

# **SEMESTER - I**

## **DATABASE SYSTEMS**

### **UNIT- I**

Introduction – Database-System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture – Database users and Administrator, Data Mining and Information Retrieval, Speciality Databases, Database Users and Administrators, History of Database Systems.

### **UNIT- II**

Introduction to the Relational Model and SQL: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations.

INTRODUCTION TO SQL- Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Subqueries, Modification of the Database.

### **UNIT -III**

Database Design: Relational Database Design- Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional Dependency Theory, Algorithms for Decomposition, Decomposition Using Multivalued Dependencies, More Normal Forms, Database-Design Process, Modeling Temporal Data.

### **UNIT-IV**

Transaction Management – Transactions – Transaction Concept, A Simple Transaction Model, Transaction Atomicity and Durability, Transaction Isolation, Serializability. Concurrency Control- Lock-Based Protocols, Deadlock Handling, Multiple Granularity, Timestamp-Based Protocols.

### **UNIT-V**

System Architecture-Distributed Databases- Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions, Concurrency Control in Distributed Databases, Distributed Query Processing.

### **TEXT BOOK**

1. Abraham Silberschatz, Henry F. Korth and S. Sudharshan, “Database System Concepts”, Sixth Edition, McGraw Hill Education (India) Edition, 2013.

### **REFERENCE BOOKS**

1. S.K.Singh, “Database Systems Concepts, Design and Applications”, First Edition, Pearson Education, 2006.
2. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
3. Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Fourth Edition, Pearson / Addison Wesley, 2007.

## DESIGN AND ANALYSIS OF ALGORITHMS

### UNIT-I

Introduction-What is an algorithm? , Algorithm Specification, Performance Analysis. Divide-and-Conquer- General Method, Finding the Maximum and Minimum, Quick Sort, Selection, Convex Hull.

### UNIT-II

The Greedy Method - General Method, Knapsack Problem, Minimum-Cost Spanning Trees, Single-Source shortest paths. Dynamic Programming – General Method- Multistage Graphs– All Pairs Shortest Paths – 0/1 Knapsack, The Traveling Salesperson Problem.

### UNIT-III

Basic Traversal and Search Techniques – Techniques for Binary Trees, Techniques for Graphs, Connected Components and Spanning Trees, Biconnected Components and DFS.

### UNIT-IV

Backtracking-The General Method, the 8-Queens Problem, Sum of Subsets, Graph Coloring, Hamiltonian Cycles. Branch and Bound –The General Method, 0/1 Knapsack Problem – Traveling salesperson.

### UNIT-V

NP-Hard & NP-Complete Problems- Basic Concepts, Cook's Theorem - NP-Hard Graph Problems –NP-Hard Scheduling Problems.

### TEXT BOOK

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/C++, Second Edition, Universities Press, 2008.

### REFERENCE BOOKS

1. Sara Baase & Allew Gelder, "Computer Algorithm: Introduction to Design & Analysis" Pearson Education, 2004, 9th Reprint.
2. Gilles Brassard and Paul Bratley, "*Fundamentals of Algorithm*", Prentice Hall of India Pvt.Ltd. 2005.
3. Rajeev Motwani and Prabhakar Raghavan Randomized Algorithms, Cambridge University Press, 1995.

## OBJECT ORIENTED SYSTEM DESIGN

### UNIT - I

Introduction – overview of object oriented systems development – Object basics – Object-Oriented Systems Development Life cycle.

### UNIT - II

Methodology, Modeling and Unified Modeling Language – Object-Oriented Methodologies – Pattern and Frameworks - Describing Design patterns – Catalog of Design patterns – Organizing the Catalog – Creational pattern, (Abstract Factory) Structural pattern (Adapter) and Behavioural Pattern (Chain of Responsibility)- Frameworks – Unified Modeling Language.

### UNIT - III

Object-Oriented Analysis: Use Case Driven – Object Oriented Analysis Process: identifying Use Cases, Object Analysis: Classification.

### UNIT - IV

Object-Oriented Design – Object-Oriented Design Process and Design Axioms, Designing Classes.

### UNIT -V

Access Layer: Object storage and Object interoperability – Distributed Databases and Client-Server Computing, Distributed Objects Computing, Object-Oriented Database Management Systems, Object – Relational systems, Designing Access layer Classes – View Layer – Designing Interface Objects.

### TEXT BOOKS

1. Ali Bahrami, “Object Oriented System Development”, McGraw Hill International Edition, 1999.
2. Erich Gamma, Richard Helm, Ralph Johnson and John Vlissides, “Design Patterns – Elements of reusable Object Oriented Software”, Addison Wesley Professional Computing Series - Pearson Education -2003

### REFERENCE BOOKS

1. Craig Larman, “Applying UML and Patterns”, Addison Wesley, 2000.
2. Fowler, “Analysis Patterns”, Addison Wesley, 1996.
3. Grady Booch, James Rumbaugh, Ivan Jacobson, “The Unified Modeling Language, User Guide”, Addison Wesley Longman, 1999.

## OPERATING SYSTEM DESIGN

### UNIT-I

Operating System Overview: Operating System Objectives and Functions – Evolution of Operating System – Virtual Machines – OS Design Considerations for Multiprocessor and Multicore.

### UNIT-II

Process Description and Control: Process States – Process Description – Process Control-Threads – Execution of OS – UNIX Process Management – Process and Threads – Types of Threads – Multicore and Multithreading – Windows 7 Thread & SMP Management-LINUX process & Thread Management

### UNIT-III

Concurrency: Mutual Exclusion and Synchronization - Principles of concurrency – Mutual Exclusion – Semaphores – Monitors – Message Passing – Reader/Writer problem-Concurrency. Deadlock and Starvation: Principles of Deadlocks – Deadlock Prevention – Deadlock Avoidance – Deadlock Detection – Dining Philosophers Problem Using Semaphores & Monitor.

### UNIT-IV

Memory Management: Memory management Requirements – Memory partitioning – Paging – Segmentation – Virtual memory –hardware control structure – OS software - UNIX & Windows memory management – Uniprocessor Scheduling – Types of Process Scheduling – Scheduling Algorithm – UNIX SVR4 & Windows Scheduling.

I/O management and Disk scheduling: I/O Devices – Organization of the I/O Functions – Operating System Design Issues – I/O Buffering – Disk Scheduling – Disk Cache.

### UNIT-V

File Management: Overview – File Organization - File Directories – File Sharing – Record Blocking – Secondary storage management – Security threats: protection- intruders-malicious software – Viruses, Worms, and Bots – Security Techniques – Authentication – Access Control – Intrusion Detection – Malware Defense – Dealing with Buffer Overflow Attacks – Windows 7 Security.

### TEXT BOOKS

1. William Stallings, Operating Systems Internals and Design Principles, Prentice Hall India Private Limited, Seventh Edition, 2016.
2. M. J. Bach, Design of the UNIX Operating system, Prentice Hall, 1986.

### REFERENCE BOOKS

1. Silberchatz and Galvin, Operating System Concepts, Addison- Wesley, 5<sup>th</sup> Edition.
2. H. M. Deitel, Operating Systems, Addison-Wesley, Second Edition.
3. Charles Crowley, Operating Systems. A Design Oriented Approach, TMH, 1998.
4. Andrew S. Tanenbaum & Albert S. Woodhull, Operating Systems Design and Implementation, Prentice-Hall, India, Second Edition.

## OOSD LAB

1. To develop a problem statement.
2. Develop an IEEE standard SRS document. Also develop risk management and project plan (Gantt chart).
3. Identify Use Cases and develop the Use Case model.
4. Identify the business activities and develop an UML Activity diagram.
5. Identify the conceptual classes and develop a domain model with UML Class diagram.
6. Using the identified scenarios find the interaction between objects and represent them using UML Interaction diagrams.
7. Draw the State Chart diagram.
8. Identify the User Interface, Domain objects, and Technical services. Draw the partial layered, logical architecture diagram with UML package diagram notation.
9. Implement the Technical services layer.
10. Implement the Domain objects layer.
11. Implement the User Interface layer.
12. Draw Component and Deployment diagrams.

Suggested domains for Mini-project:

1. Passport automation system.
2. Book bank
3. Exam Registration
4. Stock maintenance system.
5. Online course reservation system
6. E-ticketing
7. Software personnel management system
8. Credit card processing
9. e-book management system

## RDBMS LAB

1. Use of DDL, DML commands and retrieval of values from multiple tables
2. Creation of index, views and sequences
3. Perform Join operation on relational tables
4. Apply set operators
5. Use aggregate functions in SQL
6. Write Subqueries
7. Granting system privilege
8. PL/SQL blocks conditional, iterative and unconditional controls for making programs
9. Use of transactions
10. Processing of SQL statements using cursors
11. Use of Procedures and Functions
12. Use of database triggers
13. Use of Exception handling

## **SEMESTER – II**

### **DATA COMMUNICATIONS AND NETWORKING**

#### **UNIT – I**

Introduction – Data communications – networks – protocols & standards – standard organizations – topology – transmission mode- categories of networks – internetworks – OSI Model – TCP/IP protocol suite - Transmission Media – guided media – unguided media – Multiplexing – FTD-TDM-WDM.

#### **UNIT – II**

Error Detection & Correction – types of errors – detection – VRC – LRC – CRC – checksum – error correction – flow control – error control – data link protocols – asynchronous protocols – synchronous protocols – Local Area Network – Ethernet – switching techniques.

#### **UNIT – III**

Networking and Internetworking devices – repeaters – bridges – router s- gateways – routing algorithms – distance vector routing – link state routing - transport layer- duties of the transport layer – connection – OSI Transport protocol.

#### **UNIT - IV**

Upper OSI layers – session layer – session & transport interaction – synchronous points – session protocol data unit - presentation layer – translation – encryption/decryption – authentication – data compression - application layer – message handling system – file transfer – virtual terminal - TCP/IP protocol – network layer – addressing – subnetting – transport layer –UDP&TCP.

#### **UNIT – V**

Client-server model – DHCP – DNS – SMTP – HTTP – WWW - Network Security – Aspects of Security – privacy – digital signature – PGP – Access Authorization.

#### **TEXT BOOK**

Behrouz A. Fourouzan, “Data Communications & Networking”, McGraw Hill (India), 37<sup>th</sup> reprint, 2016.

## DISTRIBUTED SYSTEMS

### UNIT-I

Introduction:- Characteristics, Examples, Applications, Challenges – System models:- Architectural models and Fundamental models – Network principles and Internet protocols – Interprocess communication: API, Marshalling, Client-server communication, Group communication.

### UNIT-II

Distributed objects and Remote Invocation:- Introduction, Communication between distributed objects, Remote Procedure Call, Events and Notification – Operating System Support:- Introduction, OS Layer, Protection, Processes and Threads, Communication and invocation, Operating system architecture.

### UNIT-III

Distributed File System:- File service architecture, Sun network and Andrew File system, Recent advances – Name Services:- Domain Name System, Directory and discovery services, Case study for Global name service and Directory service – Time and Global States:- Clocks, events and processes, Clock synchronization, Logical clocks, Global states, Distributed debugging – Coordination and Agreement.

### UNIT- IV

Transaction and Concurrency Control:- Transactions and nested transactions, Locks, Optimistic concurrency control, Timestamp ordering, Comparison of concurrency control – Distributed Transactions – Replication - Distributed Shared Memory: Design and implementation issues, Consistency models.

### UNIT-V

Distributed Multimedia Systems:- Characteristics, Quality of service management, Resource management, Stream adaptation – Web Services:- Introduction, Service descriptions and IDL, Directory service, XML Security, Coordination of web services -Case Study:- CORBA.

### TEXT BOOK

George Coulouris, Jean Dollimore, Tim Kindberg, Distributed Systems Concepts and Design, Fourth Edition, Pearson Education India, 2005.

### REFERENCE BOOK

Andrew S. Tanenbaum, Maarten Van Steen, Distributed System: Principles and Paradigms, Second Edition, Prentice-Hall, 2003.



## ADVANCED PYTHON PROGRAMMING

### UNIT – I

Python programming – Introduction - Data Types and Data Structures - Executing Python Code-Variables and Objects - Numbers and Strings- Collections - Built-in Functions - Control Structures - Conditional Branching – Looping – Functions- Exception Handling.

### UNIT – II

OOP - Classes and Modules - Creating Instances - Methods and Special Methods - Inheritance and Polymorphism - Modules and Multifile Applications.

### UNIT – III

Basic GUI Programming -Introduction to GUI Programming -Dialogs -Dumb Dialogs - Standard Dialogs - Smart Dialogs- Main Windows - Creating a Main Window Handling User Actions - Using Qt Designer - Data Handling and Custom File Formats - Main Window Responsibilities - Data Container Responsibilities - Saving and Loading Binary Files- Saving and Loading Text Files- Saving and Loading XML Files.

### UNIT – IV

Intermediate GUI Programming - Layouts and Multiple Documents - Layout Policies- Tab Widgets and Stacked Widgets – Splitters - Single Document Interface (SDI) - Multiple Document Interface (MDI)- Events, the Clipboard, and Drag and Drop - The Event-Handling Mechanism – Re-implementing Event Handlers - Drag and Drop - Custom Widgets.

### UNIT – V

Model/View Programming - Using the Convenience Item Widgets - Creating Custom Models - Creating Custom Delegates - Databases - Connecting to the Database - Executing SQL Queries - Using Database Form Views - Using Database Table Views.

### TEXT BOOK

Mark Summerfield,” Rapid GUI Programming with Python and Qt: The Definitive Guide to PyQt Programming”, Prentice Hall, 2008.

## NETWORKING AND DISTRIBUTED COMPUTING LAB

1. Implementation of a socket program for Echo/Ping/Talk commands.
2. Creation of a socket between two computers and enable file transfer between them.  
Using (a.) TCP (b.) UDP
3. Implementation of a program for Remote Command Execution (Two M/Cs may be used).
4. Implementation of a program for CRC and Hamming code for error handling.
5. Writing a code for simulating Sliding Window Protocols.
6. Create a socket for HTTP for web page Upload & Download.
7. Write a program for TCP module Implementation (TCP services).
8. Developing network applications using RMI technology in Java.
9. Developing a program to simulate the Distributed Mutual Exclusion.
10. Program to implement a Distributed chat server using TCP sockets.

## ADVANCED PYTHON PROGRAMMING LAB

### LAB EXERCISES:

1. Enter expressions that compute the area of a circle, the volume of a sphere, and the surface area of a sphere. You should use the variable radius with the same value in each of these expressions, as well as the most precise value of  $\pi$  available in Python.
2. The Pythagorean Theorem defines the relationship between the hypotenuse of a right triangle and its other two sides. It states that the square of the hypotenuse is equal to the sum of the squares of the other two sides. Define a function named `hypothat` that expects the lengths of other two sides of a right triangle as arguments. This function returns the triangle's hypotenuse. Include this function in a tester program that exercises its capabilities.
3. Write a program to ask the user to input a list of names, in the format "Last Name, First Name," i.e., last name, comma, first name. Write a function that manages the input so that when/if the user types the names in the wrong order, i.e., "First Name Last Name," the error is corrected, and the user is notified. This function should also keep track of the number of input mistakes. When the user is done, sort the list, and display the sorted names in "Last Name, First Name" order.
4. Implement a `Stack` class and an `EmptyStackError` exception class. The `Stack` class should use a list to store its items, and should provide `pop()` to return and remove the item at the top of the stack (the rightmost item), `top()` to return the item at the top of the stack, and `push()` to push a new item onto the stack. Also provide special methods so that `len()` and `str()` will work sensibly. Make sure that `pop()` and `top()` raise `EmptyStackError` if the stack is empty when they are called. The methods can be written using very few lines of code. Make sure that you use the `doctest` module and write unit tests for all the methods.
5. Create a program to fill the screen with triangles. Then change the code to fill the screen with different-colored (filled) triangles instead.
6. Create the dialog. It should have the class name `ResizeDlg`, and its initializer should accept an initial width and height. The dialog should provide a method called `result()`, which must return a two-tuple of the width and height the user has chosen. The spinboxes should have a minimum of 4 and a maximum of four times the width (or height) passed in. Both should show their contents right-aligned.
7. Developing a text editor.
8. *Electronic Commerce*. You need to create the foundations of an e-commerce engine for a B2C (business-to-consumer) retailer. You need to have a class for a customer called `User`, a class for items in inventory called `Item`, and a shopping cart class called `Cart`. Items go in Carts, and Users can have multiple Carts. Also, multiple items can go into Carts, including more than one of any single item.
9. Create a class for address book cards. Call the new class `AddressCard`. An address card contains all the information for an address book entry including last and first name, street, city, state, zip, phone, and mobile phone number. To use the `AddressCard` class you need to modify the program so it stores all `AddressCards` in a list. The program should read all the addresses when it starts and make one `AddressCard` object for each address in the file.

10. Implement a GUI front-end to the address book application. Each of the buttons in the application should work as described here.

The add button should add a new entry to the phonebook. This must append an entry to the phonebook.

The update button should update an existing entry or display a message saying the entry was not found. Update must find an entry that matches the first and last name displayed in the GUI. If found, the entry in the file is updated to reflect the new information found in the GUI.

The delete button deletes an existing entry. To delete an existing entry the last and first name should match the entry being deleted.

11. Implement a GUI front-end for the addressbook application, but use parallel lists to hold the fields of each record instead of reading from and writing to the file immediately. You should write code to read the entire file when the application starts and it should be written again when the application closes.

12. Create a GUI application that provides an **Entry** field where the user can provide the name of a text file. Open the file and read it, displaying its contents in a **Label**.

13. Create an application that shows two widgets: a **QListView** and a custom **BarGraphView**. The data should be held in a custom **BarGraphModel**. The user should be able to edit the data through the **QListView**, using a custom **BarGraphDelegate** to control both the presentation and the editing of data items in the list view.

14. Create a dialog-style application for adding, editing, and deleting records in a reference table. The application should create the reference.db database the first time it is run, with a single, empty Table. In addition to offering Add and Delete buttons, provide a Sort button that has a pop-up menu with three sort order options: by ID, by category, and by short description. All three could be connected to a single method using lambda or `functools.partial`. To make any new sort (or filter) take effect, you must call `select()` on the model. Use a **QDialogButtonBox** for all the buttons. If the user clicks Delete, pop up a yes/no message box, and delete only if they click the Yes button.

## **SEMESTER-III**

### **ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**

#### **UNIT – I**

Artificial Intelligence – Introduction - History of AI – Agents - Knowledge-Based Systems- Propositional Logic- First-order Predicate Logic - Limitations of Logic.

#### **UNIT – II**

Search, Games and Problem Solving – Introduction- Uninformed Search - Heuristic Search - Games with Opponents - Heuristic Evaluation Functions - Reasoning with Uncertainty - Computing with Probabilities - The Principle of Maximum Entropy - Reasoning with Bayesian Networks.

#### **UNIT – III**

Logic Programming with PROLOG - PROLOG Systems and Implementations – Simple Examples - Execution Control and Procedural Elements – Lists - Self-modifying Programs - A Planning Example - Constraint Logic Programming.

#### **UNIT – IV**

Machine Learning and Data Mining - Data Analysis - Perceptron, a Linear Classifier - Nearest Neighbor Method - Decision Tree Learning- Learning of Bayesian Networks - Clustering- Exercises.

#### **UNIT – V**

Neural Networks - From Biology to Simulation- Hopfield Networks- Neural Associative Memory- Linear Networks with Minimal Errors- Back propagation Algorithm - Support Vector Machines – Applications.

#### **TEXT BOOK**

Wolfgang Ertel, “Introduction to Artificial Intelligence”, Springer, 2011

## SOFTWARE ENGINEERING

### UNIT – I

Introduction to software engineering – role of software – changing nature of software – software myths – Software process- process framework – capability maturity model integration (CMMI) – process patterns – process assessment – process models.

### UNIT – II

Building the Analysis Model – Requirement analysis – Analysis modeling approaches – data modeling concepts – object-Oriented Analysis – flow-oriented model - class-based modeling.

### UNIT – III

Creating an Architectural Design – Software Architecture – Data Design – Architectural Styles & Patterns – Architectural Design – Modeling component level design – user-interface design – Interface analysis & design steps.

### UNIT – IV

Testing Strategies – Strategic approach to software engineering – Test Strategies for conventional & Object-Oriented Software – Software testing fundamentals – black-box & white box testing – basis path testing – object-oriented testing models – testing for specialized environments, Architectures & Applications.

### UNIT – V

Advanced Topics in Software Engineering – Cleanroom software engineering – cleanroom approach – functional specialization – classroom design – cleanroom testing - component-based development – engineering of component-based systems – CBSE process – Domain Engineering – component-based development classifying & retrieving components – economics of CBSE.

### TEXT BOOK

Roger Pressman, “Software Engineering: A Practitioner’s Approach”, McGraw Hill (India), 10<sup>th</sup> reprint, 2015.

## WEB TECHNOLOGY

UNIT- I - Web Fundamentals: Introduction to Web-Hypertext Transfer Protocol- Hyper Text Mark-up Language-Cascading Style Sheet.

UNIT- II - Client side Programming: Java Script- Java Script and HTML DOM-Advanced Java Script and HTML forms-Java Script Regular Expression.

AJAX-Introduction and Marketplace-Asynchronous Communication-Processing steps - Sending Information-Retrieving Information.

UNIT- III-Server Side Programming: Servlet:-Servlet Architecture- Life cycle of a Servlet- Generic Servlet and HttpServlet-First Servlet-Passing Parameters to Servlet-Retrieving Parameters-Cookies-Filters.

JSP-Introduction and Marketplace-JSP and HTTP-JSP engines-JSP and Servlet-Anatomy of JSP page-JSP syntax-JSP Components-Beans-Session Tracking-Users passing control and data between pages-Database connectivity-Retrieving and Processing data using JDBC.

UNIT- IV- Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads. Connecting to database (MySQL as reference), executing simple queries, File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

UNIT-V-XML Technologies: XML :-Common Usage-Role of XML-Prolog-Body-ElementsAttributes-Validation-Displaying XML Namespace-XML DTD:- XML Schema LanguagesValidation-Introduction to DTD-Using DTD in an XML document-Element type declaration-Attribute declaration-Entity Declaration-W3C XML Schema -Parsing XML-XML DOM-DOM Nodes-Node interface-DOM Node-Element Node-Text Node-Attribute Node-Java DOM-Manipulating DOM tree.

### TEXT BOOKS

1. Uttam K. Roy, Web Technologies, Oxford University Press, 2010.
2. Steven Holzner, The Complete Reference PHP, Tata McGraw-Hill.

### REFERENCE BOOKS

1. Web Programming, building internet applications, Chris Bates 2<sup>nd</sup> edition, Wiley Dreamtech.
2. Java Server Pages —Hans Bergsten, SPD O'Reilly.
3. Java Script, D.Flanagan.
4. Beginning Web Programming-Jon Duckett WROX.

## AI & MACHINE LEARNING LAB

1. Executing simple programs using Prolog like Missionaries and cannibals Problem
2. Graph coloring problem
3. Blocks world problem
4. Water Jug Problem using DFS, BFS
5. Heuristic algorithms (A \* Algorithm, best first search)
6. Representation of Knowledge using Propositional Logic and Querying
7. Representation of Knowledge using Predicate Logic and Querying
8. Forward chaining and Backward chaining
9. Unification
10. Minimax algorithm
11. Sampling Distributions
12. Statistical Inference
13. Regression Modeling
14. Multivariate analysis
15. Bayesian Modeling
16. Neural Networks: Learning And Generalization
17. Principal Component Analysis
18. Fuzzy Logic
19. Mining Frequent Item sets
20. K Means-Clustering



## WEB TECHNOLOGY LAB

1. Creation of HTML Files
2. Working with Client Side Scripting
  - 2.1 VBScript
  - 2.2 JavaScript
3. Configuration of web servers
  - 3.1 Apache Web Server
  - 3.2 Internet Information Server (IIS)
4. Working with ActiveX Controls in web documents.
5. Experiments in Java Server Pages
  - 5.1 Database Programming
  - 5.2 Session and Application objects
6. Working with other Server Side Scripting
  - 6.1 Java Servlets
  - 6.2 PHP
7. Developing Web Applications using XML.
8. Experiments in Ajax Programming
9. Developing Web Services
10. Developing any E-commerce application

## **Integrated Online Certificate Course/ Journal Publication/Conference Presentation**

### **Guidelines:**

Any one of the following:

Taken one MOOCs course (with e-certification)

OR

Research publication (One No.) in National/International peer reviewed Journal

OR

Presentation (Two research papers) in International Conferences

### **Evaluation Guidelines:**

Viva-Voce Examination by Internal Examiner only.

Max. Marks:40 (Internal Marks only) for 2 credits,

## **SEMESTER-IV**

### **BIG DATA & CLOUD COMPUTING**

#### **UNIT – I**

Big Data Science - Introduction. - Historical Review of Big Data - Historical Interpretation of Big Data - Defining Big Data From 3Vs to 32Vs. - Big Data Analytics and Machine Learning - Big Data Analytics and Cloud Computing - Hadoop, HDFS, MapReduce, Spark, and Flink.

#### **UNIT – II**

Real-Time Analytics – Introduction - Computing Abstractions for Real-Time Analytics- Characteristics of Real-Time Systems - Real-Time Processing for Big Data — Concepts and Platforms - Data Stream Processing Platforms - Data Stream Analytics Platforms - Data Analysis and Analytic Techniques.

#### **UNIT – III**

Computing Paradigms - Cloud Computing Fundamentals - Motivation for Cloud Computing - Defining Cloud Computing - Principles of Cloud computing - Cloud Ecosystem - Requirements for Cloud Services - Cloud Application - Benefits and Drawbacks.

#### **UNIT – IV**

Cloud Computing Architecture and Management – Introduction - Cloud Architecture - Anatomy of the Cloud - Network Connectivity in Cloud Computing - Applications on the Cloud - Managing the Cloud - Migrating Application to Cloud - Cloud Service Models- Infrastructure as a Service Platform as a Service- Software as a Service.

#### **UNIT – V**

Technological Drivers for Cloud Computing – Introduction - SOA and Cloud – Virtualization- Multicore Technology- Memory and Storage Technologies - Networking Technologies - Web 2.0 - Web 3.0 - Software Process Models for Cloud Programming Models - Operating System- Application Environment - Virtualization – Introduction - Virtualization Opportunities - Approaches to Virtualization – Hypervisors- From Virtualization to Cloud Computing.

#### **TEXT BOOKS**

1. Rajkumar Buyya, Rodrigo N. Calheiros, Amir Vahid Dastjerdi, “Big Data: Principles and Paradigms”, Elsevier, 2016. (for I & II Units)
2. K. Chandrasekaran, “Essentials of CLOUD COMPUTING”, CRC Press, Taylor & Francis Group LLC, 2015. (for III, IV & V Units)

## PROJECT WORK AND VIVA-VOCE

### **Evaluation of the Project:**

The candidate shall be expected to take up an independent project involving problem formulation, design, implementation and testing phases that typically explores various phases of problem solving. He /She is Expected to utilize the knowledge gained through various subjects studied in this programme. Further, the candidate has to inculcate the ability in integrating and releasing a prototype (working model) of the solution to the problem taken. The Project should be prepared and submitted for evaluation.

### **Project - Internal Assessment:**

The following components are considered during the internal assessment:

For each project, Review team is constituted with three members of the department including the project guide. At least two reviews are to be scheduled and evaluated by the team and the average of the marks awarded by the members is taken as the project seminar mark.

Component	Internal Assessment ( 150 Marks )
Project Work	80 Marks – Given at the time of End Semester Examination by the Project Guide.
Project Review 1	20 Marks - Given by the review team members as evaluation of continuous progress.
Project Review 2	25 Marks - Given by the review team members as evaluation of continuous progress.
Project Review 3	25 Marks - Given by the review team members as evaluation of continuous progress.

### **Project – External Assessment:**

External examiner evaluates the project out of 150 marks for the Project Work, Project Report and Project Viva.

Component	External Assessment (150 Marks )
Project Work	80
Project Report	40
Project Viva-Voce	30

## List of Soft Core Papers offered by the Department

### Level-I: Semester-I & Semester-II

1. Automata Theory and Computations
2. Bioinformatics
3. Computer Graphics and Multimedia Systems
4. Cyber Security
5. Data Warehousing and Data Mining
6. Modeling and Simulation
7. Principles of Compiler Design
8. Principles of Programming Languages
9. Soft Computing

### Level-II: Semester-III & Semester-IV

1. Blockchain and Bitcoin
2. Digital Image Processing
3. Information Retrieval Systems
4. Internet of Things
5. Mobile Application Development
6. Natural Language Processing
7. Operation Research
8. Professional Ethics
9. Web Services and SOA
10. Software Testing and Quality Management

## AUTOMATA THEORY AND COMPUTATIONS

UNIT I Automata Theory: Finite State Systems – Definition of an Automaton - Non-Deterministic Finite Automaton - Equivalence of DFA and NFA - Finite automata with output (Mealy and Moore Models) - Minimization of Finite Automata – Regular Expressions.

UNIT II Push Down Automata Theory: Context-Free Languages and Derivation Trees – Ambiguity in Context-Free Grammars – Chomsky Normal Form – Greibach Normal Form. Push Down Automata – Definition, Acceptance by Push Down Automata – Push Down Automata and Context Free Languages.

UNIT III Turing Theory: Turing Machines – Computable Language and Functions – Techniques For TM Construction – Modification of TM.

UNIT IV Chomsky Hierarchy: Regular Grammars – Unrestricted Grammars – Context Sensitive Languages. Linear Bounded Automata – Definition – Linear Bounded Automata and Context Sensitive Languages.

Undecidability : Properties of recursive and recursively enumerable languages – Turing Machine Codes – Universal Turing Machine.

UNIT V Computational Complexity Theory: Space Complexity – Time complexity – NonDeterministic Time and Space Complexity – Complexity Classes. Computability: Basic Concepts – Primitive Recursive Functions – Recursive Functions. Case Studies: Application of Finite Automata – Parsing.

### TEXT BOOKS

1. Daniel I.A. Cohen, —Introduction to Computation Theory, John Wiley & sons, 2nd edition
2. John E. Hopcraft and Jeffery D. Ullman, "Introduction to Automata theory, languages and computations", Narosa, First edition.
3. "K.L.P. Mishra & N. Chandrasekaran "Theory of Computer Science (Automata, Languages and Computation), PHI.

REFERENCE BOOK: 1. A. Puntambekar – “Theory of Computation” – Technical

## BIO INFORMATICS

### UNIT – I

The Central Dogma - Killer Application – Parallel Universes – Watson’s Definition –Top Down Vs. Bottom Up Approach – Information Flow –Conversance – Communications.

### UNIT – II

Definition – Data Management –Data Life Cycle – Database Technology –Interfaces – Implementation –Networks: Communication Models – Transmission Technology – Protocols – Bandwidth – Topology – Contents – Security – Ownership – Implementation.

### UNIT – III

Search Process – Technologies – Searching and Information Theory – Computational Methods – Knowledge Management – Sequence Visualizations – Structure Visualizations – User Interfaces – Animation Vs. Simulation.

### UNIT – IV

Statistical Concepts –Micro Arrays – Imperfect Data – Basics – Quantifying – Randomness – Data Analysis – Tools selection – Alignment – Clustering – Classification – Data Mining Methods – Technology – Infrastructure Pattern Recognition – Discovery – Machine Learning – Text Mining – Pattern Matching Fundamentals – Dot Matrix Analysis – Substitution Matrix – Dynamic Programming – Word Method – Bayesian Method – Multiple Sequence Alignment Tools.

### UNIT – V

Drug Discovery Fundamentals – Protein Structure – System Biology Tools – Collaboration and Communication – Standards – Issues – Case study.

### TEXT BOOKS

1. Bryan Bergeron, “Bio Informatics Computing”, Prentice Hall, 2003.
2. T.K. Affward, D.J. Parry Smith, “Introduction to Bio Informatics”, Pearson Education, 2001.
3. Pierre Baldi, Soren Brunak, “Bio Informatics – The Machine Learning Approach”, 2nd Edition, First East West Press, 2003.

### REFERENCE BOOK

1. Neil C.Jones Pavel Pevzner – An Introduction to Bioinformatics Algorithms – MIT Press.

## COMPUTER GRAPHICS AND MULTIMEDIA SYSTEMS

### UNIT-I

INTRODUCTION-Overview of Graphics System – Bresenham technique – Line Drawing and Circle Drawing Algorithms – DDA – Line Clipping – Text clipping.

### UNIT-II

2D TRANSFORMATIONS-Two dimensional transformations – Scaling and Rotations – Interactive Input methods – Polygons – Splines – Bezier Curves – Window view port mapping transformation.

### UNIT-III

3D TRANSFORMATIONS-3D Concepts – Projections – Parallel Projection – Perspective Projection – Visible Surface Detection Methods – Visualization and polygon rendering – Color models – XYZ-RGB-YIQ-CMY-HSV Models – Animation – Key Frame system – General animation functions – morphing.

### UNIT- IV

OVERVIEW OF MULTIMEDIA-Multimedia hardware & software – Components of multimedia – Text, Image – Graphics – Audio – Video – Animation – Authoring.

### UNIT-V

MULTIMEDIA SYSTEMS AND APPLICATIONS-Multimedia communication systems – Data base systems – Synchronization Issues – Presentation requirements – Applications – Video conferencing – Virtual reality – Interactive video – video on demand.

### TEXT BOOKS

1. Hearn D and Baker M.P, “Computer graphics – C Version”, 2<sup>nd</sup> Edition, Pearson Education, 2004(Unit 1, 2& 3).
2. Ralf Steinmetz, Klara stein Metz,”Multimedia Computing, Communications and Application”, Pearson Education, 2004(Unit 4&5).



## CYBER SECURITY

### UNIT-I-SECURITY CONCEPTS AND MECHANISMS

Networking Concepts Overview-Basics of Communication Systems-Wireless Networks-Internet-Information Security Concepts-Overview and services-Types of Attacks-Security Goal-E-commerce security-Security Threats and vulnerabilities-Hacking Techniques-Password cracking-Malicious code-Programming Bugs-Cryptography-Digital Signatures-PKI-Diffe-Hellman key exchange protocol-Applications.

### UNIT-II-NETWORK SECURITY

Access Control and Intrusion Detection-Identification and Authorization techniques-Intrusion Detection System-Intrusion Prevention System-Intrusion Recovery System-Server Management and Firewalls-Security for VPN and Next Generation Networks-Security in Multimedia Networks-Link Encryption Devices.

### UNIT-III-SYSTEM AND APPLICATION SECURITY

Security Architectures and Models-Designing Secure Operating Systems-Controls to enforce security services-Information flow model and Biba model-System Security –Web security-Web Authentication-Secure Socket Layer(SSL)-Secure Electronic Transaction(SET)-OS Security-OS Security Vulnerabilities, updates and patches-OS integrity checks-Anti Virus software-Design of secure OS and OS hardening-Configuring the OS for security-Trusted OS.

### UNIT-IV-SECURITY MANAGEMENT

Security Management Practices-security policies, procedures and guidelines-Risk Management-Business continuity Planning and Disaster Recovery Management-Risk Management-Change Management-Privilege Management-Security Laws and Standards-Security Assurance-Security Laws-Security Audit-International standards.

### UNIT-V-CYBER DEFENSE TECHNIQUES

E-Mail Security-Web security - Web Injection Attack-Cross Site Scripting (XSS)-Secure Software Development-Cybercrime and cyber terrorism-Cyber operations and Defense Techniques-Phases of cyber-attack-Information warfare and surveillance-Steganography-Security Engineering-Computer Forensics-Legal Issues and Ethics-Case studies.

### TEXT BOOKS

1. Ross J.Anderson, Security Engineering: A Guide to Building Dependable Distributed Systems. John Wiley, New York, NY, 2001, ISBN: 0471389226.
2. Matt Bishop, Computer Security: Art and Science, Addison Wesley, Boston, MA, 2003. ISBN: 0-201-44099-7.

### REFERENCE BOOKS

1. Frank Stajano, Security for Ubiquitous Computing, John Wiley, 2002, ISBN: 0470844930.
2. McClure, Stuart & Scambray, Joel, et al (2005), Hacking Exposed 5<sup>th</sup> Edition, McGraw-Hill Osborne Media.
3. Ortmeier, P.J. (2005), Security Management: An Introduction, 2nd Edition, Prentice Hall.
4. Skoudis, Ed & Zeltser, Lenny (2004), Malware: Fighting Malicious Code, Second Ed. Prentice Hall.

## DATA WAREHOUSING AND DATA MINING

### UNIT -I

INTRODUCTION- Why Data Mining?-What is Data Mining?-What Kinds of Data Can Be Mined?- What Kinds of Patterns Can Be Mined?-Which Technologies Are Used?-What Kinds of Applications Are Targeted?- Major Issues in Data Mining- Relation To Statistics, Databases- Data Mining Functionalities-Steps In Data Mining Process-Architecture Of A Typical Data Mining Systems- Classification Of Data Mining Systems - Overview Of Data Mining Techniques.

### UNIT – II

DATA WAREHOUSING AND ONLINE ANALYTICAL PROCESSING - Data Warehouse: Basic Concepts-Data Warehouse Modeling: Data Cube and OLAP-Data Warehouse Design and Usage-Data Warehouse Implementation-Data Generalization by Attribute-Oriented Induction.

### UNIT – III

DATA PREPROCESSING AND MINING FREQUENT PATTERNS - Data Preprocessing: An Overview-Data Cleaning, Data Integration, Data Reduction- Data Transformation. Data Mining Frequent Patterns, Associations, and correlations: Basic Concepts-Frequent Itemset Mining Methods.

### UNIT – IV

CLASSIFICATION & CLUSTERING – Classification: Basic Concepts- Decision Tree Induction-Bayes Classification Methods- Rule-Based Classification-Cluster Analysis: What is Cluster Analysis? Partitioning Methods-Hierarchical Methods.

### UNIT – V

DATA MINING TRENDS AND RESEARCH FRONTIERS- Mining Complex Data Types- Other Methodologies of Data Mining- Data Mining Applications-Data Mining and Society-Data Mining Trends.

### TEXT BOOK

1. Jiawei Han, Micheline Kamber, Jian Pei, "Data Mining-Concepts and Techniques", -Third Edition, Morgan Kaufmann Publishers, 2012.

### REFERENCE BOOKS

1. Ralph Kimball, "The Data Warehouse Life Cycle Toolkit", John Wiley & Sons Inc., 1998.
2. Sean Kelly, "Data Warehousing In Action", John Wiley & Sons Inc., 1997.
3. Alex Berson, Stephen J. Smith, "Data Warehousing, Data Mining, & OLAP", Tata McGraw- Hill, 2004.
4. Usama M.Fayyad, Gregory Piatetsky - Shapiro, Padhrai Smyth And Ramasamy Uthurusamy, "Advances In Knowledge Discovery And Data Mining", The M.I.T Press, 1996.
5. W. H. Inmon Building the Data Warehouse Wiley Computer Publishing Third Edition, 2002.

## MODELING AND SIMULATION

UNIT-I-SYSTEMS AND ENVIRONMENT: Concept of model and model building, model classification and representation, Use of simulation as a tool, steps in simulation study.

UNIT-II-CONTINUOUS TIME AND DISCRETE-TIME SYSTEMS: Laplace transform, transfer functions, state-space models, order of systems, z-transform, feedback systems, stability, observability, and controllability. Statistical Models in Simulation: Common discrete and continuous distributions, Poisson process, and empirical distributions.

UNIT-III- RANDOM NUMBERS- Properties of random numbers, generation of pseudo random numbers, techniques of random number generation, tests for randomness, random variate generation using inverse transformation, direct transformation, convolution method, acceptance-rejection.

UNIT-IV-DESIGN AND ANALYSIS OF SIMULATION EXPERIMENTS: Data Collection, identifying distributions with data, parameter estimation, goodness of fit tests, selecting input models without data, multivariate an time series input models, verification and validation of models, static and dynamic simulation output analysis, steady-state simulation, terminating simulation, confidence interval estimation, Output analysis for steady state simulation, variance reduction techniques.

UNIT-V-QUEUING MODELS & LARGRE SCALE SYSTEMS: Characteristics of queuing systems, notation, transient and steady-state behaviour, performance, network of queues, Model reduction, hierarchical control, decentralized control, structural properties of large scale systems.

### TEXT BOOK

1.Narsingh Deo, System Simulation with Digital Computer, PHI.1999.

### REFERENCE BOOKS

1. Averill Law, Simulation Modeling and Analysis (3<sup>rd</sup> Edition), Tata McGraw Hill, 2007.
- 2.G.Gordan, System Simulation (2<sup>nd</sup> Edition), Pearson Education, 2007.
3. J.Banks, J.S.Carson, B.L.Nelson, Discrete Event System Simulation (4<sup>th</sup> Ed.), PHI, 2004.
4. N.A. Kheir, Systems Modeling and Computer Simulation, Marcel Dekker, 1988.

## PRINCIPLES OF COMPILER DESIGN

### UNIT - I

Introduction to Compiler - Analysis of the source program- Phase of a compiler- Cousins of the compiler - The grouping of phases- Compiler-construction tools- Simple One-pass Compiler – Overview - Syntax definition- Syntax-directed translation – Parsing - A translator for simple expressions - Lexical analysis - Incorporating a symbol table.

### UNIT - II

Lexical Analysis - role of the lexical analyzer - Input buffering- Specification of tokens - Recognition of tokens - Language for specifying lexical analyzer - Finite automata -From a regular expression to an NFA - Design of a lexical analyzer generator - Optimization of DFA-based pattern matcher.

### UNIT - III

Syntax Analysis - The role of the parser - Context-free grammars - Writing a grammar – Top-down parsing - Bottom-up parsing - Operator-precedence parsing - LR parsers - Using ambiguous grammars - Parser generator.

### UNIT - IV

Intermediate Code Generators - Intermediate languages – Declarations - Assignment statements - Boolean expression - Case statement – Backpatching – Code generation - Issues in the design of a code generator - The target machine - Run-time storage management - Basic blocks and flow graph - A simple code generator - Register allocation and assignment - The dag representation of basic blocks - Peephole optimization - Generating code from dag.

### UNIT - V

Code Optimization – Introduction - The principal sources of optimization - Optimization of basic blocks - Loops in flow graphs - introduction to global data-flow analysis - Iterative solution of data-flow equation - Data-flow analysis of structured flow graphs - Efficient data-flow algorithms.

### TEXT BOOK

Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, "Compilers: Principles, Techniques & Tools", Pearson Education Asia, 2007.

## PRINCIPLES OF PROGRAMMING LANGUAGES

### UNIT - I

Abstract Machines - The Concepts of Abstract Machine and of Interpreter - Implementation of a Language - Hierarchies of Abstract Machines - Describing a Programming Language- Levels of Description- Grammar and Syntax - Contextual Syntactic Constraints – Compilers – Semantics – Pragmatics – Implementation - Names and The Environment - Names and Denotable Objects - Environments and Blocks - Scope Rules - Memory Management.

### UNIT – II

Techniques for Memory Management - Static Memory Management - Dynamic Memory Management Using Stacks- Dynamic Management Using a Heap- Implementation of Scope Rules- Control Structure - Expressions - The Concept of Command- Sequence Control Commands- Structured Programming – Recursion.

### UNIT – III

Control Abstraction – Subprograms - Higher-Order Functions – Exceptions - Structuring Data - Data Types - Type Systems - Type Systems - Composite Types – Equivalence - Compatibility and Conversion – Polymorphism - Type Checking and Inference - Garbage Collection - Avoiding Dangling References - Data Abstraction.

### UNIT – IV

Object-Oriented Paradigm - The Limits of Abstract Data Types - Fundamental Concepts - Implementation Aspects - Polymorphism and Generics - Functional Paradigm - Computations without State – Evaluation - Programming in a Functional Language - The Functional Paradigm: An Assessment.

### UNIT – V

Logic Programming Paradigm - Deduction as Computation – Syntax - Theory of Unification - The Computational Model – Extensions - Advantages and Disadvantages of the Logic Paradigm.

### TEXT BOOK

1. Maurizio Gabbrielli and Simone Martini,” Programming Languages: Principles and Paradigms”, Springer, 2010.

### REFERENCE BOOKS

1. Greg Perry - Absolute Beginner's Guide to Programming – Que publishers 3rd Edition

## SOFT COMPUTING

### UNIT-I

Fuzzy Logic: Fuzzy Set Theory – Fuzzy versus Crisp, Crisp sets, Fuzzy Sets, Crisp Relations, Fuzzy Relations. Neural Networks: Fundamentals of Neural Networks: Basic concepts of Neural Networks, Human Brain, Model of an Artificial Neuron, Neural Network Architectures, Learning Methods, Characteristics of Neural Networks – Taxonomy of Neural Network Architectures – Some Application Domains.

### UNIT-II

Fuzzy Logic: Fuzzy Systems – Crisp Logic, Predicate Logic, Fuzzy logic, Fuzzy Rule Based System – Defuzzification – Applications.

### UNIT-III

Neural Networks: Backpropagation Networks – Architecture of a Backpropagation Network, Backpropagation Learning, Applications, Associative Memory- Autocorrelators, Heterocorrelators: Kosko's Discrete BAM, Adaptive Resonance Theory- Cluster Structure, Vector Quantization, Classical ART Networks, Simplified ART Architecture.

### UNIT-IV

Genetic Algorithms: Fundamentals of Genetic Algorithms – Basic Concepts – Creation of Offsprings – Working Principle – Encoding – Fitness Function – Reproduction – Roulette-wheel Selection, Boltzmann Selection. Genetic Modelling: Inheritance Operators – Cross over – Inversion and Deletion – Mutation Operator.

### UNIT-V

Hybrid Systems: Hybrid Systems-Sequential Hybrid Systems, Auxiliary Systems, Embedded Hybrid systems, Neural Networks, Fuzzy Logic and Genetic Algorithms Hybrids – Soft Computing tools.

### TEXT BOOK

1. S.Rajasekaran, G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic, and Genetic Algorithms, 2003, 1<sup>st</sup> Edition, PHI.

### REFERENCE BOOKS

1. J. S.R. Jang, C.T. Sun, E.Mizutani, Neuro-Fuzzy and Soft Computing, 1997, PHI.

## BLOCKCHAIN AND BITCOIN

### UNIT – I

Blockchain - Distributed systems - history of blockchain - Introduction to blockchain - Types of blockchain - CAP theorem and blockchain - Benefits and limitations of blockchain - Decentralization - Decentralization using blockchain - Methods of decentralization- Routes to decentralization- Blockchain and full ecosystem decentralization- Smart contract - Decentralized applications - Platforms for decentralization.

### UNIT – II

Cryptography and Technical Foundations – Introduction - Cryptographic primitives - Asymmetric cryptography- Public and private keys - Financial markets and trading.

### UNIT – III

Bitcoin – Bitcoin definition - Transactions – transaction life cycle - transaction structure - Types of transaction - Blockchain - structure of a block - structure of a block header - genesis block - bitcoin network - Bitcoin payments.

### UNIT – IV

Alternative Coins - Theoretical foundations - Bitcoin limitations – Namecoin – Litecoin – Primecoin – Zcash.

### UNIT – V

Ethereum 101 – Introduction - Ethereum blockchain - Elements of the Ethereum blockchain- Precompiled contracts – Accounts – Block – Ether – Messages – Mining - Clients and wallets.

### TEXT BOOK

Imran Bashir, 'Mastering Blockchain', Packt Publishing, 2017.

## DIGITAL IMAGE PROCESSING

### UNIT I -DIGITAL IMAGE FUNDAMENTALS

Elements of digital image processing systems, Vidicon and Digital Camera working, principles, Elements of visual perception, brightness, contrast, hue, saturation, Mach, band effect, Color image fundamentals - RGB, HSI models, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms - DFT,DCT, KLT, SVD.

### UNIT II - IMAGE ENHANCEMENT

Histogram equalization and specification techniques, Noise distributions, Spatial, averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contraharmonic mean, filters, Homomorphic filtering, Color image enhancement.

### UNIT III - IMAGE RESTORATION

Image Restoration - degradation model, Unconstrained restoration - Lagrange multiplier, and Constrained restoration, Inverse filtering-removal of blur caused by uniform linear, motion, Wiener filtering, Geometric transformations-spatial transformations.

### UNIT IV - IMAGE SEGMENTATION

Edge detection, Edge linking via Hough transform – Thresholding - Region based, segmentation – Region growing – Region splitting and merging – Segmentation by, morphological watersheds – basic concepts – Dam construction – Watershed, segmentation algorithm.

### UNIT V - IMAGE COMPRESSION

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic, coding, Vector Quantization, Transform coding, JPEG standard, MPEG.

### TEXTBOOKS

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing', Pearson, Second Edition, 2004.
2. Anil K. Jain, Fundamentals of Digital Image Processing', Pearson 2002.

### REFERENCE BOOKS

1. Kenneth R. Castleman, Digital Image Processing, Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.
3. D, E. Dudgeon and RM. Mersereau, Multidimensional Digital Signal Processing', Prentice Hall Professional Technical Reference, 1990.
4. William K. Pratt, Digital Image Processing', John Wiley, New York, 2002.
5. Milan Sonka et al., 'IMAGE PROCESSING, ANALYSIS AND MACHINE VISION', Brookes/Cole, Vikas Publishing House, 2nd edition, 1999.



## INFORMATION RETRIEVAL SYSTEMS

### UNIT-I

Introduction: Definition, Objectives, Functional Overview, Relationship to DBMS, Digital Libraries and Data Warehouses, Information Retrieval System Capabilities: Search, Browse, Miscellaneous.

### UNIT-II

Cataloging and Indexing: Objectives, Indexing process, Automatic Indexing, Information Extraction. Data Structures: Introduction, Stemming Algorithms, Inverted file structure, N-gram data structure, PAT data structure, Signature file structure, Hypertext data structure.

### UNIT-III

Automatic Indexing: Classes of automatic indexing, Statistical indexing, Natural Language, Concept indexing, Hypertext linkages. Document and Term Clustering: Introduction, Thesaurus generation, Item clustering, Hierarchy of clusters.

### UNIT-IV

User Search Techniques: Search statements and binding, Similarity measures and ranking, Relevance feedback. Selective dissemination of information search, weighted searches of Boolean systems, searching the Internet and hypertext information. Visualization: Introduction, Cognition and perception, Information visualization technologies.

### UNIT-V

Text Search Algorithms: Introduction, Software text search algorithms, Hardware text search systems. Information system evaluation: Introduction, Measures used in system evaluation, Measurement example. TREC results.

### TEXT BOOKS

- 1.Kowalski, Gerlad; Information Retrieval Systems: Theory and Implementation, Kluwer Academic Press, 1997.
- 2.Frakes, W.B. Rcaedo Baeza-Yates; Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.

## INTERNET OF THINGS

### UNIT – I

Internet of Things – Introduction - Internet of Things Definition Evolution- IoT Architectures- Resource Management - IoT Data Management and Analytics - Communication Protocols - Internet of Things Applications – Security - Identity Management and Authentication- Privacy - Standardization and Regulatory Limitations.

### UNIT – II

Open Source Semantic Web Infrastructure for Managing IoT - Resources in the Cloud – Background/Related Work - OpenIoT Architecture for IoT/Cloud Convergence - Scheduling Process and IoT Services Lifecycle - Validating Applications and Use Cases.

### UNIT – III

Programming Frameworks for Internet of Things – Introduction – Background - Survey of IoT Programming Frameworks.

### UNIT – IV

Stream Processing in IoT - Foundations, State-of-the-Art, and Future Directions – Introduction - The Foundations of Stream Processing in IoT - Continuous Logic Processing System - Challenges and Future Directions - A Framework for Distributed Data Analysis for IoT – Introduction – Preliminaries- Anomaly Detection - Problem Statement and Definitions - Distributed Anomaly Detection - Efficient Incremental Local Modeling.

### UNIT – V

Security and Privacy in the Internet of Things – Concepts - IoT Security Overview - Security Frameworks for IoT - Privacy in IoT Networks - Applied Internet of Things – Introduction – Scenario - Architecture Overview – Sensors - The Gateway - Data Transmission - m Internet of Vehicles and Applications - Basics of IoV - Characteristics and Challenges - Enabling Technologies – Applications.

### TEXT BOOK

Rajkumar Buyya, Amir Vahid Dastjerdi, “Internet of Things: Principles and Paradigms”, Elsevier, 2016

## MOBILE APPLICATION DEVELOPMENT

### UNIT-I- HISTORY OF MOBILE

The Evolution of Devices- the mobile ecosystem-Operators-Networks-Devices-Platforms-Operating Systems-Application Frameworks-Applications-Services-Size and Scope of the Mobile Market-The Addressable Mobile Market-Mobile As a Medium-The Eighth Mass Medium-Ubiquity Starts with the Mobile Web.

### UNIT-II-MOBILE DESIGN

Thinking in Context-Taking the Next Steps-Developing a Mobile Strategy-New Rules-Types of Mobile Applications-Mobile Application Medium Types-Mobile Information Architecture-The Design myth-Interpreting Design-the mobile design tent-pole-designing for the best possible experience-the elements of mobile design-mobile design tools-designing for the right device-designing for different screen sizes.

### UNIT-III-MOBILE APPLICATION DEVELOPMENT

Mobile web apps versus native applications-the ubiquity principle-when to make a native application-when to make a mobile web application-what is mobile 2.0? Mobile web development-web standards-designing for multiple mobile browsers-device plans-markup-css: cascading style sheets-JavaScript.

### UNIT-IV-INTRODUCTION TO ANDROID

Background-an open platform for mobile development-native android applications-android sdk features-introducing the open handset alliance-what does android run on? Why develop for android? Introducing the development framework.

### UNIT-V-APPLICATION DEVELOPMENT

Developing for android-Developing for mobile devices-to do list example-android development tools-what makes an android application? Introducing the application manifest-using the manifest editor-the android application life cycle-understanding application priority and process states-externalizing r-sources-a closer look at android activities.

### TEXT BOOKS

1. Mobile Design and Development Practical concepts and techniques for creating mobile sites and web pages By Brian Fling Publisher: O'Reilly Media (Unit I, II, III).
2. Professional android Application Development by Reto Meier (Unit IV and Unit V).

## NATURAL LANGUAGE PROCESSING

### UNIT I – INTRODUCTION

Speech and Language Processing- Ambiguity-Models and algorithms-Language-Thought-Understanding-Brief history-Regular Expressions-Automata-Morphology and Finite State Transducers-Computational Phonology and Text-to-Speech.

### UNIT-II - PROBABILISTIC MODELS AND SPEECH RECOGNITION

Spelling-Bayesian method-Weighted Automata-N-grams-Smoothing-Entropy-HMMs and speech Recognition-Speech Recognition Architecture-Hidden Markov models-Decoding-Acoustic processing-Speech recognizer-Speech synthesis.

### UNIT-III - SYNTAX

Word classes and part-of-Speech Tagging-Tagsets-Transformation based tagging-Context free rules and trees-The noun Phrase-Co-ordination-Verb phrase-Finite state and context free grammars-Parsing with context free grammars.

### UNIT-IV- UNIFICATION AND PROBABILISTIC PARSING

Features-Implementing unification-Unification constraints-Probabilistic context free grammars-Problems-Lexicalized context free grammars-Dependency grammars-Human parsing-Language and Complexity.

### UNIT-V-SEMANTICS

Representing meaning-First order predicate calculus-Semantic analysis-Attachments-Idioms-Compositionality-Robust semantic analysis-Lexical semantics-Selectional restrictions-Machine learning approaches-Dictionary based approaches-Information retrieval.

### TEXT BOOK

1.Daniel Jurafsky and James H.Martin, “Speech and Language Processing”, Pearson Education, 2002.

### REFERENCE BOOKS

1.Michael W. Berry, “Survey of Text Mining: Clustering, Classification and Retrieval Systems”, Springer Verlag, 2003.

2.James Allen, “Natural Language Understanding”, Benjamin Cummings Publishing Co. 1995.

## OPERATION RESEARCH

### UNIT-I-LINEAR PROGRAMMING PROBLEMS

Concept of LLP-Development of LLP-Graphical Method-Simplex Method-Big-M Method-Dual Simplex-Two Phase.

### UNIT-II-SPECIAL CASES OF LLP

Mathematical Model for Transportation Problem-Types of Transportation Problem-Methods to solve Transportation Problem-Assignment Problem.

### UNIT-III-DECISION THEORY

Decision under certainty-under risk-various decision criterions- decision tree.

### UNIT-IV- GAME THEORY

Technologies of game theory- Game with pure and mixed strategies-Dominance-graphical method-LPP approach for games.

### UNIT-V-SEQUENCING PROBLEM

Johnson's algorithm for n jobs 2 machines- n jobs and 3-2 jobs through m machines.

### TEXT BOOK

1. R. Paneerselvam, Operation Research, PHI, 2<sup>nd</sup> Edition, 2006.

### REFERENCE BOOKS

1. Kanti Swarup, P.K.Gupta, Manmohan, Operation Research, Sultan Chand & Sons, New Delhi, 9<sup>th</sup> Edition.
2. Hamdy A.Taha, Operation Research An Introduction, PHI, New Delhi, 8<sup>th</sup> Edition.
3. P.R.Vittal, Introduction to Operation Research, Margham Publications, Chennai, 2<sup>nd</sup> Edition.
4. P.K. Gupta, D.S.Hira, Problems in Operations Research, Principles and Solutions, S.Chand & Company Ltd., New Delhi.
5. S.D.Dharma, Operation Research, Kedarnath, 14<sup>th</sup> Edition.

## PROFESSIONAL ETHICS

### UNIT-I- COMPUTER ETHICS INTRODCUTION AND COMPUTER HACKING

A general Introduction – Computer ethics: an overview – Identifying an ethical issue – Ethics and law – Ethical theories - Professional Code of conduct – An ethical dilemma – A framework for ethical decision making - Computer hacking – Introduction – definition of hacking – Destructive programs –hacker ethics - Professional constraints – BCS code of conduct – To hack or not to hack? – Ethical positions on hacking

### UNIT- II-ASPECTS OF COMPUTER CRIME AND INTELLECTUAL PROPERTY RIGHTS

Aspects of computer crime - Introduction - What is computer crime – computer security measures – Professional duties and obligations - Intellectual Property Rights – The nature of Intellectual property – Intellectual Property – Patents, Trademarks, Trade Secrets, Software Issues, Copyright - The extent and nature of software piracy – Ethical and professional issues – free software and open source code

### UNIT- III- REGULATING INTERNET CONTENT, TECHNOLOGY AND SAFETY

Introduction – In defence of freedom expression – censorship – laws upholding free speech – Free speech and the Internet - Ethical and professional issues - Internet technologies and privacy – Safety and risk – assessment of safety and risk – risk benefit analysis – reducing risk

### UNIT- IV-COMPUTER TECHNOLOGIES ACCESSIBILITY ISSUES

Introduction – Principle of equal access – Obstacles to access for individuals – professional responsibility - Empowering computers in the workplace – Introduction – computers and employment – computers and the quality of work – computerized monitoring in the work place – telecommuting –social, legal and professional issues - Use of Software, Computers and Internet-based Tools - Liability for Software errors - Documentation Authentication and Control – Software engineering code of ethics and practices – IEEE-CS – ACM Joint task force

### UNIT-V- SOFTWARE DEVELOPMENT AND SOCIAL NETWORKING

Software Development – strategies for engineering quality standards – Quality management  
Standards – Social Networking – Company owned social network web site – the use of social networks in the hiring process – Social Networking ethical issues – Cyber bullying – cyber stalking – Online virtual world – Crime in virtual world - digital rights management - Online defamation – Piracy – Fraud

### REFERENCE BOOKS

1. Penny Duquenoy, Simon Jones and Barry G Blundell, “Ethical, legal and professional issues in computing”, Middlesex University Press, 2008
2. George Reynolds, “Ethics in Information Technology”, Cengage Learning, 2011
3. Caroline Whitback,” Ethics in Engineering Practice and Research “, Cambridge University Press, 2011

4. Richard Spinello, "Case Studies in Information and Computer Ethics", Prentice Hall, 1997.
5. John Weckert and Douglas Adeney, Computer and Information Ethics, Greenwood Press, 1997
6. Sara Baase, "A Gift of Fire: Social, Legal, and Ethical Issues for Computing and the Internet", 3rd Edition, Prentice Hall, 2008
7. [http://www.infosectoday.com/Articles/Intro\\_Computer\\_Ethics.html](http://www.infosectoday.com/Articles/Intro_Computer_Ethics.html)

## WEB SERVICES & SOA

### UNIT – I

Web service and SOA fundamentals- Introduction - The concept of software as service (SaaS)- Web services versus Web based applications- Definition of Web services - Characteristics of Web services- Service interface and implementation.

### UNIT - II

The Service Oriented Architecture - SOA operations - SOA entry points - Layers in an SOA - The Web service technology stack - Quality of service (QoS) - Web service interoperability - Web services versus components - RESTful services -Impact and shortcomings of Web services.

### UNIT - III

Brief overview of XML - XML document structure -XML namespaces - Defining structure in XML documents - Reuse of XML schemas - Document navigation and transformation.

### UNIT – IV

Core functionality and standards - SOAP: Simple Object Access Protocol - Inter-application communication and wire protocols - SOAP as a messaging protocol - Structure of a SOAP message - SOAP communication model - Error handling in SOAP - Advantages and disadvantages of SOAP - Describing Web services - Why is a service description needed? - WSDL: Web Services Description Language - Non-functional service descriptions - WSDL 1.1 versus WSDL 2.0.

### UNIT - V

Registering and discovering services - The role of service registries - Service discovery - Universal Description, Discovery and Integration (UDDI) - The UDDI data structures - Mapping WSDL to UDDI - The UDDI API - Querying the UDDI model - SOA security and policies - Securing SOA and Web services - Network level security mechanisms - Application level security mechanisms - SOA development lifecycle- Unravelling the nature of SOA based applications - Rationale for SOA based application development- Typical SOA development pitfalls - Software development Lifecycle - Elements of SOA based applications - Best practices for developing SOA based applications - Reference model for SOA development - Guiding principles of SOA application development.

### TEXT BOOK

Michael P. Papazoglou, “Web services & SOA : principles and technology”, Prentice Hall, 2012



## SOFTWARE TESTING AND QUALITY MANAGEMENT

UNIT-I TESTING METHODOLOGY- Introduction, Evolution of Software Testing, Software Testing- Myths and facts, Goals of Software Testing, Software testing Definitions, Model for Software Testing, Software Testing Life Cycle(STLC), Verification and Validation - V&V Activities, Verification of Requirements, Verification of High - level Design, Verification of Low - level Design.

UNIT-II TESTING TECHNIQUES - Dynamic Testing: Black-Box Testing Techniques - Boundary Value Analysis (BVA), Equivalence Class Testing, State Tables-Based Testing. White Box Testing Techniques - Need of White-Box Testing, Logic Coverage Criteria, Basis Path Testing, Loop Testing. Static Testing: Structural Walkthroughs. Validation Activities: Unit Validation Testing, Integration Testing, Function Testing, System Testing, and Acceptance testing. Regression Testing: Objectives of Regression Testing, Regression Testing Types, Regression Testing Techniques.

UNIT-III MANAGING THE TESTING PROCESS - Test Management: Test Organization - Structure of Testing Group -Test Planning. Software Metrics: Need of software Measurement, Definition of Software Metrics, Classification of Software Metrics, Entities to be Measured, Size Metrics. Efficient Test Suite Management: Minimizing the Test Suite and its Benefits, Defining Test Suite Minimization Problems, Test Suite Prioritization, Types of Test Case Prioritization, Prioritization Techniques.

UNIT-IV QUALITY MANAGEMENT-Software Quality Management: Software Quality, Broadening the Concept of Quality, Quality Cost, Benefits of Investment on Quality, Quality control and quality Assurance, Quality management, QM and Project Management, Quality Factors, Methods of Quality Management, Software Quality Metrics, SQA Models. Testing Process Maturity Models.

UNIT-V TEST AUTOMATION - Automation and Testing Tools: Need for Automation, Categorization of Testing Tools, Selection of Testing Tools, Costs Incurred in Testing Tools, Guidelines for Automated Testing. Testing for specialization Environment: Testing Web-based System, Web based System, Web Technology Evolution.

### TEXT BOOK

1. Naresh Chauhan, “Software Testing: Principles & Practices”, Oxford University Press, 2012.

### REFERENCE BOOKS

1. Roger, S. Pressman (2005), “Software Engineering: A Practitioners’ Approach”, McGraw-Hill.
2. Black, R., “Managing the Testing Process”, John Willy & Sons, Second Edition.