SYLLABUS

FOR

M. SC.

COMPUTER SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

RAVENSHAW UNIVERSITY

CUTTACK, 753003

Ravenshaw University

Course Structure of M.Sc. (Computer Science)

FIRST SEMESTER

Subject Code	Subject Name	Mid Term Marks	End Term Marks
CSC -1.1	Discrete Mathematical Structures	20	80
CSC -1.2	Computer Architecture	20	80
CSC -1.3	Object Oriented Programming using C++	20	80
CSC -1.4	Theory of Computation	20	80
CSC -1.5	Advanced Database Management Systems	20	80
CSL -1.6	Object Oriented Programming using C++ Lab	25	50
CSL -1.7	Advanced Database Management Systems Lab	25	50

SECOND SEMESTER

Subject Code	Subject Name	Mid Term Marks	End Term Marks
CSC -2.1	Advanced Data Structure	20	80
CSC -2.2	Advanced Operating System	20	80
CSC -2.3	Software Engineering	20	80
CSC -2.4	Computer Graphics	20	80
CSC -2.5	Java Programming	20	80
CSL -2.6	Data Structure Lab	25	50
CSL -2.7	Java Programming Lab	**25**	**50**

THIRD SEMESTER

Subject Code	Subject Name	Mid Term Marks	End Term Marks
CSC -3.1	Optimization Techniques	20	80
CSC -3.2	Design and Analysis of Algorithms	20	80
CSC -3.3	Advanced Computer Network	20	80
CSE -3.4	Elective-I	20	80
CSE -3.5	Elective-II	20	80
CSL -3.6	Advance Java Lab	25	50
CSL -3.7	Computer Networking Lab	25	50

FOURTH SEMESTER

Subject Code	Subject Name	
CSP - 4.1	Project Work & Viva	250

Elective-I

1. Mobile Computing
2. Pattern Classification
3. Parallel and Distributed Computing
4. Digital Image Processing
5. Compiler Design

Elective-II

1. Systems Modeling & Simulations
2. Artificial Intelligence
3. Data Mining & Data Warehousing
4. Cryptography and Network Security
5. Machine Learning

FIRST SEMESTER

CSC -1.1 Discrete Mathematical Structures

Unit I

Logic: Fundamentals of logic, Logical inferences, Methods of proof of an implication, First Order Logic and other methods of Proof, Rules of Inference for quantified Propositions, Mathematical induction.

Unit II

Relations and Diagraphs : Relations and Directed Graphs special Properties of Binary Relation, Equivalence Relations, Ordering Relations, Lattices and Enumerations. Operations on Relations, Paths and Closures, Directed Graphs and Adjacency matrices

Unit III

Graphs: Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multi Graphs and Euler Circuits, Hamiltonian Graphs.

Unit IV

Boolean algebra: Introduction to Boolean algebra, Boolean Functions, Switching Mechanisms, Minimization of Boolean Functions.

Unit V

Algebraic structures & Applications to Finite State Machines and Language: Binary Operations, Semi Groups, Groups, finite State Machines, Semi Groups, Machines and Languages, simplifications of Machines.

Reference Books:

1. Discrete Mathematics for Computer Scientists & Mathematics J. Mott, A. Kandel, T. P. Baker PIII (1999) [Chapters 1.5-1.10,4.1-4.7,5.1-5.10,6.1-6.5]
2. Discrete Mathematical Structures for Computer Science, Bernard Kolman, Robert C. Busby, Saaron Ross, PIII (1999) [Chapters 9.1,9.2,9.4,10.3,10.6]

CSC - 1.2 Computer Architecture

Unit I

Information Representation: Number systems, Binary numbers, Sign Magnitude & 2s complement representation. Fixed and Floating point, IEEE-754 Single Precision format, IEEE-754 Double Precision format, Floating-Point Arithmetic, IEEE Standard for Binary Floating-Point Arithmetic , Precision and range, BCD code, ASCII and EBCDIC

Digital Electronics: Boolean algebra, Logic gates, Truth Tables, Combinational circuits, Karnaugh map, Flip-flops, Sequential circuits

Unit II

Combination RTL Components : Integrated circuits, Multiplexer, Demultiplexers, Decoder, Encoder, Registers, Shift Registers, Binary Counters, Memory Unit - RAM, ROM. Parity generators and checkers, Error detection and correction : Hamming Code, Binary Adder-Subtracter, Decimal adder, Binary multiplier, magnitude comparator, Programmable Logic Devices- PLA, PAL, ROM. Sequential RTL components : Registers counters

Unit III

Central Processing Unit : General Register Organization, Stack Organization, Reverse Polish Notation, Machine Language instructions, Addressing modes, Instruction formats, Instruction set selection, Instruction cycle and execution cycle, RISC vs CISC

8085 Microprocessor: Block diagram, System Bus, Addressing modes, Instruction Set, Instruction Set Classification, Instruction Format, Simple assembly language Programming using 8085 microprocessor

Unit IV

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.

Multiprocessors: Characteristics of Multiprocessors, Interconnection Structures: Time shared common bus, Multiport memory, Crossbar switch, Multistage switching network, Hypercube system. Interprocessor Arbitration, Interprocessor communication and Synchronization, Cache Coherance

Unit V

Pipeline and Vector Processing: Parallel processing, Flynn's classification, Pipelining, Arithmetic Pipeline, Instruction pipeline, RISC Pipeline, Pipelining in CPU design, Superscalar processors, Vector Processing, Array Processing.

Quantitative principles of Computer Design : Clock cycle, Clock cycle time, Clock speed, CPU time, Instruction count, Instructions per clock, Cycles per second, Clock cycles per instruction, CPU clock cycles, Amdahl's Law,

Text Books:

1. Mano M, Computer System and Architecture (3rd Ed) (PHI)

2. J.L.Hennessy&D.A.Patterson – Computer Architecture – A Quantative approach 2nd Edition – Mergan Kaufman Pub – 1996

3. V.C.Hammacher, Z.G.Vranesic, S.G.ZAky – Computer Organization McGraw Hill 1996

Reference Books:

1. K.Hwang – Advanced Computer Architecture, McGraw Hill, 1993

2. D.Sima, T.Fountation, P.Kacsak – Advanced Computer Architecture – A design space Approach, Addison Wesley, 1997

CSC -1.3   Object Oriented Programming using C++

Unit I

Introduction to object oriented Programming, Features of OOPS. Getting started with C++ Data type, variables, expression, control structure, Concept of reference variable, I/O Stream class. Function: Definition, parameter passing, references, inline function, function overloading, function with arguments and reference, returning by reference.

Unit II

Class: Structure and class comparison Classes & objects , private, public & protected access specifies, data member and member function , static data member & member function, inline function ,friend function, constructor, types of constructor, destructor.

Unit III

Dynamic memory management (new and delete), pointer to object. Inheritance: What is inheritance? Types of inheritance, Member accessibility, function overriding, derived class by derived by different access specifiers, multipath inheritance and pointer to objects in inheritance. Polymorphism: Run time polymorphism & virtual function, abstract class, object slicing.

Unit IV

Operator Overloading: Overloading of unary & binary operators, overloading using member function & friend function, overloading of Stream operator, Copying object, Type Conversion – Class to basic conversion, basic to class conversion

Unit V

Exception Handling - Exception and derived classes, try, catch, throw statement, catching all exception, unexpected exception, re-throwing an exception.

Templates - Function templates, class templates, Introduction to STL - Containers, algorithms, iterators

Reference Books:

1. A.N. Kamthane, "Object Oriented Programming with ANSI & Turbo C++", Pearson Education.
2. E. Balguruswamy, "Object Orientd Programming with C++", TMH Publisher.
3. K.R.Venugopal, Rajkumar,,TRavishankar, "Mastering C++", TMH Publisher

CSC -1.4 Theory of Computation

Unit I

Introduction to finite automata, Central concepts of automata theory, Informal picture of finite automata, Deterministic finite automata, Non-deterministic finite automata, Application, Formal Language

Unit II

Regular expressions, Finite automata and Regular expressions, Applications of regular expressions, Algebraic laws of regular expressions, Pumping Lemma and its application for regular languages, Closure and Decision properties of regular languages

Unit III

Context-Free Grammars, Parse trees, Ambiguity in Grammar & Languages, Pushdown automation. The language of PDA, Equivalence of PDA's and CFG's, Deterministic pushdown automata, Chomsky Normal form, The pumping Lemma for context free languages, Decision properties of CFL's

Unit IV

The Turing machine, Programming techniques for Turing machines, Extension to the basic Turing machine, Restricted Turing machine, Turing machines and computers.

Unit V

Non-Recursively enumerable languages, Undecidable problem that in recursively enumerable, Undecidable problem about Turing machines, Post's correspondence problem, other undecidable problems.

Text Books

1. Introduction to Automata Theory, Languages and Computation- J.Hoperoft, R.Motwani, J.D.Ullman – Pearson Education
2. Mishra, Chandrashekharan, "Theory of Computer Science", PHI

Reference Books

1. Introduction to Theory of Computation – M.Siper, Thomson Learning
2. P. Linz, "An Introduction to formal Languages and Automata", Norasa, 2000
3. LewishPapadimitra: theory of Computations, Prentice Hall of India, New Delhi

CSC -1.5   Advanced Database Management Systems

Unit 1

Introduction: Introduction to File and Database systems- History- Advantages, disadvantages- Data views – Database Languages – DBA – Database Architecture – Data Models -Attribute types – Keys -ER diagram–EER Diagram- Overview of Network and Hierarchical models.

Unit 2

Relational Model: The relational data model, Relational constraints, Relational calculus. The domain relational calculus, Relational algebra .ER and ERR to relational mapping

Query languages – SQL – Data definition – Queries in SQL – SQL: Basic queries .Complex queries, Insert delete and update statement in SQL, Views, Constraints and assertion, Updates

Unit 3

Database Design: Design Phases – Pitfalls in Design –Functional Dependence – Amstrong Axioms, Normalization (1NF, 2NF, 3NF, BCNF, 4NF, 5NF).

Unit 4

Transaction Management: Transaction concept – state- Serializability – Recoverability- Concurrency Control –Locks- Two Phase locking – Deadlock handling– Time stamp odering, File Organization – Organization of Records in files – Indexing and Hashing.

Query processing and Optimization: Basic algorithms for Query operations, Using heuristics selectivity & cost estimates in query optimization, semantic query optimization

Unit 5

Current Trends: Object-Oriented Databases- OODBMS- rules – ORDBMS- Complex Data types – Distributed databases – characteristics, advantages, disadvantages, rules- Homogenous and Heterogeneous-Distributed data Storage –Overview Data mining- Data warehousing

Text Book:

1. Rameez Elmasri, Shamkant B. Navathe, 'Fundamentals of Database Sytems', 5th Ed., Pearson Education, 2009.

Reference Book:

1. Philip J. Pratt, Joseph J Adamski, 'Database Management Systems', Cengage Learning, 2009.

2. Abraham Silberschatz, Henry F. Korth & S. Sudarshan, 'Database System Concepts',. McGraw Hill International Edition, 2006

3. Arun K Majumdar, Pritimoy Bhattacharyya, 'Database Management Systems', TMH, 2009

4. ISRD group, 'Introduction to Database Management Systems', TMH, 2008

5. Raghu Ramakrishnan, Johannes Gehrke, 'Database Management Systems', McGraw Hill ,International Edition, 2003.

6. Ramon A Mata-Toledo, Pauline K Cushman, 'Database Management Systems', TMH, 2008.

CSL -1.6 Object Oriented Programming using C++ Lab

01. Implementing classes and creation of objects.
02. Checking Precedence of operators & side effects.
03. Implementing various control structures & loops.
04. Making structured programming & stepwise refinement.
05. Implementing Procedural abstraction with functions.
06. Implementing Constructors and destructors.
07. Implementing Data abstraction & inheritance.
08. Implementing Multiple & hybrid inheritance.
09. Implementing Polymorphism concepts.
10. Implementing Operator overloading & friend's functions.
11. Working with new & delete, object copying.
12. Implementing Object slicing, this operator.
13. Exception handling mechanisms.
14. Implementing class templates & function templates.
15. Creating files in C++ and file related operations.

CSL -1.7 Advanced Database Management Systems Lab

01. Learning basic DDL and DML commands
02. Learning basic DCL and TCL commands.
03. Insertion, Deletion, Updating to a table using SQL commands
04. Working with dual table.
05. Data retrieval using Select & where clause.
06. Oracle inbuilt functions-Date, aggregate, group by etc.
07. Use of Joins and Sub queries.
08. Views, sequences and indexes.
09. Managing users, privileges and roles.
10. PL/SQL-Data types, control structures.
11. Creating procedures with PL/ SQL.
12. Error handling in PL/ SQL.
13. Cursor Management in PL/ SQL.
14. Writing Programs on Packages & triggers.

SECOND SEMESTER

CSC -2.1 Advance Data Structure

Unit I

Basic Concepts of OOPs, Templates Function and class templates. Algorithms: performance analysis: time complexity and space complexity. ADT, List (Singly, Doubly and Circular) Implementation, Array, Pointer

Unit II

Stacks and Queues: ADT, Implementation and Applications. Trees: General Tree, Binary Search tree, Expression tree, AVL. Introduction to Red Black trees, B Trees, Implementations, Tree Traversals

Unit III

Priority Queue, Implementation, Graphs, Directed Graphs, Shortest Path Problem. Undirected Graph: Spanning Trees, Graph Traversals: BFS, DFS

Unit IV

Hash table representation: hash functions, collision resolution, separate chaining, open addressing, linear probing: quadratic probing, double hashing, rehashing, Garbage collection and Compaction,

Unit V

Searching Techniques , Sorting , Bubble Sort , Insertion Sort ,Quick Sort ,Heap Sort, Radix Sort ,Merge Sort , Introduction to Designing Techniques : Divide and Conquer , Dynamic Programming, Greedy Algorithm , Backtracking.

Text Books:

1. Mark Allen Weiss, —Data Structures and Algorithm Analysis in C++‖, Pearson Education, 2002.
2. Aho Hopcroft Ullman, —Data Structures and Algorithms‖, Pearson Education, 2002.
3. Data structures, Algorithms and Applications in C++, S.Sahni, University Press (India) Pvt.Ltd, 2nd edition,
4. E. Balguruswamy. Object-Oriented Programming with C++, 3rdEdition, 2007, Tata McGraw-Hill (TMH) Publication Pvt. Ltd., New Delhi.

Reference Books:

1. Data structures and Algorithms in C++, Michael T.Goodrich, R.Tamassia and Mount, Wiley student edition, John Wiley and Sons.
2. Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI
3. C++ Primer – Lippman, Addison Wesley

CSC -2.2 Advance Operating System

Unit I

Operating System, 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 Environments, Open-Source Operating Systems. Operating System Services, User Operating System Interface, System Calls, Types of System Calls, System Programs, Operating-System Design and Implementation, Operating System Structure, Virtual Machines, Operating System Debugging, Operating System Generations. System Boot.

Unit II

Process: Process Concept, Process Scheduling, Operations on Processes, Inter-Process Communication, Examples of IPC Systems, Communication in Client-Server Systems Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Process synchronization: Background, Critical section problem, Semaphore, Overview of classical synchronization problem: The Bounded-Buffer problem, The Reader-Writers Problem, The Dining -Philosopher Problem, Monitors.

Unit III

Deadlocks: System Model, Deadlock Characterization, Methods of Handling Deadlocks, Deadlock Prevention, Deadlock avoidance, Deadlock Detection, Recovery from Deadlock. Memory Management Strategies: Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation.

Unit IV

Virtual-Memory Management: Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files, Allocating Kernel Memory. File System: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection.

Unit V

Introduction to advanced OS, It's evolution, Categorization, Distributed operating system: Architectures, issues in Distributed operating systems, Limitation of Distributed Systems.

Text Books:

1. Abraham Silberschatz and Peter Bear Galvin, "Operating System Concepts", Addison Wesley.
2. Mukesh Singnal and Niranjan G. Shivaratri , Advanced Concepts in operating System, TMH.

Reference Books:

1. Milan Milenkovic, System Concepts & Design, TMH
2. H.M. Beitel, Operating System, Pearson.
3. Andrew, S Tannenbaum , "Operating System", PHI

CSC -2.3 Software Engineering

Unit I

Introduction to software Engineering: Basic concepts about software and program and Evolution of Software Engineering, Basic concepts on process and life cycle models. Models: Waterfall, Prototype, Evolutionary, Incremental, Spiral, V Model, RADM.

Unit II

Requirements Engineering, Functional and Non-Functional Requirements, The Software Requirements Document, Requirements Specification, Software design: Methods and strategies, desirable design attributes, Concept of good design, Cohesion and coupling.

Unit III

Function-Oriented Software Design: Structured system analysis and structured design, formal approach design, data flow oriented design. Software Coding and Testing: Coding Standard and Guidelines, Code Review, Software Inspection, Testing: Unit, Integration, System Testing, Black box and White box testing, Incremental Testing, Formal Proof of Correctness, Software Matrix. Introduction to Software Verifications.

Unit IV

Overview of Object Oriented Concepts: Basic mechanisms, Key concepts, related technical terms, Advantages of OOD. Object oriented vs. function-oriented design, Object oriented modelling.

Context Models, Interaction Models, Structural Models, Behavioural Models, Model-Driven, Engineering, Architectural Design, Architectural Design Decisions, Architectural Views, Architectural Patterns, Application Architectures.

A Case Study: (Ex: - ATM, Trading System, Banking System, Library Information System, Student Information System etc.)

Unit V

Software Reliability and Quality Management: S/W and H/W Reliability, Reliability Matrices, S/W Quality, ISO9000. Software Engineering Management: Introduction to Capability Maturity Model, Quality Assurance and Software Cost Estimation (Delphi, COCOMO), Introduction to Computer Aided Software Engineering, Software Reuse and Maintenance.

Reference Books:

1. Rajib Mall, "Introduction to S/W Engineering", PHI.
2. Rohit Khurana, "Software Engineering Principles and Practices" 2nd Ed.
3. R.S. Pressman, "Software Engineering, A practitioner's approach", McGraw Hill.
4. Grady Booch, Rambaugh, IvarJacohson, "Unified Modeling Language", User Guide Pearson.
5. H. Srimathi, H. Sriram, A. Krishnamurthy, Scitech, "Object Oriented Analysis & Design Using UML"

6. Craig Larman , "Applying UML and Patterns".

7. Satzinger, Jackson, Burd, "Object-Oriented Analysis & Design with the Unified Process" Cengage Learning.

CSC -2.4 Computer Graphics

Unit I

A survey of computer graphics: Computer Aided Design, Presentation graphics, Computer Art, Entertainment, Education and training, Visualization, Image processing, Graphical User Interfaces.

Overview of graphics Systems: Video display devices, Raster Scan Displays, Random Scan Displays, Input devices, Hard-copy devices, Graphics software. Output Primitives: Points and Lines, Line drawing Algorithms (DDA and Bresenham's Line algorithm), Mid-point circle algorithm, Ellipse generating algorithms, Filled-Area Primitives. Attributes of Output Primitives: Line Attributes, Curve Attributes, Color and Grayscale Levels, Area-Fill Attributes and Character Attributes, Bundled attributes and anti-aliasing.

Unit II

Two dimensional geometric Transformation: Basic Transformation(Translation, Rotation, Scaling), Matrix representation and Homogenous Coordination, Composite Transformation, Reflection Shear, Transformation between coordinate systems, Two dimensional viewing: The Viewing Pipeline, Viewing coordinate reference frame, window to viewport coordinate transformation, Line Clipping: (Cohen-Sutherland & Liang-Barsky algorithm) and Polygon Clipping (Sutherland-Hodgeman Algorithm).

Unit III

Three dimensional object Representation: Polygon Surfaces, Quadratic Surfaces, Spline Representation, Beizer Curves and Surfaces, B-Spline Curves and Surfaces, Fractal Geometry Methods: Fractal Generation Procedures, Classification of Fractals, Fractal Dimension, Geometric Construction of Deterministic Self Similar Fractals, Self Squaring fractals.

Unit IV

Three Dimensional Geometric and Modeling Transformations: Translation, Rotation, Scaling. Reflections, Shears, Composite Transformations, Modeling and coordinate Transformations.

Three Dimensional Viewing: Viewing Pipeline, Viewing Coordinates, Projections (Parallel and Perspective) Clipping.

Unit V

Visible Surface Detection Methods: Classification of Visible-Surface Detection Algorithms, Back-Face Detection, Depth-Buffer Method, A-Buffer Method, Scan line and Depth Sorting,

Illumination Models and Surface-Rendering Methods: Basic Illumination Models, Displaying Light Intensities, Halftone Patterns and Dithering Techniques, Polygon-Rendering Methods (Gouroud Shading, Phong Shading),

Text Books:

1. Donald Hearn & M. Pauline Baker, "Computer Graphics with OpenGL", Third Edition, 2004, Pearson Education, Inc. New Delhi.

Reference Books:

2. J.D. Foley, A.Dam, S.K. Feiner, J.F. Hughes: Computer Graphics Principle and Practice Addision Wisely.

CSC -2.5 Java Programming

Unit I

Introduction to Java Programming Language, Data Types and Operations, Structured Programming, Selection Statements, Loops, Methods, Method Abstraction and Stepwise Refinement, Arrays, Object-Oriented Programming: Classes and Objects, Constructors, Implementing & Designing Classes.

Unit II

Use of Keywords: static, final, this, Class Abstraction and Encapsulation, Strings and Text I/O, Inheritance and Polymorphism, use of super keyword, Overriding vs. Overloading, Object: The Cosmic Superclass, Abstract Classes and Interfaces, Packages, Object-Oriented Design and Patterns.

Unit III

GUI Programming: GUI Basics, Graphics, Event-Driven Programming, Creating User Interfaces, Applets and Multimedia, Exception Handling, Binary I/O.

Unit IV

Files & Streams, Recursion, Dynamic Binding, Generics & Generic Programming, Java Collections Framework, Algorithm Efficiency, Searching & Sorting.

Unit V

Multithreading, Networking, JDBC, Internationalization, Advanced GUI Programming: MVC, JavaBeans and Bean Events, Containers, Layout Managers, and Borders, Menus, Toolbars, Dialogs and Swing Models, JTable and JTree, New Features of Java.

Reference Books:

1. Y. Daniel Liang, "Introduction to Java Programming: Comprehensive Version", 7th Edition, 2009, Pearson Education Inc., New Delhi. (Book Chapters: 1 to 24, 26, 29 to 37)

2. Herbert Schildt, "Complete reference of Java" 7th edition, TMH, New York

3. Richard A. Johnson, "An Introduction to Java Programming and Object Oriented Application Development", First Edition, 2007, CENGAGE Learning India Pvt. Ltd., New Delhi.

4. E. Balagurusamy, "Programming with Java: A Primer", 3rdEdition, 2008, McGraw-Hill Education (India), New Delhi.

5. Harvey M. Deitel& Paul J. Deitel, "Java How to Program", 8thEdition, 2009, PHI Learning Pvt. Ltd., New Delhi.

6. Mahesh P. Bhave& Sunil A. Patekar, "Programming with Java", First Edition, 2009, Pearson Education, Inc. New Delhi.

CSL -2.6 Data Structure Lab

01. Matrix Operations-Add, Multiply, Rank, Det.etc.
02. Stack & Queue operations using Arrays.
03. Self-referential structures & single linked list operations.
04. Implementing Stack and queues using linked lists.
05. Implementing Polish Notations using Stacks.
06. Circular and double linked list operations.
07. Implementing priority queue & dequeue using lists.
08. Evaluating polynomial operations using Linked lists.
09. Implementing set related operations & Hashing.
10. Linear & binary search, bubble sort technique.
11. Insertion sort, selection sort & merge sort techniques.
12. Quick sort, counting sort and Shell sort techniques.
13. Radix (bucket) and address calculation sort methods.
14. Binary tree traversals (preorder, inorder, postorder).
15. Heap sort & AVL tree implementations.
16. Graph representation with matrix & adjacency lists.

CSL -2.7 Java Programming Lab

01. Introduction to java, Compiling & executing a java program.
02. Program with data types & variables.
03. Program with decision control structures: if, nested if etc.
04. Program with loop control structures: do, while, for etc.
05. Program with classes and objects.
06. Implementing data abstraction & data hiding.
07. Implementing inheritance.
08. Implementing and polymorphism.
09. Implementing packages.
10. Program with modern features of java.
11. Implementing interfaces and inner classes
12. Implementing wrapper classes
13. Working with files.
14. Working with AWT
15. Working with JDBC

THIRD SEMESTER

CSC - 3.1 Optimization Techniques

Unit I

Graphical solution of linear programming problems, The Simplex Method: Computational procedure, .Artificial variable techniques, Two-phase simplex method.

Duality in linear programming: Concept of duality. Formulation of primal dual pairs, Duality and simplex method, Dual simplex method and algorithm, Computational procedure of the revised simplex method

Unit II

Transportation Problems: Mathematical formulation, Vogel's method with optimality test - MODI method, Unbalanced transportation problem. Assignment problem - Mathematical formulation, Hungarian assignment method, the travelling salesman's problem

Unit III

Sequencing problems: Problems with n jobs & 2 machines, n jobs and k machines, 2 jobs and k machines

Integer Programming: Gomory's methods, Branch & Bound method.

Network Scheduling: Basic terms, Critical path methods, PERT

Unit IV

Queuing Theory: Characteristics of queuing systems, Poisson process and exponential distribution, Steady state M/M/1, M/M/C (Models I, II, IV, V)

Unit V

Inventory Control: Inventory Costs, Economic order quantity, Deterministic inventory problems, EOQ problems with no shortage, With shortage, Production problem with no shortage, with shortage

Replacement Problem: Replacement of items that deteriorate, Replacement of items that fail - Group and individual replacement, Recruitment and promotion problems.

Reference Books:

1. Operations Research - Kanti Swarup, P. K. Gupta & Man Mohan, Sultan Chand & Sons Pub.
2. Operations Research – S. D. Sharma, Kedar Nath Ram Nath Pub.
3. Operation Research - Hamdy A. Taha, McMillan Pub.

CSC- 3.2 Design and Analysis of Algorithm

Unit I

Introduction to design and analysis of algorithms, Growth of functions, Recurrences, Solution of recurrences by Substitution, Recursion tree and Master method, Worst case analysis of Merge sort, Quick sort and Binary search

Heapsort: Heaps, Building a heap, The Heapsort algorithm, Priority Queue, Lower bounds for sorting

Unit II

Dynamic Programming: Matrix-chain multiplication, Elements of dynamic programming, Longest common subsequence

Greedy Algorithms: An activity- selection problem, Elements of greedy strategy, Fractional knapsack problem, Huffman codes

Unit III

Data structures for Disjoint Sets: Disjoint set operations, Linked-list representation of disjoint sets, Disjoint-set forests.

Graph Algorithms: Elementary Graph Algorithms: Representations of graphs, Breadth-first search, Depth-first search, Minimum Spanning Trees: Kruskal and Prim's algorithms, Single-Source Shortest Paths: The Bellman-Ford and Dijkstra's algorithm, All-Pairs Shortest Paths: The Floyd-Warshall Algorithm

Unit IV

Maximum Flow: Flow Networks, The Ford-Fulkerson method, Polynomials and the FFT: Representation of polynomials, The DFT and FFT, String Matching: The naïve string-matching algorithm, The Rabin-Karp algorithm.

Unit V

NP-Completeness: Polynomial time, Polynomial-time verification, NP-completeness and reducibility, NP-completeness proofs, NP-completeness problems, Approximation Algorithms: The vertex-cover problem, The travelling-salesman problem, The set-covering problem, The subset-sum problem

Reference Books:

1. Introduction to Algorithms: T. H. Cormen, C. E. Leiserson, R. L. Rivest (PHI), Second Edition.
2. E. Horowitz, S. Sahani, S. Rajsekharan, "Fundamentals of Computer Algorithms", Second Edition, Universities Press, 2007
3. Algorithm Design – Goodrich, Tamassia, Wiley India.
4. Algorithms By Sanjay Dasgupta, Umesh Vazirani – McGraw-Hill Education

CSC-3.3 Advanced Computer Network

Unit I

Introduction: Data Communication, Network Protocols and Standards, Point to Point and Multi Point line configuration, Network Topologies: Mess, Star, Tree, Bus, Ring

Transmission Modes: Simplex, Half Duplex, Networks: LAN, MAN, WAN. The OSI Models: Function of Layers. TCP/ IP Protocol Suit

Signals: Analog and Digital signals, Periodic and Aperiodic signal,

Encoding and Modulating: Digital to Digital conversion. Unipolar. Polar Bipolar, Analog to Digital conversion AM, FM, PM

Unit II

Transmission of Digital data: Parallel and Serial transmission. DTE/DCE interface, Modems, Guided and Unguided transmission media. Transmission impairment, Performance

Multiplexing: Frequency division, Wave division and Time division multiplexing, the Telephone system, Digital Subscriber Line (DSL), Error Detection and Correction: Types of Error, Redundancy Checks (VRC, LRC, CRC), Error Correction

Unit –III

Data Link Control: Line Discipline, Flow Control, Error Control

Data Link Protocol: Asynchronous and Synchronous Protocols, Character and Bit Oriented Protocols.

Local Area Networks: IEEE 802 standards, Ethernet, Token Bus, Token Ring, FDDl

Switching: Circuit Switching, Packet Switching, Message Switching

Unit IV

Integrated Services Digital Network (ISDN), Services, History, Subscribers access to ISDN, The ISDN layers, Broadband ISDN

X.25: X.25 Layers, Protocols related to X.25

Frame Relay: Introduction, Frame Relay operation. Frame Relay layers, Congestion Control, Leaky bucket algorithm. Traffic control

Unit V

Networking and Internetworking Devices: Repeaters, Bridges, Routers, Gateways, Routing Algorithms.

TCP/IP Protocol Suite: Overview, Network Layer, Addressing Subneting, Transport Layer, Application Layer: Client Server Model, BOOTP, DHCP, DNS, Telnet, FTP, SMTP, SNMP, HTTP, WWW

Reference Books:

1. Behrouz A Forouzen "Data Communications and Networking " Tata McGraw Hill.
2. Stalling W "Computer Communication Networks " Prentice Hall

3. Tannenbaum A.S "Computer Networks" PHI
4. Bartee T.C "Data Communication ,Network and systems" BPB
5. Schweber WL"Data Communication "Mc Graw Hill
6. Steven W.R: TCP/IP Illustrated ,Vol 1 ,The protocols" Addition Wesley

CSE-3.4 Elective-I (Compiler Design)

Unit -1

Introduction: Overview and phases of compilation.

Non-deterministic and deterministic finite automata (NFA & DFA), Conversion of NFA to DFA Classification of grammars, regular grammar, regular expressions and regular languages, Context free grammars, ambiguous grammar

Unit -2

Scanners: Top down parsing, LL grammars, Bottom up parsing, Polish expressions. Operator precedence grammar, LR grammars, Comparison methods Error handling

Unit-3

SLR parsers and construction of SLR parsing tables, LR(1) parsers and construction of LR(1) parsing tables, LALR parsers and construction of efficient LALR parsing tables, parsing using ambiguous grammars

Symbol table handling techniques, Organisation for non-block and block structured languages

Unit – 4

Syntax Directed Translation: Syntax directed definitions (SDD), inherited and synthesized attributes, dependency graphs, semantic rules, application of syntax directed translation.

DAG for expressions, three address codes - quadruples and triples, types and declarations, translation of expressions, array references, type checking and conversions, translation of Boolean expressions and control flow statements, back patching, intermediate code generation for procedures.

Run time storage administration, Static and Dynamic allocation

Unit-5

Intermediate forms of source program, Semantic analysis and code generation.

Code optimization folding, peephole optimization, Redundant sub-expression evaluation, redundant and un-reachable codes, Optimization with interactive loops. Basics of flow of control optimization

Reference Books:

1. A.V. Aho, R. Sethi & J.D. Ullman "Compilers Principles Techniques and Tools" Pearson Education
2. Kenneth C. Louden "Compiler Construction Principles & Practice "Cengage Learning Indian Edition.

CSE-3.5 Elective-II (Artificial Intelligence)

Unit – I

Introduction to AI, Application areas of AI, State-Space-Search: Production system design, Production system characteristic.

Search Techniques

Blind search: Depth first search, Breadth first search.

Heuristic search Techniques: Hill Climbing, Best first search, Branch and bound, A*, AO*.

Unit- II

Game playing: Min-Max Search, Alpha-Beta Cutoff.

Knowledge Logic: Skolemizing queries, Unification algorithm, Modes Ponens, Resolution.

Unit- III

Structured knowledge representation,: Semantic nets, Frames, Conceptual dependencies, Scripts.

Unit – IV

Expert System: Expert System need & Justification, Rule based architecture, Non production system architecture, Case studies of expert system: MYCIN, R1. Learning: Concept of learning, Types of learning, Genetic algorithm, Neural network.

Unit – V

Natural language processing: Introduction syntactic processing, semantic analysis, discourse and pragmatic processing.

Handling uncertainty: Probabilistic reasoning, Use of certainty factor

Knowledge organization & management: Introduction, HAM.

Reference Books:

1. Rich & Knight (Chapters 1.1,2,3,5,9,10.1,10.2,12.1, 12.2, 12.3, 15.1-15.4, 17.1-17.6)
2. Dan W. Patterson (Chapters 4.1-4.4, 5.3, 11.1,11.4, 15.1-15.4)
3. N.J. Nilson "Artificial Intelligence a new Synthesis"
4. Russel & Norvig "Artificial Intelligence a Modern Approach"

CSE-3.5 Elective-II (Cryptography and Network Security)

Unit I

Overview of Cryptography, Substitution and affine cipher , Polyalphabetic Cipher and their cryptanalysis, Perfect Security, Block Cipher, Data Encryption Standard (DES),2DES,3DES, Differential and linear Cryptanalysis, Block Cipher Design Principles, Block Cipher modes of operation, Advanced Encryption Standard..

Unit II

Principles of Public-Key Cryptosystems, The RSA Algorithm, Key Management, Diffie-Hellman Key Exchange and Cryptanalysis, Authentication Functions, Message Authentication Codes (MAC), Hash Functions, Security of Hash Functions and MAC, Secure Hash Algorithm, HMAC.

Unit III

Discrete Logarithms, ElGamal System, Schnorr signature scheme, The ElGamal signature scheme, The digital signature algorithm, Provable secure signature schemes

Unit IV

Elliptic curve over the reals, Elliptic curves modulo a prime, Properties of Elliptic cures Point compression and ECIes, Computing point multiples on Elliptic curves, Elliptic curve digital signature algorithm, ECElGamal Cryptosystem, ElGamal EC Digital signature scheme, Elliptic curve factorization, Elliptic curve primality test.

Unit V

Network Security Practice: Kerberos, X.509 Authentication Service, Public Key Infrastructure, E-Mail Security (Pretty Good Privacy), IP Security (Architecture, Authentication Header, Encapsulation Security Payload, Combining Security Associations, Key Management), Web Security (Secure Sockets Layer and Transport Layer Security).

Reference Books:

1. W. Stallings – Cryptography and Network Security Principles and Practice, Pearson Education Asia, 3rd Edition, 2000.

2. D. Stinson - Cryptography : Theory and Practice, CRC Press, 2006

3. Bernard Menezes," Network Security and Cryptography", Cengage Learning.

4. Atul Kahate, "Cryptography and Network Security", TMH

CSL - 3.6 Advance Java Lab

1. Design a web page having blue colour background and white colour text with title 'student details'.
2. Design a web page having three paragraphs with different alignment, text colour and font size.
3. Design a web page to demonstrate physical style tags.
4. Design a web page having three hyperlinked text and two hyperlinked images.
5. Design a web page that contains an ordered list of operating system and an unordered list of programming languages.
6. Design a web page that contains a nested list.
7. Design a web page to display mark sheet of a student in table format.
8. Design a web page to create an image gallery of six images arranged in 2X3 table.
9. Design a web page to create a registration form having name, address, password, gender, course, nationality, skill and CV with appropriate GUI control.
10. Develop a HTML document having three vertical frame of equal size.
11. Design a web page having four paragraphs with different font, text and background properties using external CSS.
12. Design a web page having three shadowed images and four rounded corner buttons using inline style sheet.
13. Develop a JavaScript program that accepts student details and displaysaccepted information in formatted manner.
14. Develop a JavaScript program that reads a stringand then displays the string 10 times with alternate red and blue colour.
15. Develop a JavaScript program that that reads an integer and displays its multiplication table in html table format.
16. Develop a JavaScript program that reads p and n and calculates P(n,r) using user defined factorial function.
17. Develop a JavaScript program to demonstrate parseInt(),parseFloat() and eval() function.
18. Develop a JavaScript program that accept n values in an array and perform the following operation
    (i) Sort (ii) Reverse (iii) Insert element at the beginning (iv) Delete element from the end
19. Develop a JavaScript program that calculates reverse the number entered in first text field referring DOM hierarchy. The result is stored in second text field.
20. Develop a JavaScript for validation of mobile number and mandatory fields in a HTML form.
21. Develop a DHTML program to change background colour of a web page on clicking the corresponding button.
22. Develop a DHTML program for GUI calculator that performs all arithmetic operation.
23. Develop an XML document that contains employee (eid, ename, designation) details using internal DTD.
24. Develop an XML document that contains student (roll, name (first name, last name), address, contact) using external DTD.
25. Develop a Generic Servlet program to display message 'Welcome to Servlet' .Run this program in Apache Tomcat Web server.
26. Develop anHttp Servlet program to display message 'Hello World' in first level heading and red colour.

27. Develop a Servlet program to generate dynamic HTML that displays personal details in formatted manner. The details are accepted from client HTML page
28. Develop a Servlet that accepts basic pay, DA%, HRA%, Deduction% from client HTML page and generates payslip in table format using request response model.
29. Develop a Servlet for hit counter using session concept. The counter will be increased by 1 for every request.
30. Develop a JSP program to display current date and time. Run this program in Apache Tomcat web server.
31. Develop a JSP program that accepts two numbers x and y from client HTML page and calculates x^y.
32. Develop a JSP program that accepts a number n and display factorial of all numbers from 1 to n in table format.
33. Develop a JSP program that inserts records to table emp(eid,ename,salary) using JDBC. The data is accepted from client HTML page.
34. Develop a JSP program displays message "Welcome" for first client request. The message should be "Welcome Back" for second request onwards. Use the concept of session.
35. Develop a JSP program that manipulates a bean named student. Bean student has two property roll and name.
36. Develop a login application using JSF framework.
37. Develop a RMI program showing marshalling and unmarshalling processes.
38. Develop a stateless session bean that calculates mean of 3 numbers.
39. Develop a stateful session bean to perform deposit, withdraw and balance check operation on a bank account.
40. Develop a web based project university management system using JSP and database.

CSL - 3.7 Computer Networking Lab

1. Write a tcl script for creating network animator.
2. Write a tcl script for creating a simple topology with two nodes and a link.
3. Write a tcl script for creating nodes, links and orientation.
4. Write a tcl script for creating nodes, links , orientation and labelling.
5. Write a tcl script for creating nodes, links, bandwidth and delay description.
6. Write a tcl script for creating eight nodes , bandwidth, delay and queue of the link
7. Write a tcl script to set identification colors to the links.
8. Write a tcl script for UDP communication between two nodes.
9. Write a tcl script for UDP communication in a network topology having ten number of nodes.
10. Write a tcl script for TCP communication between two nodes.
11. Write a tcl script for TCP communication between two sources and two destinations.
12. Write a tcl script for TCP communication for more number of nodes.
13. Write a tcl script to drop down packets in a link.
14. Write a tcl script to drop down packets in a router and end server at a particular time.
15. Write a tcl script to drop down packets in a link at particular time interval.

FOURTH SEMESTER

CSP - 4.1 Project work

Each student must have an internal supervisor who is a faculty of the department/ Institution. Each student must submit the abstract of the project which will be approved by the department on the recommendation of the internal supervisor. .

Guidelines: SUMMARY/ABSTRACT

All students must submit a summary/abstract of the project to be undertaken to the internal supervisor for approval, preferably, should be of about 3-4 pages. The content should be as brief as is sufficient enough to explain the objective and implementation of the project that the candidate is going to take up. The write up should include the followings-
1. Name / Title of the Project
2. Statement about the Problem
3. Why is the particular topic chosen?
4. Objective and scope of the Project
5. Methodology (including a summary of the project)
6. Hardware & Software to be used
7. Testing Technologies used
8. What contribution would the project make?
After the approval, the student is allowed to carry out the project in any organization/ Institution. He/She must immediately inform the internal supervisor about the name and contact details of the external supervisor in the organization/Institution. Moreover he must report to the internal supervisor about the progress of his/her work periodically. After the end of 16 weeks, the student is required to submit the project report in the department after getting approved by the internal and external supervisors.

Guidelines for preparation of the final project report

Good quality white executive bond paper of A4 size should be used for typing and duplication with the following specification
Left margin : 3.0cm
Right margin : 2.0cm
Top margin : 2.5cm
Bottom margin : 2.5cm
Page numbers: All text pages as well s the Program source code should be numbered in the bottom center of the pages.
Font size of the normal Text :12pt Times New Roman
Font size of Paragraph Heading :14pt Times New Roman
Font Size of chapter Heading :18pt Times New Roman
Font size of Code :10pt Courier New

Format of the Project report

Cover page
Certificate of the internal supervisor
Certificate of the external supervisor
Self certificate
Acknowledgement
List of abbreviations, figures, Tables
Synopsis of the project (3-4 pages)
Main Report
Objective and scope of the project
Theoretical background
Definition of the problem

System Analysis and design
System planning
Methodology adopted
System implementation
System maintenance and Evaluation
Cost benefit Analysis
Detail life cycle of the project
Test reports (print out of the reports)
Print out of the code
References
Every student has to submit the followings
(a) One hard copy of the Project report
(b) Soft copy of the project on CD (to be submitted to the Universiy) on a cover mentioning the name of the project, name of the student, Regd No. , name of the department, Year
(c) Five copies of the synopsis of the project report

Evaluation of the Project

Evaluation of the project will be done by a jury of experts including one external expert, Head of the Department, internal supervisor, two teachers of the department. The evaluation will be done on the basis of the followings:
Presentation : 50 marks
Viva-Voce : 50 marks

Project report : 150 marks