematical Foundation for Computer Science	ZCSM13	4
	Core-4	Compiler Design	ZCSM14	4
	Core-5	Distributed operating system	ZCSM15	4
	Core - 6 Practical - 1	Algorithm Lab	ZCSL11	2
	Core - 7 Practical - 2	Advanced Java Lab	ZCSL12	2

DESIGN AND ANALYSIS OF ALGORITHMS

Course Objectives:

- To understand fundamental concepts of Algorithm
- To impart knowledge about Basic Traversal And Search Techniques and Problematic Design

Course Outcomes:

- Get a view of how to choose problem
- Able to design and solve complex problems

UNIT-1

Introduction :

Algorithm-Specification - Performance Analysis. Elementary Data Structure : Stacks And Queues- Trees-Dictionaries-Priority Queues- Graphs

UNIT – II

Divide And Conquer :

General Method-Binary Search- Finding the Maximum And Minimum-Quick sort - Strassen's Matrix Multiplication.

UNIT – III

The Greedy Method:

General Method-Knapsack Problem-Job Sequencing with Deadlines- Minimum Cost Spanning Tree-Single Source Shortest Path. Dynamic Programming: General Method-Multistage Graph-All Pairs Shortest Path-Optimal Binary Search Tree-0/1 Knapsack-Travelling Salesperson Problem.

UNIT – IV

Basic Traversal And Search Techniques :

Techniques for Binary Trees –Techniques for Graphs-Connected Components and Spanning Trees-Biconnected Components and DFS. Backtracking: General Method-8-Queen Problem, Sum of Subsets Graph Coloring : Hamiltonian Cycle.

UNIT – V

Branch and Bound :

The Method-0/1 Knapsack Problem. NP-Hard And NP - Complete Problem - Basic Concepts - Cook's Theorem -NP - HARD GRAPH Problems - Clique Decision Problem - Chromatic Number Decision Problem NP - HARD Scheduling Problems - Flow Shop Scheduling - Job shop scheduling.

Text and Reference books

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, ―Fundamentals of Computer Algorithms, 2nd Edition,Universities Press(India) Private Ltd., 2018.
2. Aho, Hoporoft and Ullman, ―The Design and Analysis of Computer Algorithm, Pearson Education, Delhi, 2001.
3. Basu S.K., ―Design Methods and Analysis of Algorithms, PHI, 2006.
4. M.A.Weiss, ―Data Structures and algorithm Analysis in C++, Pearson Education, Asia, 2013.
5. Sandeep Sen and Amit Kumar Design and Analysis of Algorithms: A contemporary perspective, Cambridge University Press, 2019.

ADVANCED JAVA PROGRAMMING

Course Objectives:

- To deepen student's programming skills by analyzing the real world problem in a programmer's point of view and implement the concepts in real time projects
- To enable the students to learn the ethical, historical, environmental and technological aspects of Advanced Java Programming and how it impacts the social and economic development of society

Course Outcomes:

- Able to develop a Graphical User Interface (GUI) with Applet and Swing.
- Develop a Client-Server Application with Database Maintenance.

Unit I-

Applets &Event Handling:

Applets - Applet Basics, Methods of Building an Applet, Some General Methods of Applet , Displaying Text in Status Bar, Embedding Applet Information, The HTML Applet Tag , Reading Parameters into Applets , Colors in Applet, Getting Document base and Codebase, Interfaces in Applet, Multimedia in Applet Event Handling- Model, Event, Event Listeners, Registering Listener with Source, Example programs, Adapter Classes.

Unit II –

Swing and GUI Components:

Swing - Origin of Swing, Creating Windows in Swing, JFrame,Jbutton, JLabel, JToggleButton, JCheckBox, JRadioButton, JList, JScrollBar, JScrollPane, JTextField, JPasswordField, JTextArea, JComboBox, JMenuItem, JMenu, JMenuBar, JDialog, JOptionpane, JFileCheck, JProgressBar, LayoutManager.

Unit III-

Networking:

Networking-InetAddress, Socket Programming, Datagram, URL.

Unit IV-

JDBC:

JDBC- Introduction, DriverManager, Connection Interface, Statement Interface, PreparedStatement Interface, CallableStatement Interface, ResultSet Interface.

Unit V –

Servlet & JSP:

Servlet – Introduction, HTML, Interface Servlet, HttpServlet Class, Servlet Programs, Servelet with I/O Files, Servelet with JDBC, Session Handling, Session Tracking. JSP – Introduction, JSP Working Model, Syntax of a JSP Page with Sample Programs.

Text Book:

1. Advanced Programming in Java2, K.Somasundaram, Jaico publishing Company Limited, New Delhi, 2008.

Reference Books:

1. Herbert Schildt, Java 2-The complete reference, 7th Edition McGraw Hill, 2018.
2. Naughton and Herbert Schildt, Java The complete reference, 7th Edition McGraw Hill, 2007.
3. Jim Keogh, The Complete Reference J2EE, Tata McGraw Hill Edition, New Delhi, 2002.
4. Marty Hall, and Larry Brown, Core Servlets and Java Server Pages, 2nd Edition, Pearson Education, 2004.

E-Resources:

1. Advanced Programming in Java2,
2. https://www.researchgate.net/publication/315894230_Advanced_Programming_in_Java2 2. JDBC, Java Database Connectivity, K.Somasundaram, Jaico Publishing House, Mumbai, India, First Edition, 2013. 3. JDBC Connectivity in Java JDK16, June 2021, DOI: 10.13140/RG.2.2.19415.60325
3. https://www.researchgate.net/publication/352172393_JDBC_Connectivity_in_Java_JDK16 4. Installing Eclipse 2019-12-R and Tomcat 9.0 and Develop a Servlet, June 2021, DOI: 10.13140/RG.2.2.12123.08487
4. https://www.researchgate.net/publication/352785295_Installing_Eclipse_2019-12-R_and_Tomcat_90_and_Develop_a_Servlet
5. JSP, Java Server Pages, In book: Server Side Programming Chapter: Chapter 25,K.Somasundaram, 2012, DOI: 10.13140/2.1.1715.9365
6. JavaServerPageshttps://www.researchgate.net/publication/268076772_Java_Server_Pages

MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE

Course Objectives:

- To enable a clear understanding about mathematical logic
- To apply basic mathematical concepts in project developments
- To get clear understanding about graph and tree

Course Outcomes:

- Get an insight about basic mathematical concepts related to computer science
- Able to get knowledge about simple data structure concepts
- Able to have knowledge about mathematical logic

UNIT-1

Mathematical Logic:

Introduction-Statements and Notation-Connectives-Normal Forms-The Theory of Inference for the Statement calculus –The Predicate Calculus-Inference theory of the Predicate Calculus

UNIT – II

Set Theory: Introduction – Basic concepts of Set theory-Relations-Functions.

UNIT – III

Matrices:

Rank of Matrix, Solving System of Equations, Eigen values and Eigen Vectors-Inverse of matrix- Cayley Hamilton Theorem.

UNIT – IV

Graph Theory:

Introduction-Graphs-Application of Graphs-Finite and Infinite Graphs-Incidenceand Degree-Isolated Vertex, Pendant Vertex and Null Graph Paths and Circuits: Isomorphism-Sub graphs - Walks, Paths and Circuits-Connected and Disconnected graphs-Components-Euler Graphs-Operation on Graphs -Hamiltonian paths and circuits- Travelling Salesman Problem

UNIT – V

Trees and Fundamental Circuits:

Properties of Trees-Pendant vertices in trees-Distance and centers in a Tree-Rooted and Binary Tree-Spanning Tree-Fundamental circuits—Spanning Tree in the Weighted Graph. Matrix Representation of Graphs: Incidence Matrix-Sub matrices-Circuit Matrix-Path matrix-Adjacency Matrix

Text and Reference books

1. J.P. Trembley and R.Manokar, ―Discrete Mathematical Structureswith Applications to Computer Science , Tata Mc Graw Hill Publications,2017.
2. Narasingh Deo, ― Graph Theory With Applications To Engineering And Computer Science‖, Prentice-Hall of India Private Limited, 2017.
3. Kenneth H. Rosen ― Discrete Mathematics and Its Applications with Combinatorics and Graph Theory (SIE) | 7th Edition, Tata Mc Graw Hill Publications, 2017.

COMPILER DESIGN

Course Objectives:

- To discover principles and techniques that can be used to construct various phases of compiler.
- To explore knowledge about parsers, optimization technique

Course Outcomes:

- Able to understand various phases of a compiler
- Explore the features of code generation and optimization techniques
- Able to design a compiler

UNIT-I
LEXICAL ANALYSIS

Introduction to Compiling: Language Processors, The Structure of a Compiler. Lexical Analysis: The role of the lexical analyzer - Input buffering Specification of tokens - Recognition of tokens – The Lexical Analyzer Generator Lex - Finite automata - Regular expression to finite automata – Design of Lexical Analyzer Generator - Optimization of DFA - based pattern matchers.

UNIT – II
SYNTAX ANALYSIS

Syntax Analysis: The role of the parser - Context-free grammars - Writing a grammar - Top down Parsing - Bottom-up Parsing - LR parsers- Parser Generators. Run time environment: Storage Organization – Static Allocation of space.

UNIT – III
INTERMEDIATE CODE GENERATION

Intermediate Code Generation : Variants of Syntax trees – Three Address code – Types and Declarations - Translation of Expressions – Type checking - Control flow - Back patching - Switch Statements – Intermediate Code for Procedure

UNIT – IV
CODE GENERATION

Code Generation : Issues in the design of a code generator - The target language – Address in the Target Code – Basic Block and Flow graphs – Optimization of Basic Blocks - A simple code generator – Peephole Optimization.

UNIT – V
OPTIMIZATION TECHNIQUES

Machine Independent Optimizations: The Principal Sources of Optimization - Introduction to Data Flow analysis – Foundations of data flow analysis – Partial Redundancy Elimination - Loops in flow graph

Text and Reference books

1. Alfred V. Aho, Monica S.Lam, Ravi Sethi and Jeffrey D. Ullman, "Compilers-Principles, Techniques,and Tools", Second Edition, Pearson Education Asia, 2014.
2. Kennath C.Louden, Compiler Construction Principles and Practice, Vikas publishing House, 2004.

3. Terence Halsey, Compiler Design Principles, Techniques and Tools, Larsen and Keller Education, 2018
4. Sudha Rani S, Karthi M., Raj Kumar Y - Compiler Design, Wiley 2019.
5. Adesh K Pandey, “Concepts of Compiler Design”, Katson, 2013.

DISTRIBUTED OPERATING SYSTEM

Course Objectives:

- To get a clear understanding about networks and operating systems
- To apply basic networking concepts in projects
- To get clear understanding about file systems

Course Outcomes:

- Get an insight about networking concepts
- Able to get knowledge about operating system concepts
- Able to have knowledge about file system concepts

UNIT-1

Fundamentals:

What is Distributed Operating System – Evolution of Distributed Computing System – Distributed Computing System Models – Why are Distributed Computing Systems gaining popularity – What is a Distributed Computing System – Issues in Designing Distributed Computing System – Introduction to Distributed Computing Environment. Introduction to Computer Networks – Network types – LAN –WAN – Communication protocols – Internetworking – ATM Technology

UNIT – II

Message Passing:

Introduction Desirable features – Issues in PC Message Passing – Synchronization – Buffering – Multi datagram Messages – Encoding and Decoding – Process Addressing – Failure Handling – Group Communication

UNIT – III

Remote Procedure Calls :

RPC models – Transparency of RPC–Stub generation–RPC messages–Marshaling arguments and results–Exception Handling–Light weight RPC; Distributed Shared Memory: Introduction – General Architecture of DSM system – Design and Implementation Issues of DSM – Granularity – Structure of Shared Memory – Consistency Models – Replacement Strategy – Thrashing.

UNIT – IV

Synchronization:

Introduction – Clock Synchronization – Event Ordering – Mutual Exclusion – Deadlock – Election Algorithm–Process Management: Introduction-Process Migration– Threads.

UNIT – V

Distributed File System:

Introduction – Desirable features – File Models – File Accessing Models – File Sharing Semantics – File Caching Schemes – File Replication – Fault Tolerance – Atomic Transactions – Design Principles.

Text and Reference books

1. Pradeep K Sinha, ―Distributed Operating Systems – Concepts and Design‖, PHI, 2016

2. Andrew S Tanenbaum , ―Distributed Operating Systems‖, First Edition, PHI.2017
3. Abraham Silberchalz Peter B. Galvin, G.Gagne, ―Operating Systems Concepts‖,Ninth edition, Addision Wesley Publishing Co., 2018.
4. Coulouris George, Dollimore Jean, Blair Gordon–Distributed systems- concepts and design Pearson 2017.

ALGORITHM LAB (USE C++/JAVA)

Course Objectives:

- To learn programming constructs of C++.
- To implement the linear and non-linear data structure using STL
- To Understand different operations of search trees
- To Implement graph traversal and searching algorithms
- Be exposed to searching and sorting algorithms

Course Outcomes:

- Apply generic programming technique to implement any data structure
- Apply appropriate search trees for an application
- Use graphs in problem solving

(Model List only, Please add more algorithms based programmes)

1. Sort a given set of elements using the Quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n.
2. Sort a given set of elements using merge sort method and determine the time required to sort the elements. Repeat the experiment for different of values of n.
3. Write a program to obtain the topological ordering of vertices in a given digraph.
4. Implement travelling salesman problem.
5. Implement the knapsack problem (0/1).
6. Print all the nodes reachable from a given starting node in a digraph using BFS method.
7. Check whether a given graph is connected or not using DFS method.
8. Write a program to implement binary search using divide and conquer technique
9. Write a program to implement insertion sort using decrease and conquer technique
10. Find minimum cost spanning tree of a given undirected path using a Prim's algorithm.
11. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.

ADVANCED JAVA LAB

Course Objectives:

- To deepen student's programming skills by analyzing the real world problem in a programmer's point of view and implement the concepts in real time projects
- To enable the students to learn the ethical, historical, environmental and technological aspects of Advanced Java Programming and how it impacts the social and economic development of society

Course Outcomes:

- Able to develop a Graphical User Interface (GUI) with Applet and Swing.
- Develop a Client-Server Application with Database Maintenance.

(This is a model List only, please add more programmes)

1. Write a Program in Java to implement Calculator using Swing technology
2. Write a Program that displays two textboxes for entering a students' Roll-no and Name with appropriate labels and buttons
3. Write a Java program that makes a connection with database using JDBC and prints metadata of this connection
4. Include the database connectivity to insert, update, delete and display of student information and display it
5. Write a java program for one way TCP communication for server and client, where server will response to client with current data and time.
6. Write a java program for two way TCP communication for server and client. It should look like a simple chat application
7. Write a java program for UDP Communication where client will send name of country and server will return the capital of that country
8. Create a simple calculator application that demonstrates the use of RMI. You are not required to create GUI.
9. Create Servlet That Prints Hello World.
10. Create Servlet That Prints Today's Date
11. Create Servlet for login page, if the username and password is correct then prints message "Hello username" else a message"login failed".
12. Create Servlet that uses cookies to store the number of times a user has visited the servlet
13. Create a Servlet for demo of KBC game. There will be continuous two or three pages with different MCQs. Each correct answer carries Rs. 10000. At the end as per user's selection of answers total prize he won should be declared. User should not be allowed to backtrack.
14. Create a Servlet that implements ServletContextAttributeListener interface such that a message dialog is displaued whenever an attribute is added or removed or replaced.
15. Create a Servlet filter that calculates server's response time and add it to response when giving it back to client.
16. Create a jsp that prints hello world.
17. Create jsp that prints current date and time.
18. Create a jsp that add and subtract two numbers.
19. Create a jsp for login module.
20. Create a web page that prints 1 to 10 using JSTL.
21. Create a custom JSP tag that prints current date and time. Use this tag into JSP page.