JAVA

UNITWISE SYLLABUS

1. **Introduction, Environment and Programming Structure:** Java White Paper Buzzwords, History of Java, Common Misconceptions, Choosing a Development Environment: Command-Line Tools, Running a Graphical Application, Building and Running Applets; A Simple Java Program, Comments, Data Types, Variables, Operators, Input and Output, Control Flow, Big Numbers, Arrays.
2. **Class, Objects and Inheritance:** Introduction to OOP, Predefined Classes, User Defined Classes, Static Fields and Methods, Method Parameters, Object Construction, Packages, Class Path, Documentation Comments, Class Design; Inheritance: Super-classes and Subclasses, Types of Inheritance, Polymorphism, Abstract class, Object: The Cosmic Super class, Generic Array Lists, Object Wrappers and Autoboxing, Methods with a Variable Number of Parameters, Enumeration Classes, Reflection, Inheritance Guidelines, Interfaces.
3. **String Handling, Exception Handling and Generic Programming:** String Handling APIs: String, Immutable String, Methods of String Class, StringBuffer, StringBuilder, StringTokenizer. Exceptions: Dealing with Errors, Catching Exceptions, Guidelines for Using Exceptions, Assertions, Logging; Generic Programming: Definition, Generic Methods, Bounds for Type Variables, Generic Code and VM, Restrictions and Limitations, Inheritance Rules for Generic Types, Reflection and Generics.
4. **Java Collections and Multithreading:** Collection Interfaces, Concrete Collections, The Collections Framework, Algorithms, Legacy Collections, Multithreading: Threads, Interrupting Threads, Thread States, Thread Properties, Synchronization, Blocking Queues, Thread-Safe Collections, Callable and Futures, Executors, Synchronizers.
5. **Java GUI Programming and JDBC:** Introduction to Swing, Creating a Frame, Positioning a Frame, Displaying Information in a Component, Displaying Images, Event Handling, Basics of Event Handling, Actions, Mouse Events, The AWT Event Hierarchy; JDBC: Basic JDBC Programming Concepts, JDBC Drivers, Statements, Executing Queries, Result Sets.

Text Books

1. Horstmann & Cornell: Core Java Volume I: Fundamentals, Pearson Education
2. Horstmann & Cornell: Core Java Volume II: Advanced Features, Pearson Education.
3. H. Schildt: Java 2: The Complete Reference (9th Ed.), 2014, Tata McGraw Hill.
4. Daniel Liang: Introduction to Java programming, 7th Edition Pearson Education.

Reference Books

1. Dietel & Dietel: Java How To Program, Pearson Education.

DBMS

UNITWISE SYLLABUS

1 **Database:** Data, Database and Database Management System (DBMS); Database vs. Traditional File System Approach; Three Schema Architecture of DBMS and Data Independence; Categories of Database Management Systems: Hierarchical, Network and Relational Database Systems.

2 **Database Models:** Introduction, Categories of Database Models: High-level or Conceptual Data Models, Representational or Implementation Data Models, Low-level or Physical Data Models, Object Data Models. Entity relationship (ER) Model: Basic Concepts and their representations – Entity, Entity Type and Entity Set, Attributes and Keys, Relationships, Relationship Types, and Structural Constraints, Weak Entity, Naming Conventions & Design Issues in ER Model. ER and EER Diagrams.

3 **Relational Database Model:** Structure of Relational Model; Domains, Attributes, Tuples, and Relations; Characteristics of Relations; Relational Constraints – Domain Constraints, Key Constraints, Entity Integrity, and Referential Integrity Constraints; Relational Database Schema; Relational Algebra Operations – Select, Project, Rename, Union, Intersection, Set Difference, Join, and Division Operations; Aggregate Functions and Groupings.

4 **Structured Query Language (SQL):** Schema, Table and Domain Creation; Schema and Table Deletion; Table Modification; Insert, Delete, and Update Statements; SELECT-FROM-WHERE Structure; Renaming Attributes; Nested Queries and Set Comparisons; EXISTS and UNIQUE Functions; Aggregate Functions; Creating and Updating Views. Introduction to PL/SQL.

5 **Functional Dependencies and Normalization:** Informal Design Guidelines for Relation Schemas; Functional Dependencies; Inference Rules for Functional Dependencies; Normalization using Functional Dependencies – First Normal Form (INF), Second Normal Form (2NF), Third Normal Form (3NF), and Boyce-Codd Normal Form (BCNF); Multi-Valued Dependencies and Fourth Normal Form (4NF); Join Dependencies and Fifth Normal Form (5NF); Relation Decomposition and Insufficiency of Normal Forms; Dependency Preserving and Lossless Join Decompositions; Null Values and Dangling Tuples.

Transaction Management and Concurrency Control: Transaction Concept; Transaction State; Concurrent Executions; Serializability and Recoverability; Testing for Serializability. Concurrency Control – Lock-Based Protocols and Timestamp-Based Protocols.

Software Engineering

UNITWISE SYLLABUS

1. **Software Engineering and Process:** Software and its Components: Evolving Role of software; Software Characteristics, Software: A Crisis on the Horizon , Legacy Software and Software Myths; Software Engineering – A Layered Technology.

2. **Software Process Models:** The Software Process, Software Process Models The Linear Sequential Model, The Prototyping Model, The RAD Model, Evolutionary Software Process Models, Component-Based Development, The Formal Methods Model, Process Technology, Product and process.

3. **Design Concepts And Principles**: Software Design and Software Engineering, The Design Process, Design Principles, Design Concepts, Effective Modular Design, Design Heuristics for Effective Modularity, The Design Model, Design Documentation, Software Architecture, Data Design, Architectural Styles, Analyzing Alternative Architectural Designs, Mapping Requirements into a Software Architecture, Transform Mapping, Transaction Mapping, User Interface Design, Task Analysis and Modeling, Interface Design Activities, Implementation Tools, Design Evaluation, Structured Programming.

4. **Project Management Concepts**: The Management Spectrum, The Product, The Process, Software Process And Project Metrics: Measures, Metrics, and Indicators, Metrics in the Process and Project Domains, Software Measurement, Metrics for Software Quality, Integrating Metrics Within the Software Engineering Process, Software Project Estimation, Decomposition Techniques, Empirical Estimation Models, Data Modeling, Functional Modeling and Information Flow, Behavioral Modeling, The Mechanics of Structured Analysis, Software Design and Software Engineering.

5. **Software Testing and Quality:** Software Testing Fundamentals, Test Case Design, White-Box Testing, Basis Path Testing, Control Structure Testing, Black-Box Testing, Testing for Specialized Environments, Architectures, and Applications, Strategic Approach to Software Testing, Unit Testing, Integration Testing, Validation Testing, System Testing, The Art of Debugging. Quality Concepts, Software Quality Assurance and Software Quality Control.

Text Books

1. Pressman: Software Engineering, 6th Ed.; Mc Graw Hill Publications.
2. Sommerville: Software Engineering, 7th Edition, Pearson Education.
3. Rajib Mall: Fundamentals of Software Engineering, 3 rd Edition, PHI, 2009.
4. kelkar S.A.: Software Engineering, PHI 2007.

Analysis and Design of Algorithm

Course Code	:	CSCC34
L-T-P	:	3-1-4
Credit	:	4
Course Prerequisite	:	CBCS11, CBSE12, CSCC14, CSCC23
Course Status	:	Core Course
Instructor's name	:	
Tel. No.	:	
Office Location	:	
Office Hours	:	
Class Location	:	
Class Time	:	

a) **Course Description:** Techniques for the design and analysis of efficient algorithms, emphasizing methods useful in practice. Topics include a number of problem solving techniques like divide and conquer, dynamic programming, greedy approach, back tracking, and branch and bound for solving different kinds of problems. It also covers the different category of algorithms based on its time and space complexity.

b) **Objectives:** Upon completion of this course, students will be able to do the following:

1. Analyze the asymptotic performance of algorithms.
2. Write rigorous correctness proofs for algorithms.
3. Demonstrate a familiarity with major problem solving techniques.
4. Apply important algorithmic design paradigms and methods of analysis.
5. Synthesize efficient algorithms in common engineering design situations.

UNITWISE SYLLABUS

1. **Introduction:** Algorithm and its Basic features; Importance of Developing Efficient Algorithms; Every-Case Time Complexity, Worst-Case Time Complexity, Average-Case Time Complexity, and Best-Case Time Complexity; Complexity Representation using Order Notations: Big-o (O), Theta (Θ), Big-Omega

Analysis & Design of Algorithms

(Ω), Small-o (o) and Small-Omega (ω) Notations; Properties of Complexity Notations; Limit Approach to Determine Order, Master Theorem. Divide and Conquer Approach: Introduction to Divide-and-Conquer Approach – Divide, Conquer, and Combine Steps; Design and Analysis of Binary Search (Recursive and Non-recursive), Merger Sort, Quicksort, and Strassen's Matrix Multiplication Algorithms.

2. **Dynamic Programming:** Introduction to Dynamic Programming; Difference Between Divide-and-Conquer and Dynamic Programming Approaches; Binomial Coefficient Finding using Dynamic Programming; Dynamic Programming and Optimization Problems: Chained Matrix Multiplication and Longest Common Subsequence Problems; Travelling Salesman Problem.
3. **Greedy Approach:** Introduction to Greedy Approach; Components of Greedy Approach: Selection Procedure, Feasibility Check, and Solution Check; Minimum Spanning Tree Generation: Prim's and Kruskal's Algorithms; Dijkstra's Algorithm for Single-Source Shortest Paths; Scheduling: Single Server and Multi-Server Scheduling, Scheduling with Deadlines; Huffman Code; The Knapsack Problem (Greedy Approach vs Dynamic Programming): 0-1 Knapsack and Fractional Knapsack Problems.
4. **Backtracking:** Introduction to Backtracking; Backtracking Technique: State Space Tree, Promising and Non-Promising Nodes, Pruned State Space Tree; Backtracking Algorithms for n-Queens, Sum-of-Subsets, Graph Coloring, and 0-1 Knapsack Problems.
5. **Branch-and-Bound Method and Intractable Problems:** Introduction to Branch-and-Bound Method; Solving 0-1 Knapsack Problem using Branch-and-Bound Method: Breadth-First Search with Branch-and-Bound Pruning, Best-First Search with Branch-and-Bound Pruning; Solving Traveling Salesman Problem using Branch-and-Bound Method. Intractable Problems: NP-hard and NP-complete problems, Some examples of NP hard and NP complete Randomized Algorithm with examples.

Text Books

1. Neapolitan and Naimipour: Foundations of Algorithms using C++ Pseudo-Codes, JBL.
2. Rizvi and Aggarwal, "Algorithms: Analysis, Design and Implementation", Anamaya Publications, 2007, ISBN: 978-81-89927-03-5
3. Horowitz and Sahani, Fundamentals of Computer Algorithms, Galgotia Publications Pvt Ltd Delhi India.
4. Aho, "Design and Analysis of Computer Algorithms", Pearson Education.

Reference Books

1. Thomas H Cormen Leiserson "Introduction to Algorithms", PHI Learning Private Limited, Delhi India.

2. Explain how communication works in data networks and the Internet.
3. Recognize the different internetworking devices and their functions.
4. Explain the role of protocols in networking.
5. Analyze the services and features of the various layers of data networks.
6. Design, calculate, and apply subnet masks and addresses to fulfill networking requirements.
7. Undertake basic System Administration activities on popular operating system like Windows/Linux.

Computer Network & System

UNITWISE SYLLABUS

1. **Introduction Concepts:** Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling.
2. **Medium Access sub layer:** Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols. Sliding Window Protocols, Error Handling.
3. **Network Layer:** Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking - TCP / IP, IP packet, IP address, IPv6.
4. **Transport Layer and Application Layer:** Transport Layer - Design issues, connection management, session Layer- Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.

   Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other applications. Example Networks - Internet and Public Networks.
5. **Introduction to System Administration**: Concepts of users and groups, Access assignment and control, Group policies, File System Management, Disk quota for users, System logs, Backup/Restore operations, Remote access, setting up of firewalls, Firewll logs, Configuring network services such as DNS,DHCP,HTTP etc.

Text Books

1. Computer Networks, Andrew S. Tanenbaum, PHI.
2. Introduction to Computer Networks, S.A.M. Rizvi, V.K. Sharma, Narosa.
3. Data and Computer Communications, William Stallings, PHI
4. Data Communications and Networking, Behrouz A. Forouzan, TMH.

Scientific & Statistical using fortran 23

UNITWISE SYLLABUS

1. **Solution of Equations and System of Simultaneous Equations:** Solution of Algebraic and Transcendental Equations using Bisection, Regula False, and Newton Raphson Methods, Solutions of Linear Systems using Matrix Inverse, Gauss Elimination, Gauss Seidel, and Jacobi Methods.
2. **Interpolation, Numerical Differentiation and Integration, and Differential Equations:** Interpolation using Lagrange, and Newton's methods, Extrapolation, Least Square Fitting, Numerical Differentiation, Numerical Integration using Trapezoidal, and Simpson's Rules, Numerical Solution of Ordinary Differential Equations using Euler's and Range-Kutta Methods.
3. **Statistics:** Population, Sample, Sample Collection Methods, Data Representations and Classification, Central Tendency and Dispersion: Mean, Geometric Mean, Harmonic Mean, Median and Mode, Quartiles and Percentiles, Measures of Dispersion: Range, Variance, Standard Deviation, and Coefficient of Variation.
4. **Probability, Correlation and Regression:** Sample Space, Events, Equally Likely Events, Probability, Independent Events, Addition and Multiplication Rules, Conditional Probability, Probability Distributions – Normal, Binomial, and Poison Distributions; Correlation using Karl Pearson and Spearman Method, Regression Analysis.
5. **Hypothesis**: Hypotheses, Hypothesis Testing, t-Test, Chi-Square Test, Analysis of Variance (ANOVA), One and Two Way ANOVA, F-Test.

Text Books

1. S.S. Sastry, Introductory Methods of Numerical Analysis, PHI.
2. Gupta and Kapoor, Fundamentals of Mathematical Statistics a Modern Approach, S.Chand.
3. Seymour Lipschutz (Author), John J. Schiller: Introduction to Probability and Statistics, Mc Graw Hill.

Reference Books

1. Phillips and Taylor, Theory and Applications of Numerical Analysis, Elsevier
2. Balagurusamy, Numerical Methods, TMH.
3. Lindsey, Introduction to Applied Statistics: A Modelling Approach, Oxford University Press