SYLLABUS FOR

Professional Electives

V to VIII SEMESTER B.E.

INFORMATION SCIENCE & ENGINEERING

2022-23

Professional Electives for Academic Year 2022-2023
Fifth Semester - Eighth Semester

Sl. No.	Code	Elective Name
1	RISE01	Advanced DBMS
2	RISE02	System Software
3	RISE03	Computer Vision
4	RISE04	Advanced Data Structures and Algorithms
5	RISE05	Cloud Computing
6	RISE06	Language Processor
7	RISE07	Object Oriented Modeling and Design
8	RISE08	Mobile Application Development
9	RISE09	Wireless Sensor Networks
10	RISE10	Data warehouse and Data Mining
11	RISE11	Digital Image Processing
12	RISE12	Business Intelligence
13	RISE13	Enterprise Content Management
14	RISE14	Wireless and Mobile Networks
15	RISE15	Storage Technology
16	RISE16	System simulation and Modeling

Sl. No.	Code	Elective Name
17	RISE17	High Performance Computing
18	RISE18	Information Retrieval
19	RISE19	Fuzzy Logic with Engg. Applications
20	RISE20	Artificial Neural Networks and Deep Learning
21	RISE21	Distributed Operating System
22	RISE22	Big Data Analytics
23	RISE23	Advanced Computer Architecture
24	RISE24	Bioinformatics
25	RISE25	Intelligent Agent Systems
26	RISE26	Human Computer Interaction
27	RISE27	NLP with Python
28	RISE28	Sensors and Internet of Things
29	RISE29	Agile Software Technology
30	RISE30	Web Technology
31	RISE31	JAVA and J2EE
32	RISE32	AWS cloud Offering-Industry Perspective

ADVANCED DATABASE MANAGEMENT SYSTEMS

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE01	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Understand concepts of query processing and techniques involved in query optimization.
2. Emphasize the details of transaction processing.
3. Understand principles of concurrency control.
4. Identify need of recovery management.
5. Analyze concepts of parallel and distributed databases.

UNIT I

Query Processing

Overview, Measures of Query Cost, Selection Operation, Sorting, Join Operation, Other Operations, Evaluation of Expressions.

7 Hrs.

UNIT II

Query Optimization

Overview, Transformation of Relational Expressions, Estimating Statistics of Expression Results, Choice of Evaluation Plans, Materialized Views, Advanced Topics in Query Optimization, Summary

Transactions:

Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity, Transaction Isolation Levels, Implementation of Isolation Levels, Transactions as SQL Statements.

8 Hrs.

UNIT III

Concurrency Control:

Lock-Based Protocols, Deadlock Handling, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols, Multifermion Schemes, Snapshot Isolation, Insert Operations, Delete Operations, and Predicate Reads, Weak Levels of Consistency in Practice, Concurrency in Index Structures.

8 Hrs.

UNIT IV

Recovery System:
Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with Loss of Nonvolatile Storage, Early Lock Release and Logical Undo Operations, ARIES**, Remote Backup Systems

System Architecture: Database-System Architecture
Centralized and Client –Server Architectures, Server System Architecture Parallel Systems, Distributed Systems, Network Types.

8 Hrs.

UNIT V

Parallel Databases:
Introduction, I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism, Query Optimization, Design of Parallel Systems, Parallelism on Multicore Processors.

Distributed Databases:
Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions, Commit Protocols, Concurrency Control in Distributed Databases, Availability, Distributed Query Processing, Heterogeneous Distributed Databases, Cloud-Based Databases, Directory Systems.

8 Hrs.

TEXT BOOKS		
1	Abraham Silberschatz, Henry F Korth, S Sudearshan	Database System Concepts, 7th Edition, McGraw Hill, 2005. (chapters 13,14,15,16,17,20,21,22)

REFERENCE BOOKS		
1	Elmasri and Navathe	Fundamentals of Database Systems, 5th Edition, Pearson Education, 2006.
2	Raghu Ramakrishnan and Johannes Gehrke	Database Management Systems, 3rd Edition, McGraw-Hill, 2002.

Course Outcomes:

Upon completion of this course the student will be able to:
CO1: **Analyze** Query Processing and Query selection operation.
CO2: **Design** and **Apply** various Query Optimization methods and Transactions.
CO3: **Apply** different Concurrency Control algorithms and protocols.
CO4: **Identify** the differences between Centralized, Client-Server Architectures, Server System Architectures, Parallel Systems, and Distributed Systems
CO5: **Analyze** the design of Parallel Systems and Distributed Systems.

SYSTEM SOFTWARE

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE02	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Know the relationship between machine architecture and system software.
2. Get the Knowledge of design and implementation of assemblers, macro processor and linker.
3. Attain knowledge on working of loaders and system software tools.
4. Understand the working concept of editors and debugging systems.

UNIT I

Machine Architecture

Introduction, System Software and Machine Architecture, Simplified Instructional Computer (SIC): SIC Machine Architecture, SIC/XE Machine Architecture, SIC Programming Examples, Traditional (CISC) Machines: VAX Architecture, Pentium Pro Architecture, RISC Machines: Ultra SPARC Architecture, Cray T3E Architecture.

Assemblers

Basic Assembler Function, A Simple SIC Assembler, Assembler Algorithm and Data Structures.

08 Hrs.

UNIT II

Assembler Continued...

Machine Dependent Assembler Features: Instruction Formats & Addressing Modes, Program Relocation, Machine Independent Assembler Features: Literals, Symbol Definition Statements, Expression, Program Blocks, Control Sections and Programming Linking, Implementation Examples: MASM Assembler, SPARC Assembler.

08 Hrs.

UNIT III

Loaders and Linkers

Basic Loader Functions - Design of an Absolute Loader, A Simple Bootstrap Loader, Machine Dependent Loader Features: Relocation, Program Linking, Algorithm and Data Structures for a Linking Loader, Machine Independent Loader Features: Automatic Library Search, Loader Options.

08Hrs.

UNIT IV

Loaders and Linkers Continued...

Loader Design Options: Linkage Editor, Dynamic Linkage, Bootstrap Loaders, Implementation Examples: MS-DOS Linker, Sun OS Linker,

Cray MPP Linker.

Editors and Debugging Systems

Text Editors - Overview of Editing Process, User Interface, Editor Structure, Interactive Debugging Systems, Debugging Functions and Capabilities, User Interface Criteria.

07 Hrs.

UNIT V

Macro Processor

Basic Macro Processor Functions, Macro Definitions and Expansion, Macro Processor Algorithm and Data Structures, Machine Independent Macro Processor Features, Concatenation of Macro Parameters, Generation of Unique Labels, Conditional Macro Expansion, Keyword Macro Parameters, Macro Processor Design Options - Recursive Macro Expansion, General Purpose Macro Processors, Macro Processing Within Language Translators.

08 Hrs.

TEXT BOOKS		
1	Leland L Beck	System Software, 3rd Edition, Addison-Wesley, 1997.

REFERENCE BOOKS		
1	I A Dhotre and A A Puntambekar	System Programming, 3rd Edition, Technical Publication, 2008
2	D. M. Dhamdhere	System Programming and Operating Systems, 2nd Edition, TMH, 1999.

Course Outcomes:

Upon completion of this course the student will be able to:

CO1: **Identify** the requirements for designing system software.
CO2: **Apply** the concepts of assembler to generate the machine code.
CO3: **Analyze** the working principles of linker and loader.
CO4: **Describe** interactive text editing system and interactive program debugging systems.
CO5: **Apply** macro processor algorithms to construct tables such as NAMTAB, ARGTAB, SYMTAB etc.

COMPUTER VISION

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE03	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Understand the working of fundamentals of computer vision and different transformation techniques
2. Describe different filtering techniques used in image processing
3. Understand different feature extraction algorithm for image matching
4. Describe different segmentation algorithms.
5. Understand image based on 2D-3D alignment methods

UNIT I

Introduction

Introduction to computer vision; A brief history of computer vision.

Image formation

Geometric primitives and transformations: Geometric primitives, 2D transformations, 3D transformations, 3D rotations, 3D to 2D projections

07 Hrs.

UNIT II

Image formation continued...

The digital camera: Sampling and aliasing, Color, Compression.

Image processing

Point operators: Pixel transforms Color transforms, Compositing and matting, Histogram equalization, Application: Tonal adjustment. Linear filtering: Separable filtering, Examples of linear filtering, Band-pass and steerable filters. More neighborhood operators: Non-linear filtering, Morphology, Distance transforms. **08 Hrs.**

UNIT III

Image processing continued...

Fourier transforms: Fourier transform pairs, Two-dimensional Fourier transforms, Wiener filtering, Application: Sharpening, blur, and noise removal

Feature detection and matching

Points and patches: Feature detectors, Feature descriptors, Feature matching, Feature tracking, Application: Performance-driven animation.

08 Hrs.

UNIT IV

Feature detection and matching continued...

Edges: Edge detection, Edge linking, Application: Edge editing and enhancement. Lines: Successive approximation, Hough transforms, Vanishing points, Application: Rectangle detection Additional reading.

Segmentation

Active contours: Snakes, Dynamic snakes and CONDENSATION, Scissors, Level Sets, Application: Contour tracking and rotoscoping.

Mean shift and mode finding: K-means and mixtures of Gaussians Mean shift, Normalized cuts, Graph cuts and energy-based methods, Application: Medical image segmentation.

08 Hrs.

UNIT V

Feature-based alignment

2D and 3D feature-based alignment: 2D alignment using least squares, Application: Panography, Iterative algorithms, Robust least squares and, 3D alignment. Pose estimation: Linear algorithms, Iterative algorithms, Application: Augmented reality. Geometric intrinsic calibration: Calibration patterns, Vanishing, Application: Single view Rotational motion, Radial distortion

08 Hrs.

	TEXT BOOKS	
1	Richard Szeliski	Computer Vision: Algorithms and Applications, Ist Edition, Springer Science & Business Media, Sep.-2010

	REFERENCE BOOKS	
1	David A. Forsyth, Jean Ponce,	Computer Vision: A Modern Approach, 2nd Edition, Pearson, Nov.-2011.

Course Outcomes:

Upon completion of this course the student will be able to:

CO1: **Apply** different transformation techniques for image formation.
CO2: **Design** a suitable filtering technique for image processing
CO3: **Analyze** different feature detection algorithms for image matching.
CO4: **Apply** various segmentation algorithms to analyze the image
CO5: **Analyze** images based on 2D-3D alignment methods

ADVANCED DATA STRUCTURES AND ALGORITHMS

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE04	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Understand the concept of abstract data types and their implementation.
2. Design different heap structures and perform insert, delete and merge operations.
3. Describe the working of randomized and backtracking algorithm design techniques.
4. Analyze the performance of different heap structures using amortized analysis.
5. Develop algorithms to construct advanced data structures like Red-Black trees, AA-trees, and treaps.

UNIT I

Abstract Data Types (ADTs)

Vector and List in the STL: Iterators, Example: Using **erase** on a list, *const_iterators*, Implementation of vector, implementation of list.

Trees

Preliminaries: Implementation of Trees, Tree Traversals with an Application, Binary Trees: Implementation, An Example: Expression Trees, The Search Tree ADT- Binary Search Trees, Splay Trees: A Simple Idea, Splaying, Tree Traversals (Revisited), Sets and Maps in the Standard Library: Sets, Maps, Implementation of *set* and *map*, An Example that uses Several Maps.

08 Hrs.

UNIT II

Priority Queues (Heaps)

Model, Simple Implementations, Binary Heap: Structural Property, Heap-order Property, Basic Heap Operations, Other Heap Operations, Applications of Priority Queues: The Selection Problem, Event Simulation, d-Heaps, Leftist Heaps: Leftist Heap Property, Leftist Heap Operations, Skew Heaps, Binomial Queues: Binomial Queue Structure, Binomial Queue Operations, Implementation of Binomial Queues, Priority Queues in the Standard Library. **08 Hrs.**

UNIT III

Sorting

Preliminaries, Shell sort, Linear time sorts: Bucket Sort, Radix sort.

Algorithm Design Techniques

Randomized Algorithms: Random Number Generators, Skip Lists, Primality Testing, Backtracking Algorithms: The Turnpike Reconstruction Problem. **08 Hrs.**

UNIT IV

Amortized Analysis

An Unrelated Puzzle, Binomial Queues, Skew Heaps, Fibonacci Heaps: Cutting Nodes in Leftist Heaps, Lazy merging for Binomial Queues, The Fibonacci Heap Operations, Splay Trees.

08 Hrs.

UNIT V

Advanced Data Structures and Implementation

Top-down Splay Trees, Red-Black Trees: Bottom-Up Insertion, Top-Down Red-Black Trees, Top-Down Deletion, AA-Trees, Treaps**.**

07 Hrs.

TEXT BOOKS

1	Mark Allen Weiss	Data Structures and Algorithm Analysis in C++: Pearson Education, Inc Fourth Edition 2014. (Chapters:3.3,3.4,3.5,4(except 4.4), 6, 7.4, 7.11, 10.4, 10.5, 11,12.1 to12.3, 12.4 (third edition),12.6)

REFERENCE BOOKS

1	Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein	Introduction to Algorithms. Third edition. PHI. 2009.

Course Outcomes:

Upon completion of this course, the student will be able to:

CO1: **Identify** several Abstract Data Types to implement various data structures like Binary Trees and Splay Trees and Apply the knowledge of Sets and Maps to design simple real-world problems.

CO2: **Analyze**, Design and implement different types of Heap Structures like Binary Heap, d-Heap, and Leftist Heap.

CO3: **Analyze** the performance of different sorting algorithms, apply algorithm design techniques like randomized and backtracking algorithms to solve problems.

CO4: **Apply** Amortized Analysis and Compute the complexity of different Heap and Tree data structures.

CO5: **Implement** advanced data structures like Red-Black Trees, Splay Trees and perform various operations on it.

CLOUD COMPUTING

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE05	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Learn advanced and cutting-edge state-of-the-art knowledge and implementation in cloud computing.
2. Understand research publications in the technical area of cloud computing, beyond that of the traditional textbook level.
3. Learn advanced services and applications in stacks of cloud.
4. Explore the cloud Infrastructure and understanding Abstraction & Virtualization in cloud computing.

UNIT I

Defining Cloud Computing: Cloud Types, The NIST model, The Cloud Cube Model, Deployment models, Service models, Examining the Characteristics of Cloud Computing, Paradigm shift, Benefits of cloud computing, Disadvantages of cloud computing; Assessing the value proposition: Early adopters and new applications, the laws of cloudonomics, cloud computing obstacles, behavioral factors relating to cloud adoption, measuring cloud computing costs, specifying SLAs

7 Hrs.

UNIT II

Understanding Cloud Architecture: Exploring the Cloud Computing Stack, Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols; Understanding Services and Applications by Type: Defining IaaS, Defining PaaS, Defining SaaS, Defining IDaaS

9 Hrs.

UNIT III

Understanding Abstraction and Virtualization: Using Virtualization Technologies, Load balancing and Virtualization, Understanding Hypervisors; Capacity Planning: Defining Baseline and Metrics, Baseline measurements, System metrics, Load testing, Resource ceilings, Server and instance types, Network Capacity, Scaling.

8Hrs.

UNIT IV

Understanding Service Oriented Architecture: Introducing Service Oriented Architecture, Event-driven SOA or SOA 2.0, The Enterprise Service Bus, Service catalogs, Defining SOA Communications, Business Process Execution Language, Business process modeling, Managing and Monitoring SOA, SOA management tools, SOA security, The Open Cloud Consortium, Relating SOA and Cloud Computing.

8 Hrs.

UNIT V

Understanding Cloud Security: Securing the Cloud, The security

boundary, Security service boundary, Security mapping, Securing Data, Brokered cloud storage access, Storage location and tenancy, Encryption, Auditing and compliance, Establishing Identity and Presence, Identity protocol standards, Windows Azure identity standards.

7 Hrs.

TEXT BOOKS

1	Barrie Sosinsky	"Cloud Computing Bible", Wiley Publishing Inc. 2011

REFERENCE BOOKS

1	David S. Linthicum	Cloud Computing and SOA Convergence in Your Enterprise: A Step-by-Step Guide, Addison-Wesley Information Technology Series, 2000
2	Kai Hwang, Geoffrey C. Fox, and Jack J. Dongarra	"Distributed and Cloud Computing from Parallel Processing to the Internet of Things", Morgan Kaufman Publishers, 2012.

Course Outcomes:

Upon completion of this course the student will be able to:

CO1: **Analyse** the fundamental concepts of cloud computing to apply it to real world problems

CO2: **Analyse** cloud computing technologies covering cloud infrastructure and platform services.

CO3: **Illustrate** the novelty in different cloud computing frameworks.

CO4: **Identify** different Technologies for data security in cloud computing to resolve real time issues

CO5: **Analyse** application Integration process and compare various security options available for cloud computing.

LANGUAGE PROCESSOR

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE06	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Understand various phases of compilation.
2. Understand the usage of various compiler construction tools.
3. Construct various parsing tables by applying Top and bottom-up approach.
4. Understand intermediate code generation and run-time environment.

UNIT I

INTRODUCTION, LEXICAL ANALYSIS, SYNTAX ANALYSIS

Compilers; Analysis of Source Program; The Phases of a Compiler; Cousins of the Compiler; The grouping of phases; Compiler-Construction tools. The Role of Lexical Analyzer; Input Buffering; Specifications of Tokens; Recognition of Tokens. SYNTAX ANALYSIS: The Role of the Parser; Context-free Grammars Writing a Grammar.

8 Hrs.

UNIT II

SYNTAX ANALYSIS CONTINUED ...

Top-down Parsing; Recursive descent parsing, Transition diagrams for predictive parsers, Non recursive predictive parsing, FIRST and FOLLOW, LL(1) Grammars Bottom-up Parsing, Handles, Handle pruning, Stack implementation of shift reduce parsing , viable prefixes.

8 Hrs.

UNIT III

SYNTAX-DIRECTED TRANSLATION, RUN-TIME ENVIRONMENTS

LR Parsers – LR Parsing algorithm, construction of SLR, CLR, LALR Parsing tables, Syntax-Directed definitions; Constructions of Syntax Trees; Bottom-up evaluation of S-attributed definitions; L-attributed definitions; Top-down translation. **8 Hrs.**

UNIT IV

INTERMEDIATE CODE GENERATION

Intermediate Languages; Declarations; Assignment statements; Boolean Expressions, Type Checking, Case statements; Backpatching: Backpatching for Boolean Expressions, Flow-of-Control Statements.

8 Hrs.

UNIT V

CODE GENERATION Issues in the design of Code Generator; The Target Machine; Run-time Storage Management; Issues in the design of Code Generator; The Target Machine; Run-time, Storage Management; A Simple Code Generator;

7 Hrs.

TEXT BOOKS

1	Alfred V Aho, Ravi Sethi, Jeffrey D Ullman	Compilers-Principles, Techniques and Tools, Addison-Wesley, 2nd Ed, 2007

REFERENCE BOOKS

1	Charles N. Fischer, Richard J. leBlanc, Jr.	Crafting a Compiler with C, Pearson Education, 1991.
2	Andrew W Apple	Modern Compiler Implementation in C, Cambridge University Press, 1997.

Course Outcomes:

Upon completion of this course, the student will be able to:

CO1: **Apply** the acquired knowledge to illustrate the various phases of compilation and compiler construction tools.

CO2: **Identify** the issues, specifications and recognition of tokens during lexical analysis.

CO3: **Design** different parsing tables for the given grammar and associate the semantic rules for the productions of the grammar.

CO4: **Analyze** the program dynamics during runtime.

CO5: **Analyze** and Apply suitable techniques to generate the target code.

OBJECT ORIENTED MODELING AND DESIGN

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE07	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Understand Object Oriented Systems Development concepts.
2. Emphasize the fundamental of Rumbaugh, Booch and Jacobson methodologies.
3. Understand concepts of modeling and UML.
4. Analyze object-oriented analysis along with case studies.
5. Apply object-oriented design along with case studies.

UNIT I

INTRODUCTION.

An overview of object-oriented systems development. Why an object orientation? Overview of the unified approach. Object basics: Introduction, An object-oriented philosophy. Objects, Classes, Attributes: Object behavior and methods. Encapsulation and Information hiding, Class hierarchy, Polymorphism, Object relationships and associations. Aggregations and object containment. Case study: Payroll program, advanced topics. Object-oriented systems development life cycle: Introduction. The software development process, Building high-quality software, Object oriented systems development: A use-case driven approach, Reusability.

8 Hrs.

UNIT II

METHODOLOGY, MODELING AND UML.

Object oriented methodologies, Introduction: Survey of some of the object-oriented methodologies, Rumbaugh's Object modeling technique, The Booch methodology. The Jacobson Methodologies, Patterns, Frameworks. The unified approach. Unified modeling language: Introduction. Static and Dynamic models, Why modeling, Introduction to the unified modeling language. UML diagrams - UML class diagram, Use-case diagram. UML dynamic modeling, Model management: Packages and model organizations, UML extensibility, UML meta-model.

8 Hrs.

UNIT III

OBJECT ORIENTED ANALYSIS.

Object oriented analysis, Process-identifying use cases: Introduction, Business object analysis: Understanding the business layer, Use-case driven object-oriented analysis: The unified approach, Business process modeling. Use-case model: Development effective documentation. Case study: ViaNet bank ATM. Object analysis-classification: Introduction. Classifications theory, Approaches for identifying classes. Noun phrase approach, Common class patterns approach. Use-case driven approach-identifying classes and their behaviors through Sequence/collaboration modeling. Classes,

Responsibilities and collaborators, Naming classes.

8 Hrs.

UNIT IV

OBJECT ORIENTED ANALYSIS Contd...

Identifying object relationships, Attributes and methods: Introduction, Associations, Super-sub class relationships, A-part-of relationships-aggregation, Case study. Class responsibility: Identifying attributes and methods, Class responsibility: Defining attributes by analyzing use cases and other UML diagrams, Defining attributes for ViaNet bank objects. Object responsibility: Methods and messages, Defining methods for ViaNet bank objects.

OBJECT-ORIENTED DESIGN

The object-oriented design process and design axioms: Introduction. The object-oriented design process, Object oriented design axioms, Corollaries, Design patterns. Designing classes: Introduction, The Object-oriented design philosophy, UML object constraint language. Designing classes: The process. Class visibility: Designing well-defined public. Private and protected protocols. Designing classes: Refining attributes. Refining attributes for the ViaNet bank projects. Designing methods and protocols. Designing methods for the ViaNet bank objects, Packages and managing classes **8 Hrs.**

UNIT V

OBJECT-ORIENTED DESIGN CONT...

Access Layer-Object storage and object interoperability: Introduction, Object Store and Persistence: Database Management Systems, Organization and Access control, Distributed Databases and Client-Server Computing, Distributed Objects Computing, Object-Oriented Database Management Systems, Object-Relational systems, Multi database systems, Designing Access layer classes, Case Study: Designing the access layer for the ViaNet Bank ATM. View Layer-Designing Interface objects: Introduction, User Interface design as a creative process, Designing view layer classes. Macro-Level Process: Identifying View Classes by Analyzing Use Cases, Micro-Level Process, The Purpose of a view Layer Interface, Prototyping the User Interface.

7 Hrs.

TEXT BOOKS

1	Bahrami Ali	Object oriented systems development, Mc-Graw-Hill. 2008.
2	Craig Larman	Applying UML and Patterns, An Introduction to Object-Oriented Analysis and design, Addison Wesley, 2007.

REFERENCE BOOKS

1	Rebecca Wirfs	Designing Object-oriented software, Prentice-Hall India, 1990.
2	Grady Booch	Unified Modeling Language User guide, Addison-Wesley, 2007.

Course Outcomes:

Upon completion of this course, the student will be able to:

CO1: **Apply** the fundamental knowledge of object-oriented concepts to solve the problems.

CO2: **Analyze** different object-oriented methodologies and unified modeling language.

CO3: **Analyze** use-case driven object-oriented methods for developing use-case models.

CO4: **Examine** the object-oriented design process and design axioms.

CO5: **Design** the access and view layer for a given case study.

MOBILE APPLICATION DEVELOPMENT

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE08	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Understand the basic structure, functions Flutter App development Framework
2. Analyze the performances by adding interactivity to an app by using gestures
3. Describe the different animation and navigation effects for a mobile application
4. Understand the structure and organization of any mobile application.
5. Enhance the user-friendly nature of mobile application by applying the different library functions.

UNIT I

INTRODUCING FLUTTER AND GETTING STARTED

Introducing Flutter, Understanding Widget Lifecycle Events, Understanding the Widget Tree and the Element Tree, Installing the Flutter SDK, Installing on Windows, Installing on Linux, Configuring the Android Studio Editor

CREATING A HELLO WORLD APP

Setting Up the Project, Using Hot Reload, Using Themes to Style Your App, Understanding Stateless and Stateful Widgets, Using External Packages

LEARNING DART BASICS

Why Use Dart?, Commenting Code, Running the main() Entry Point, Referencing Variables, Declaring Variables, Using Operators, Using Flow Statements, Using Functions, Import Packages, Using Classes, Implementing Asynchronous Programming. **8 Hrs.**

UNIT II

CREATING A STARTER PROJECT TEMPLATE

Creating and Organizing Folders and Files, Structuring Widgets

UNDERSTANDING THE WIDGET TREE

Introduction to Widgets, Building the Full Widget Tree, Building a Shallow Widget Tree

USING COMMON WIDGETS

Using Basic Widgets, Using Images and Icons, Using Decorators, Using the Form Widget to Validate Text Fields, Checking Orientation

ADDING ANIMATION TO AN APP

Using Animated Container, Using Animated Cross Fade, Using Animated Opacity, Using Animation Controller. **8 Hrs.**

UNIT III

CREATING AN APP'S NAVIGATION

Using the Navigator, Using Hero Animation, Using the BottomNavigationBar, Using the BottomAppBar, Using the TabBar and TabBarView, Using the Drawer and ListView

CREATING SCROLLING LISTS AND EFFECTS

Using the Card, Using the ListView and ListTile, Using the GridView, Using the Stack, Customizing the CustomScrollView with Slivers

BUILDING LAYOUTS

A High-Level View of the Layout, Creating the Layout

8Hrs.

UNIT IV

APPLYING INTERACTIVITY

Setting Up GestureDetector: The Basics, Implementing the Draggable and Dragtarget Widgets, Using the GestureDetector for Moving and Scaling, Using the InkWell and InkResponse Gestures, Using the Dismissible Widget

WRITING PLATFORM-NATIVE CODE

Understanding Platform Channels, Implementing the Client Platform Channel App, Implementing the iOS Host Platform Channel, Implementing the Android Host Platform Channel

8 Hrs.

UNIT V

SAVING DATA WITH LOCAL PERSISTENCE

Understanding the JSON Format, Using Database Classes to Write, Read, and Serialize JSON, Formatting Dates, Sorting a List of Dates, Retrieving Data with the FutureBuilder, Building the Journal App, Adding the Journal Database Classes, Adding the Journal Entry Page, Finishing the Journal Home Page

ADDING THE FIREBASE AND FIRESTORE BACKEND

What Are Firebase and Cloud Firestore? Structuring and Data Modeling Cloud Firestore, Viewing Firebase Authentication Capabilities, Viewing Cloud Firestore Security Rules, Configuring the Firebase Project, Adding a Cloud Firestore Database and Implementing Security, Building the Client Journal App

7 Hrs.

TEXT BOOK

1	Marco L. Napoli	Beginning Flutter, Published by John Wiley & Sons, Inc. Indianapolis, Indiana 2020

REFERENCE BOOKS

1	Prajyot Mainkar, Salvatore Giordano	Google Flutter Mobile Development, Production reference: 1290319, Published by Packt Publishing Ltd., Birmingham, B3 2PB, UK. March 2019 ISBN 978-1-78934-496-7
2	Rap Payne	Beginning App Development with Flutter: Create Cross-

		Platform Mobile Apps, Copyright © 2019 by Apress Publications. ISBN-13 (pbk): 978-1-4842-5180-5 ISBN-13 (electronic): 978-1-4842-5181-2 https://doi.org/10.1007/978-1-4842-5181-2

Course Outcomes:

Upon completion of this course the student will be able to:

CO1: **Understand** how Flutter framework works behind the scenes and about the benefits of the Dart language.

CO2: **Create** a new project by organizing files and folders in it and **Apply** widgets to create simple and complex layouts.

CO3: **Apply** the Navigator widget to manage a stack of routes to move between pages and work on different views.

CO4: **Develop** interactive android applications with platform native code using gestures.

CO5: **Understand** data persistence over app launches by using the JSON file format and saving the file to the local iOS and Android filesystem using Firebase and Firestore Backend.

WIRELESS SENSOR NETWORKS

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE09	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Understand the basic WSN technology and supporting protocols, with basic sensor systems
2. Understand the medium access control protocols and address physical layer issues
3. Learn key routing protocols for sensor networks and main design issues
4. Learn transport layer protocols for sensor networks, and design requirements
5. Understand the Sensor management, power management, and sensor network middleware.

UNIT I

Motivation for a Network of Wireless Sensor Nodes

Definitions and Background, Challenges and Constraints.

Node Architecture: The Sensing Subsystem, The Processor Subsystem, Communication Interfaces, Prototypes.

Operating Systems

Functional Aspects, Non-functional Aspects, Prototypes, Evaluation.

8Hrs.

UNIT II

Physical Layer

Basic Components.

Medium Access Control

Overview, Wireless MAC Protocols, Characteristics of MAC Protocols in Sensor Networks, Contention-Free MAC Protocols, Contention-Based MAC Protocols, Hybrid MAC Protocols.

8 Hrs.

UNIT III

Network Layer

Overview, Routing Metrics, Flooding and Gossiping, Data-Centric Routing, Proactive Routing, On-Demand Routing. **8 Hrs.**

UNIT IV

Network Layer(cont..)

Hierarchical Routing, Location-Based Routing, QoS-Based Routing Protocols.

Power Management

Local Power Management Aspects, Dynamic Power Management, Conceptual Architecture.

8 Hrs.

UNIT V

Time Synchronization
Clocks and the Synchronization Problem, Time Synchronization in Wireless Sensor Networks, Basics of Time Synchronization
Localization
Overview, Ranging Techniques, Range-Based Localization.

7 Hrs.

TEXT BOOKS

1	Waltenegus Dargie, Christian Poellabauer	Fundamentals Of Wireless Sensor Networks: Theory And Practice, John Wiley & Sons Ltd, 1st edition, 2010

REFERENCE BOOKS

1	FeiHu, Xiaojun Cao,	Wireless Sensor Networks: Principles and Practice, CRC Press. 2010
2	Feng Zhao	Wireless Sensor Networks: An information processing approach. Edition 1, Elsevier Publication 2004.
3	Kazem Sohraby,Daniel Minoli,Taieb Znati	Wireless Sensor Networks: Technology, Protocols, and Applications, A John Wiley and Sons., 2007

Course Outcomes:
Upon completion of this course the student will be able to:
CO1: **Identify** and Apply the technologies and applications in the computer network for wireless sensor networks (WSN).
CO2: **Classify** the MAC protocols and algorithms used in the sensor network.
CO3: **Analyze** the routing techniques and issues involved in the network layer for different applications in the WSN.
CO4: **Identify** the requirement of power management, localization and time synchronization in WSN.
CO5: **Identify** the security issues and challenges involved in WSN.

DATA WAREHOUSE AND DATA MINING

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE10	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Become familiar with basic data preprocessing concepts.
2. Understand and implement classical models and algorithms in data warehouses and data mining
3. Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
4. Master in data mining techniques in various applications like social, scientific and environmental context.
5. Develop skill in selecting the appropriate data mining algorithm for solving practical problems.

UNIT I

Introduction:

What Is Data Mining? Data Mining - On What Kind of Data? Data Mining Functionalities - What Kinds of Patterns Can Be Mined? Major Issues in Data Mining.

Data Preprocessing:

Why Preprocess the Data? Data Cleaning, Data Integration and Transformation, Data Reduction: Data Cube Aggregation, Attribute subset selection.

7 Hrs.

UNIT II

Data Warehouse and OLAP Technology: An Overview

What Is a Data Warehouse?

Differences between Operational Database Systems and Data Warehouses, But, Why Have a Separate Data Warehouse?

A Multidimensional Data Model

From Tables and Spreadsheets to Data Cubes, Stars, Snowflakes, and Fact Constellations: Schemas for Multidimensional Databases, Examples for Defining Star, Snowflake and Fact Constellation Schemas, Measures: Their Categorization and Computation, Concept Hierarchies, LAP Operations in the Multidimensional Data Model, A Starnet Query Model for Querying Multidimensional Databases.

Data Warehouse Architecture

Steps for the Design and Construction of Data Warehouses, A Three-Tier Data Warehouse Architecture, Data Warehouse Back-End Tools and Utilities, Metadata Repository, Types of OLAP Servers: ROLAP versus MOLAP versus HOLAP.

8 Hrs.

UNIT III

Mining Frequent Patterns, Associations, and Correlations:

Basic Concepts and a Road Map

Market Basket Analysis: A Motivating Example, Frequent Item sets, Closed Item sets, and Association Rules, Frequent Pattern Mining: A Road Map.

Efficient and Scalable Frequent Item set Mining Methods

The Apriori Algorithm: Finding Frequent Item sets Using Candidate Generation, Generating Association Rules from Frequent Item sets, Improving the Efficiency of Apriori, Mining Frequent Item sets without Candidate Generation, Mining Frequent Item sets Using Vertical Data Format, Mining Closed Frequent Itemsets.

Mining Various Kinds of Association Rules

Mining Multilevel Association Rules, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses.

8 Hrs.

UNIT IV

Classification and Prediction: What Is Classification? What Is Prediction? Issues Regarding Classification and Prediction

Preparing the Data for Classification and Prediction, Comparing Classification and Prediction Methods.

Classification by Decision Tree Induction

Decision Tree Induction, Attribute Selection Measures, Tree Pruning, Scalability and Decision Tree Induction.

Bayesian Classification

Bayes' Theorem, Naïve Bayesian Classification, Bayesian Belief Networks, Training Bayesian Belief Networks.

Rule-Based Classification

Using IF-THEN Rules for Classification, Rule Extraction from a Decision Tree, Rule Induction Using a Sequential Covering Algorithm.

Prediction Linear Regression, Nonlinear Regression, Other Regression-Based Methods.

8 Hrs.

UNIT V

Cluster Analysis

What is cluster analysis?, Types of data in cluster analysis

Interval-Scaled Variables, Binary Variables, Categorical, Ordinal and Ratio-Scaled Variables, Variables of Mixed Types, Vector Objects.

A categorization of major Clustering Methods

Partitioning Methods: Classical Partitioning Methods, Partitioning Methods in Large databases

Hierarchical Methods: Agglomerative and Divisive Hierarchical Clustering, BIRCH, ROCK, Chameleon

Density-Based Methods: DBSCAN, OPTICS, DENCLUE

Grid-Based Methods: STING, Wave Cluster

Model-Based Clustering Methods: Expectation-Maximization, Conceptual Clustering, Neural Network Approach

Mining Stream, Time-Series, and Sequence Data Mining Data Streams, Mining Time-Series Data, Mining Sequence Patterns in Transactional Databases, Mining Sequence Patterns in Biological Data.

8Hrs

TEXT BOOKS

1	Jiawei Han, & Micheline Kamber	Data Mining: Concepts and Techniques, 3rd Edition, Elsevier publication, 2011 ISBN: 9780123814791

REFERENCE BOOKS

1	Arun K. Pujari	Data Mining Techniques, University Press (India) private Limited, second Edition, 2010. EISBN 9788173718533

Course Outcomes:

Upon completion of this course the student will be able to:

CO1: **Describe** the importance and basic terminologies of Data Warehousing and Data Mining.

CO2: **Analyze** various kinds of Data Warehousing and Data Mining Tasks, methods and tools.

CO3: **Illustrate** the basic concepts and techniques of Data Warehousing and Data Mining.

CO4: **Identify** the business applications of Data Mining.

CO5: **Apply** recent Data Warehousing and Data Mining software for solving practical problems.

DIGITAL IMAGE PROCESSING

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE11	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Understand basics of Digital Image Processing concepts.
2. Have the ability to analyze intensity transformations.
3. Analyze and apply spatial filtering and frequency domain filtering.
4. Understand the role of alternative color spaces and their usage in Image Processing.
5. Have a command of basic image segmentation techniques.

UNIT I

INTRODUCTION:

What is Digital Image Processing? The origins of Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of Digital Image Processing Systems: Image Acquisition, Storage, Preprocessing, Communication, Display.

DIGITAL IMAGE FUNDAMENTALS

Elements of Visual Perception: Structure of the Human Eye, Image formation in the Eye, Brightness adaptation and Discrimination. Image sensing and acquisition: Image acquisition using a Single Sensor, Image acquisition using sensor strips, Image acquisition using Sensor Arrays, A simple Image Formation Model.

8 Hrs.

UNIT II

DIGITAL IMAGE FUNDAMENTALS (continued……)

Image Sampling and Quantization: Basic concepts in Sampling and Quantization, Representing Digital Images, Spatial and Intensity Resolution, Image Interpolation. Some Basic Relationships Between Pixels: Neighbors of a Pixel, Adjacency, Connectivity, Regions and Boundaries, Distance Measures. An introduction to the Mathematical Tools Used in Digital Image Processing.

INTENSITY TRANSFORMATIONS AND SPATIAL FILTERING

Background, Some Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering.

8 Hrs.

UNIT III

INTENSITY TRANSFORMATIONS AND SPATIAL FILTERING (contd..)

Smoothing Spatial filtering, Sharpening Spatial Filters.

FILTERING IN THE FREQUENCY DOMAIN

Preliminary Concepts, Image Smoothing Using Frequency Domain filters, Image Sharpening Using Frequency Domain Filters.

8 Hrs.

UNIT IV

COLOR IMAGE PROCESSING

Color Fundamentals, Color Models, Pseudo-Color Image processing, Basics of Full-color Image Processing.

MORPHOLOGICAL IMAGE PROCESSING

Preliminaries, Erosion and Dilation, Opening and Closing, The HIT-or-Miss transformation, Some basic Morphological Algorithms.

8 Hrs.

UNIT V

IMAGE SEGMENTATION

Fundamentals. Point, Line and Edge Detection. Thresholding: Foundation, Basic Global Thresholding, Optimum Global Thresholding Using Otsu's Method, Using Image Smoothing to Improve Global Thresholding, Using Edges Improve Global Thresholding. Region based segmentation: Region growing, Region splitting and merging.

7 Hrs.

TEXT BOOKS

1	Rafael. C. Gonzalez and Richard E. Woods.	Digital Image Processing, Third Edition, Pearson Education 2008.

REFERENCE BOOKS

1	Rafael. C. Gonzalez and Richard E. Woods, Steven L. Eddins	Digital Image Processing Using Matlab, Second Edition, Pearson Education 2009.

Course Outcomes:

Upon completion of this course the student will be able to:

CO1: **Apply** the basic concepts of image processing.

CO2: **Formulate** and analyze the different image enhancement techniques.

CO3: **Analyze** the transformation with respect to frequency and special domain.

CO4: **Examine** the Color image processing concepts.

CO5: **Analyse** segmentation techniques on images.

BUSINESS INTELLIGENCE

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE12	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Understand concepts and methodologies in business intelligence.
2. Identify different types of skills required for OLTP.
3. Understand the need for data integration to retrieve validate data.
4. Design different data models and report based on dimensions anc facts.

UNIT I

Business View of Information Technology Applications: Business Enterprise, Functions and Core Business Processes, Baldrige Business Excellence Framework, Purpose of Using IT in Business, Application development Approaches, Information Users and Their Requirements.

Introduction to digital data and its types – structured, semi-structured and unstructured.

8 Hrs.

UNIT II

Introduction to OLTP and OLAP, OLAP Architectures (MOLAP, ROLAP, HOLAP), Data Models for OLTP and OLAP, OLAP operations.

Introduction to Business Intelligence: BI Definitions & Concepts, BI Framework, who is BI for?, Data Warehousing concepts and its role in BI, BI Infrastructure Components – BI Process, BI Technology, BI users, Business Applications of BI, BI best practices.

Aggregate Functions in SQL, Grouping: The GROUP BY and HAVING Clauses, Discussion and Summary of SQL Queries. Insert, Delete statements in SQL, Delete and Update statements in SQL, Additional Features of SQL, Specifying General Constraints as Assertion, Views (Virtual Tables) in SQL, Database Programming: Issues and Techniques Embedded SQL, Dynamic SQL.

8 Hrs.

UNIT III

Basics of Data Integration: Concepts of data integration, needs and advantages of using data integration, Need for Data Warehouse, Definition, Goals, Benefits, Use, Components, Data Marts, Ralph Kimball's AND W.H. Inmon's Approach, Extraction, Transformation & Loading, introduction to common data integration approaches, Meta data - types and sources, Introduction to data quality, data profiling concepts and applications, introduction to ETL using Pentaho data Integration (formerly Kettle).

7 Hrs.

UNIT IV

Multi-dimensional Data Modeling: Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi dimensional modeling, concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema, Dimensional modeling life cycle.

Measures, Metrics and KPIs: Understanding Measures and Performance, Role of Metrics, KPIs.

8 Hrs.

UNIT V

Basics of Enterprise Reporting: Reporting perspectives, Report standardization and present practices, Enterprises reporting characteristics in OLAP world, balanced scorecard, enterprise dashboard, balanced scorecard vs. enterprise dashboard, The buzz behind analysis: Funnel analysis, distribution channel analysis, performance analysis, enterprise reporting using MS Access / MS Excel, best practices in the design of enterprise dashboards.

8 Hrs.

TEXT BOOKS

1	R N Prasad and Seema Acharya	Fundamentals of Business Analytics, Wiley India, August 2011.

REFERENCE BOOKS

1	David Loshin	Business Intelligence, Morgan Kaufmann Publishers, 2003.
2	Roland Bouman, Jos van Dongen	Business Intelligence and Data Warehousing with Pentaho and MySQL,2009, ISBN 9780470484326
3	Ralph Kimball, Margy Ross	Practical Tools for DWH and BI, Kimball Group, Wiley India Ed. 2010

Course Outcomes:

Upon completion of this course the student will be able to:

CO1: **Describe** business intelligence methodologies and concepts.

CO2: **Identify** the difference between Online Analytic Processing and Online Transaction Processing (OLTP), and identify the different types of OLAP Professional Skill.

CO3: **Discuss** the need for data integration and various approaches to integrate the data.

CO4: **Apply** different methods to build data model and report based on the dimensions and facts.

CO5: **Design** the data model and generate the report using various techniques.

ENTERPRISE CONTENT MANAGEMENT

Contact Hours/Week	:	2L+2P	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE13	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Gain understanding about Digital Technology, best practices and relevant success stories of the industry.
2. Have hands on proficiency on Adobe Experience Manager - a platform for delivering, engaging, multichannel experience.
3. Create components and templates in AEM using JCR
4. Design responsive and dynamic webpages with digital asset management.

UNIT I

WCM & AEM Introduction: AEM Terminology, Basic concepts.

AEM Setup & Overview: Install and deploy AEM, Work with various Web Consoles, Work with User interfaces (UIs)

Web Framework: Understand Representational State Transfer (REST) architectural style, Apache Sling.

OSGi Framework: Understand the concepts of OSGi and Apache Sling, Describe the AEM functional building blocks, Describe the Granite platform, Understand OSGi framework, Understand about OSGi bundles

(5+5) Hrs.

UNIT II

Content Repository: Basic Concepts – JCR, learn about the Java Content Repository (JCR), Understand the concepts of Apache Jackrabbit, Explore Adobe CRX, Understand the underlying repository structure.

AEM – Developer UI: Content Authoring Overview, CRX Interface, CRXDE Lite Interface.

AEM – Templates & Components: Creating Project Structure, Introduction to Sightly, Creating Template & Page Component (JSP and Sightly), Creating Pages & Website Structure.

(5+5) Hrs.

UNIT II

Sightly: Features of Sightly in AEM Development, Sightly versus JSP, Building Blocks, Expressions & Statements.

AEM Authoring Framework – Components & Design: Modularize the template, Extend the component hierarchy, assign a design, Create and include components in scripts.

AEM Authoring Framework – Dialog Boxes: Create dialog boxes for components, Create Design dialog boxes for global content, Use the Edit_Config property to enhance components.

(5+5) Hrs.

UNIT IV

Authoring Responsive and Mobile Pages: Define Responsive Design Work with Responsive page layout, create a Mobile page, Add content to the Mobile page.

DAM: Finding & Viewing Assets, create a folder and upload assets to it, edit an asset and its properties, Add a content fragment and an asset to a page.

Adding New Content: Create a page, insert a new paragraph, Edit the text paragraph, Add new components, Work with the Content Finder.

Handling Page Properties: Describe Page Properties, Provide Multiple titles for a Page, Bulk Editing.

(6+6) Hrs.

UNIT V

Workflows: Creating and Managing Workflows, Creating and Managing Launches.

Admin Basics: Roles, Users, Groups and Permissions(ACLs), Apache Felix Console Interface, Package Manager.

Agile Basics: Agile Basics for AEM Projects.

(5+5) Hrs.

TEXT BOOKS

1	Ryan D Lunka	Adobe Experience Manager: Classroom in a book, Adobe Press, 2014

REFERENCE BOOKS

1	Shane closer	Adobe Experience Manager: Quick reference guide, Adobe Press, 2014.
2	Shivanikarwal	Digital Marketing Handbook, Create Space Independent Publishing Platform, 2015

Course Outcomes:

Upon completion of this course the student will be able to:

CO1: **Understand** the knowledge of digital touch points to provide unified experience

CO2: **Develop** templates on AEM by applying the knowledge of JCR and Apache Jackrabbit

CO3: **Create** dialog boxes and components using Sightly language

CO4: **Design** the responsive pages, mobile pages, folders and manipulation on AEM framework

CO5: **Create** and manage AEM workflows.

WIRELESS AND MOBILE NETWORKS

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE14	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Understand the concept of cellular and mobile communication.
2. Choose system (TDMA/FDMA/CDMA) according to the complexity, installation cost, speed of transmission, channel properties etc.
3. Identify the requirements of mobile communication as compared to static communication.
4. Identify the limitations of 2G and 2.5G wireless mobile communication and Understand the various generations (3G, 4G, 5G) of mobile communications.
5. Enhance the knowledge on wireless sensor network for research.

UNIT I

Wireless Networking: Introduction, Difference between Wireless and Fixed Telephone Networks, Development of Wireless Networks

Introduction To Wireless Communication Systems: Evolution of Mobile Radio Communications Mobil Radio Systems around the world examples of Wireless Communication Systems. Cellular Telephone Systems, Comparison of Common Wireless Communications Systems.

Modern Wireless Communications Systems: Second generation (2G), Cellular Networks, evolution of 2.5G, TDMA Standards, Third Generation (3G) Wireless Networks, Wireless Local Area Networks (WLANs), Bluetooth and Personal Area Networks (PANS), Fourth generation (4G), Fifth Generation (5G)

8 Hrs.

UNIT II

The Cellular Concept: System Design Fundamentals, Introduction, Frequency reuse, channel assignment strategies, handoff strategies – prioritizing handoffs, Practical Handoff considerations. Interference and system capacity, co-channel interference and system capacity, channel planning for wireless systems, adjacent channel interference, power control for reducing interference.

8 Hrs.

UNIT III

Mobile Radio Propagation: Introduction to radio wave propagation, Free space propagation model, Relating power to electric field, The three basic propagation mechanism, Reflection, Diffraction, Scattering.

8Hrs.

UNIT IV

Modulation Techniques For Mobile Radio: Frequency modulation Vs

amplitude modulation, Amplitude modulation, Angle modulation, Digital Modulation, Linear Modulation techniques – Binary phases shift keying (BPSK), Differential Phase Shift Keying (DPSK), Quadrature Phase Shift Keying (QPSK), Constant envelope modulation – Binary Frequency Shift Keying, Minimum Shift Keying (MSK), Gaussian Minimum Shift Keying (GMSK).

8 Hrs.

UNIT V

Multiple Access Techniques for Wireless Communications: Introduction to Multiple access, Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Spread Spectrum Multiple Access, Space Division Multiple Access (SDMA), Packet Radio. Protocols, Reservation Protocols – Reservation ALOHA, Packet Reservation Multiple Access (PRMA), Capacity of cellular systems.

7 Hrs.

TEXT BOOKS

1	Theodore S Rappaport	Wireless Communications, Principles and Practice, 2nd Edition, Pearson Education Asia, 2010.

REFERENCE BOOKS

1	William C Y Lee	Mobile Communications Engineering Theory and Applications, 2nd Edition, McGraw Hill, 1998.
2	William Stallings	Wireless Communications and Networks, Pearson Education Asia, 2nd Edition, 2010.

Course Outcomes:

Upon completion of this course the student will be able to:

CO1: **Delineate** the basic and advanced theories on wireless and mobile communications systems.

CO2: **Describe** mobile communication standard, its architecture, logical channels, advantages and limitations.

CO3: **Analyze** the wireless and mobile network model, design issues of mobile networks.

CO4: **Identify** existing mobile networks and future system standards.

CO5: **Identify** and select a wireless technology or a combination of technologies to suit a given application.

STORAGE TECHNOLOGY

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE15	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Understand different storage centric and server centric IT infrastructures.
2. Compare different network storage options in multiple platforms.
3. Define information security and identify different storage virtualization technologies.
4. Identify security considerations to be taken across different storage network devices.
5. Understand the Sensor management, power management, and sensor network middleware.

UNIT I

Introduction: Server Centric IT Architecture and its Limitations; Storage – Centric IT Architecture and its advantages; Case study: Replacing a server with Storage Networks.

Intelligent Disk Subsystems- 1: Architecture of Intelligent Disk Subsystems; Hard disks and Internal I/O Channels, JBOD, Storage virtualization using RAID and different RAID levels. Caching: Acceleration of Hard Disk Access. **8 Hrs.**

UNIT II

Intelligent Disk Subsystems -2, I/O Techniques - 1: Intelligent disk subsystems; Availability of disk subsystems. The Physical I/O path from the CPU to the Storage System; SCSI.

I/O Techniques -2 NETWORK ATTACHED STORAGE: Fibre Channel Protocol Stack; Fibre Channel SAN; IP Storage. **8 Hrs.**

UNIT III

File System and NAS: Local File Systems; Network file Systems and file servers; Shared disk file systems; Comparison of fibre Channel and NAS.

Storage Virtualization-1: Once again virtualization in the I/O path, Limitations and requirements. **8 Hrs.**

UNIT IV

Storage Virtualization-2 Definition of Storage virtualization; Implementation Considerations; Storage virtualization on Block or file level; Storage virtualization on various levels of the storage Network; Symmetric and Asymmetric storage virtualization in the Network **8 Hrs.**

UNIT V

Security Considerations-Overview of Information Security, Security Methods, StorageSecurity Technology, Storage Security Challenges, Fiber Channel SAN Security, NAS Security.

7 Hrs.

TEXT BOOKS

1	Ulf Troppens, Rainer Erkens and Wolfgang Muller	Storage Networks Explained – John Wiley & Sons, 2nd Edition, 2011.
2	Robert Spalding	Storage Networks: The Complete Reference-Tata McGraw Hill Publications,2003 (ISBN:0072224762)

REFERENCE BOOKS

1	Richard Barker, Paul Massiglia, and John	Storage Area Network Essentials: A Complete Guide to understanding and Implementing SANs – Wiley India, 2002.
2	Marc Farley	Storage Networking Fundamentals, Cisco Press, 2005

Course Outcomes:

Upon completion of this course the student will be able to:

CO1: **Discuss** the fundamental requirements of the file systems.
CO2: **Comprehend** storage area network architectures.
CO3: **Deliberate** different RAID levels, SAN and NAS technologies.
CO4: **Identify** and adopt different storage virtualization techniques.
CO5: **Analyze** security elements to address solutions across different storage network.

SYSTEM SIMULATION AND MODELING

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE16	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Understand basic concepts in modeling and simulation.
2. Learn various concepts of Discrete-Event Simulation.
3. Generate and test random number variates.
4. Analyze input/output data produced by a model and test validity of the model.
5. Apply simulation on computer systems.

UNIT I

INTRODUCTION TO SIMULATION:

When simulation is the appropriate tool and when it is not appropriate; Advantages and disadvantages of Simulation; Areas of application; Systems and system environment; Components of a system; Discrete and continuous systems; Model of a system; Types of Models; Discrete-Event System Simulation; Steps in a Simulation Study. Simulation examples: Simulation of queuing systems.

7 Hrs.

UNIT II

GENERAL PRINCIPLES AND QUEUING MODELS:

Concepts in Discrete-Event Simulation: The Event-Scheduling / Time-Advance Algorithm. Characteristics of queuing systems: The Calling Population, System Capacity, The Arrival Process, Queue Behavior and Discipline, Service Times and Mechanism; Queuing notation.

7 Hrs.

UNIT III

RANDOM-NUMBER GENERATION:

Properties of random numbers; Generation of pseudo-random numbers; Techniques for generating random numbers, Linear Congruential Method, Combined Linear Congruential generators; Tests for Random Numbers, Frequency tests: Kolmogrov-Smirnov test and Chi-Square test. Independence test: Autocorrelation test.

RANDOM VARIATE GENERATION:

Inverse Transform technique: exponential distribution, Uniform distribution, Weibull distribution, Triangular distribution.

9 Hrs.

UNIT IV

ANALYSIS OF SIMULATION DATA, VERIFICATION AND VALIDATION:

Input Modeling- Data collection, Identification and distribution with data, parameter estimation, Goodness of fit tests, Selection of input

models without data.
Model building, Verification and Validation; Verification of Simulation Models, Calibration and Validation of Models, Face validity, Validation of Model Assumptions, Validation Input-Output Transformations, Input-Output Validation: Using Historical Input data.

9 Hrs.

UNIT V

OUTPUT ANALYSIS FOR A SINGLE MODEL:
Types of simulation with respect to output analysis. Output analysis for steady-state simulations.

SIMULATION OF COMPUTER SYSTEMS:
Introduction, Simulation Tools: Process Orientation, Event Orientation; CPU Simulation, Memory Simulation. **7 Hrs.**

TEXT BOOKS

1	Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol	Discrete-Event System Simulation, 5th Edition, Pearson Education, 2009.

REFERENCE BOOKS

1	Lawrence M. Leemis, Stephen K. Park	Discrete – Event Simulation: A First Course, Pearson / Prentice-Hall, 2006.
2	Averill M. Law	Simulation Modeling and Analysis,4th Edition, Tata McGraw-Hill, 2007.

Course Outcomes:
Upon completion of this course the student will be able to:
CO1: **Analyze** the need of simulation, its applications and usage.
CO2: **Develop** the Discrete-Event Simulation model and examine the performance of queuing systems.
CO3: **Analyze** various techniques for random number generation and also analyze the test for random numbers.
CO4: **Analyze** the data simulation, verification and validation.
CO5: **Illustrate** the output analysis and simulation tools.

HIGH PERFORMANCE COMPUTING

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE17	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Understand the scope and significance of Grid Computing & High-Performance Computing.
2. Emphasize the fundamental concepts and issues related to parallel programming platforms.
3. Acquire knowledge of communication operations and analytical modeling of Parallel programs.
4. Develop Program in message-passing paradigm.
5. Develop Program in shared address space platforms.

UNIT I

Introduction to HPC-I:

Grid computing–The Data centre, the Grid and Distributed/High Performance computing, Cluster and Grid Computing, Meta computing – Scientific, Business and E-Governance Grids–Web services and Grid computing, business computing, e-Governance.

Technologies and Architectures for Grid Computing: Clustering and Grid Computing, Issues in Data Grids, Key Functional Requirements/ Standards in Grid Computing, Recent Technological Trends in Large Data Grids. Cluster Computing- Approaches to Parallel Computing, low cost Parallel Computing, and Categories of Clusters. Levels and Layers of Single System Image (SSI), Cluster Middleware Design Objectives, Resource Management and Scheduling, Cluster Programming Environment and Tools.

Introduction to Parallel Computing: Motivating Parallelism, Scope of Parallel Computing.

08 Hrs.

UNIT II

Introduction to HPC-II:

Parallel Programming Platforms: Implicit Parallelism: Trends in Microprocessor Architectures, Limitations of Memory System Performance, Dichotomy of Parallel Computing Platforms, Physical Organization of Parallel Platforms, Communication Costs in Parallel Machines, Routing Mechanisms for Interconnection Networks, Impact of Process-Processor Mapping and Mapping Techniques.

Principles of Parallel Algorithm Design:

Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods for Containing Interaction Overheads, Parallel Algorithm Models.

07 Hrs.

UNIT III

Basic Communication Operations:

One-to-All Broadcast and All-to-One Reduction, All-to-All Broadcast and Reduction, All-Reduce and Prefix-Sum Operations, Scatter and Gather All-to-All Personalized Communication, Circular Shift, Improving the Speed of Some Communication Operations

Analytical Modeling of Parallel Programs:

Sources of Overhead in Parallel Programs, Performance Metrics for Parallel Systems, the Effect of Granularity on Performance.

08 Hrs.

UNIT IV

Programming Using the Message-Passing Paradigm:

Principles of Message-Passing Programming, The Building Blocks: Send and Receive Operations, MPI: the Message Passing Interface, Topologies and Embedding, Overlapping Communication with Computation, Collective Communication and Computation Operations, Groups and Communicators.

08 Hrs.

UNIT V

Programming Shared Address Space Platforms:

Thread Basics, Why Threads? The POSIX Thread API, Thread Creation and Termination, Synchronization Primitives in Pthreads, Controlling Thread and Synchronization Attributes, Thread Cancellation, Composite Synchronization Constructs, Tips for Designing Asynchronous Programs,OpenMP: a Standard for Directive Based Parallel Programming.

08 Hrs.

TEXT BOOKS

1	Ananth Grama,Anshul Gupta,Vipin kumar,George Karypis,	Introduction to parallel computing, second edition, Pearson education publishers. (chapters 01,2,3,4,5.1,5.2,5.3,6,7)
2	C.S.R Prabhu,	Grid and Cluster computing, PHI-2010(Chapters 1,2,8 and 9)

REFERENCE BOOKS

1	Thomas Rauber and Gudula Runger,	Parallel Programming for Multicore and cluster systems, Springer International Edition,2009
2	Hennessey and Patterson	Computer Architecture: A quantitative Approach, Morgan Kaufman Publishers
3	Michael J.Quin	"Parallel Programming in C with MPI and Open MP", McGraw Hill. (For MPI and Open MP).
4	D. E. Culler, J. P. Singh and A.	Parallel Computer Architecture. Morgan-Kaufmann publishers MongoDB Action 2nd

	Gupta	Edition, 2016.

Course Outcomes:

Upon completion of this course the student will be able to:

CO1: **Compute** an efficient programming code to transfer algorithms in the computational area for modern computer architectures

CO2: **Analyze** and inculcate the various technologies and architectures in Grid Computing.

CO3: **Design** and **Develop** message passing interface to various platforms with clusters and shared address space platforms.

CO4: **Analyze** the code w.r.t performance and design basic operations for efficient data transfer in parallel algorithms

CO5: **Examine** the analytical modelling to deal with metrics for quantifying the performance of parallel algorithms.

INFORMATION RETRIEVAL

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE18	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Elaborate on the fundamentals of information retrieval (IR)
2. Become familiar with difference between Information retrieval and data Base Management Systems
3. Learn different indexing techniques to apply data Base systems
4. Understand various searching techniques to retrieve data from databases and ware houses.
5. Acquire the knowledge of necessary experience to design, and implement real applications using Information Retrieval systems

UNIT I

Boolean Retrieval: An example information retrieval problem, A first take at building an inverted index, Processing Boolean queries, The extended Boolean model versus ranked retrieval.

The term Vocabulary and Postings Lists: Document delineation and character sequence decoding, Obtaining the character sequence in a document, Choosing a document unit, Determining the vocabulary of terms, Tokenization, Dropping common terms: stop words, Normalization (equivalence classing of terms), Stemming and lemmatization, Faster postings list intersection via skip pointers, Positional postings and phrase queries, Bi-word indexes, Positional indexes, Combination schemes.

8 Hrs

UNIT II

Dictionaries and tolerant retrieval: Search structures for dictionaries, Wildcard queries, General wildcard queries, k-gram indexes for wildcard queries, spelling correction, Implementing spelling correction, Forms of spelling correction, Edit distance, k-gram indexes for spelling correction, Context sensitive spelling correction, Phonetic correction.

Index Construction*:* Hardware basics, Blocked sort-based indexing, Single-pass in-memory indexing, Distributed indexing, Dynamic indexing, Other types of indexes.

Index Compression: Statistical properties of terms in information retrieval, Heaps' law: Estimating the number of terms, Zipf's law: Modeling the distribution of terms, Dictionary compression, Dictionary as a string, Blocked storage.

8 Hrs

UNIT III

Scoring, term weighting and the vector space model: Parametric and zone indexes, Weighted zone scoring, Learning weights, the optimal weight *g,* Term frequency and weighting, Inverse document frequency, Tf-idf weighting, The vector space model for scoring, Dot products, Queries as vectors, Computing vector scores.

Computing scores in a complete search system: Efficient scoring and ranking, Inexact top *K* document retrieval, Index elimination, Champion lists, Static quality scores and ordering, Impact ordering, Cluster pruning, Components of an information retrieval system, Tiered indexes, Query-term proximity, Designing parsing and scoring functions. Putting it all together**.**

8 Hrs

UNIT IV

Evaluation in information retrieval: Information retrieval system evaluation, Standard test collections, Evaluation of unranked retrieval sets, Evaluation of ranked retrieval results.

Text classification and Naïve Bayes: The text classification problem, Naïve Bayes text classification, The Bernoulli model, Properties of Naïve Bayes, Feature Selection, Evaluation of text classification. Assessing relevance, Results snippets.

7 Hrs

UNIT V

Vector space classification: Document representations and measures of relatedness in vector spaces, Rocchio classification, k nearest neighbour, linear versus nonlinear classifiers, Classification with more than two classes, The bias-variance tradeoff.

Support vector machines and machine learning on documents: Support vector machines: The linearly separable case, Extensions to the support vector machine model, Issues in the classification of text documents, Machine-learning methods in ad hoc information retrieval.

8 Hrs

TEXT BOOKS

1	Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze	An Introduction to Information Retrieval, University Press Cambridge, 2008, England Edition 1, ISBN 978-0-521-86571-5 (Chapters 1, 2, 3, 4, 5, 6, 7, 8, 13, 14, 15)

REFERENCE BOOKS

1	Ricardo Baeza-Yates, Berthier Ribeiro-Neto	Modern Information Retrieval, 7th Edition, ACM Press, 1999
2	Kowalski, Gerald,	Information Retrieval Systems: Theory and

	Mark T Maybury	Implementation, Kluwer Academic Press, 1997

Course Outcomes:

Upon completion of this course the student will be able to:

1. **Apply** the concepts of indexing, vocabulary, normalization and dictionary in Information Retrieval.
2. **Apply** the various methodologies inculcated while defining the concepts of Index Construction and Index compression.
3. **Illustrate** the working of classification and clustering methods using various retrieval models.
4. **Design** information retrieval algorithms by knowing the basic knowledge of an Evaluation system.
5. **Design** the text classification problem using Naïve Bayes, Vector Space Classification and various machine learning algorithms.

FUZZY LOGIC WITH ENGINEERING APPLICATIONS

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE19	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Understand the fundamental difference between crisp set and fuzzy sets.
2. Transform crisp sets to fuzzy sets
3. Understand and Apply the subtle difference between classical and fuzzy logic
4. Use Python to IoT domain.
5. Apply fuzzy classification and clustering techniques.

UNIT I

INTRODUCTION: Uncertainty and Imprecision, Static and Random Processes, Uncertainty in information, Fuzzy sets and Classical sets, properties and mapping of fuzzy sets to function, Fuzzy set operations, properties. Sets as points in Hypercubes.

Cartesian product, crisp relations, Fuzzy relations, Tolerance and equivalence relations, Fuzzy tolerance, Value assignments

07 Hrs.

UNIT II

Membership functions: Features of membership functions, standard forms and boundaries. Fuzzification, membership value assignment. Fuzzy to crisp conversions, Lamda cuts for fuzzy sets, Lamda cuts for fuzzy relations.

07 Hrs.

UNIT III

Defuzzification Methods, extension principle, crisp function, mapping and relations, practical considerations. Fuzzy numbers, interval analysis in arithmetic, approximate methods of extension, Fuzzy vectors.

Classical logic and fuzzy logic, predicate logic, Fuzzy logic, approximate reasoning, Fuzzy tautologies, consideration, equivalence and logical proofs. **10 Hrs.**

UNIT IV

Fuzzy rule based systems, natural language, linguistic hedges, Rule based systems, canonical rule forms, Decomposition of compound rules, likelihood and truth qualification, aggregation of fuzzy rules, graphical techniques.

08 Hrs.

UNIT V

Fuzzy classification by equivalence relations, crisp relations, Fuzzy relations cluster analysis, cluster validity, C-means clustering, HCM and LCM, Classification metric, Hardening the fuzzy C-Partition, Similarity relations from clustering. **07 Hrs**

TEXT BOOKS

1	Thimoty J Ross,	Fuzzy Logic with Engineering Applications, Third Edition, John Wiley & Sons Ltd. Publications.

REFERENCE BOOKS

1	Dr. Shivanandam and Deepa	Principles of Soft Computing, Third Edition, Wiley Publication, 2019. ISBN: 978-81-265-7713-2.

Course Outcomes:

Upon completion of this course the student will be able to:

CO1: **Apply** the knowledge of crisp sets and fuzzy sets to solve problems.

CO2: **Apply** the concept of fuzzification and fuzzy to crisp conversion to solve problem.

CO3: **Apply** the concept of Defuzzification to solve simple problems.

CO4: **Illustrate** the application of fuzzy sets to develop fuzzy rule-based systems.

CO5: **Apply** fuzzy sets to classification and clustering problems.

ARTIFICIAL NEURAL NETWORKS AND DEEP LEARNING

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE20	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Understand the evolution of artificial neural networks.
2. Use & comprehend different models of ANN to solve the problems.
3. Understand the philosophy and working of Deep Forward Neural Networks.
4. Discuss the salient features and benefits of Associative Neural Networks.
5. Acquire the knowledge of the significance of Competitive and SOFM nets.

UNIT I

INTRODUCTION TO NEURAL NETWORKS:

Neural Processing, Overview of Neural Networks, The rise of neurocomputing, Definition of Neural Network, Introduction to Neural Networks, Historical Developments of Neural Networks, Biological Neural Networks, Comparison between the Brain and the computer, Comparison between Artificial and Biological Neural Networks, Basic Building Blocks of Artificial Neural Network. (Chapter 1, Text Book 1)

8 Hrs.

UNIT II

FUNDAMENTAL MODELS OF ANN:

McCulloch-Pitts Neuron Mode: Learning Rules: Hebbian Learning Rule, Perceptron Learning Rule, Delta Learning Rule, Competitive Learning Rule, Outstar Learning Rule, Boltzmann Learning Rule, Hebbian Network, Perceptron Networks: Architecture, Algorithm and Application Procedure, Adaline and Madaline Networks:

FEED FORWARD NETWORKS

Structure, Delta rule, generalized Delta Rule, Architecture, Training extensions, Practical considerations, Generalization, Prunning Techniques, advantages and disadvantages, applications. (Reference

8 Hrs.

UNIT III

DEEP FORWARD NEURAL NETWORKS

Definition of Deep Forward Neural Networks, Brief Survey on Deep Neural Networks, Advantages and Disadvantages of Deep Neural Network, Applications of Deep Neural Networks, Deep Neural Network Architecture, Learning in Deep forward Neural Networks.

(Chapter No.1 and Chapter No. 3 of Text Book 2) **8 Hrs.**

UNIT IV

ASSOCIATIVE MEMORY NEURAL NETWORKS

Introduction, Algorithms for Pattern Associations, Hetero Associative Memory Neural Networks, Auto Associative Memory Neural Networks, Bi-Directional Associative Memory Neural Networks (Chapter 6, Text Book 1)

8 Hrs.

UNIT V

COMPETITIVE AND SELF ORGNIZING NETWORKS

Introduction: general clustering procedures, competitive learning architectures and algorithms, self-organizing feature maps (Chapter 9, Text Book 1)

7 Hrs.

TEXT BOOKS

1	S.N.Shivanadam, S Sumathi, S N Deepa	Introduction to Neural Networks using MATLAB 6.0, Second Reprint 2006, ISBN:0-07-059112-1, TMH Publishing House, New Delhi.
2	Dr. Rajiv Chopra	Deep Learning-A Practical Approach using Python. Second Edition, ISBN:978-93-86173-41-6, Khanna Publisher, 2020.

REFERENCE BOOKS

1	James A. Freeman and David M. Skupura	Neural Networks: Algorithms, Applications and Programming Techniques, ISBN 13: 9780201513769, Pearson Education Publications, 2003.
2	Dr. Shivanandam and Deepa	Principles of Soft Computing, Third Edition, Wiley Publication, 2019. ISBN: 978-81-265-7713-2.
3	Robert J Schalkoff	Artificial Neural Networks, Mc Graw Hill, International Edition ISBN-13: 978-0262019309, 1997.
4	B. Yegnanarayana	Artificial Neural Networks, PHI 1999.

Course Outcomes:

Upon completion of this course the student will be able to:

CO1: **Apply** the fundamental concepts of ANN
CO2: **Analyze** and apply the different ANN models to solve the real world problem.
CO3: **Discuss** the fundamental issues with Deep Neural Networks.
CO4: **Analyze** and Apply training and testing algorithms to Associative NN.
CO5: **Explore** the salient features and significance of Competitive and SOFM nets.

DISTRIBUTED OPERATING SYSTEMS

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE21	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Understand the different Distributed Systems and the challenges involved in various Distributed computing models.
2. Understand how to utilize computing power and synchronize in Distributed systems.
3. Analyze Distributed applications using Technologies like RPC, threads.
4. Learn how to store data in Distributed File System.
5. Understand how Distributed Shared Memory is managed.

UNIT I

Fundamental Concepts

Distributed computing systems, Distributed computing models, Distributed Operating system, Issues in designing distributed operating system.

Message Passing

Message passing, Synchronization, Buffering, Multi datagram Messages, Encoding and Decoding of Message data, Process addressing.

8 Hrs.

UNIT II

Message Passing Contd..

Failure handling, Group Communication.

Remote Procedure Calls

RPC model, Transparency of RPC, Implementation of RPC mechanism, Stub Generation, RPC Messages, Marshalling the Arguments and Results, Management of Server, Parameter passing semantics, call semantics, communication protocols for RPC's, Client server binding.

8 Hrs.

UNIT III

Distributed Shared Memory

Generalized Architecture of Distributed Shared Memory Systems, Design Issues and Implementation issues of Distributed Shared Memory Systems, Granularity, Structure of Shared Memory Space, Consistency Models, Replacement Strategy, and Thrashing.

Synchronization

Clock Synchronization, Event Ordering, Mutual Exclusion

8Hrs.

UNIT IV

Synchronization Contd...

Deadlock, Election algorithms.

Resource Management

Desirable features of a Good Global Scheduling Algorithm, Task Assignment Approach.

7 Hrs.

UNIT V

Process Management

Process Migration and Threads

Distributed File Systems

Desirable Features of a Good Distributed File System, File models, File accessing models, file sharing semantics, file caching schemes.

8 Hrs.

TEXT BOOK

1	Pradeep K Sinha	"Distributed Operating Systems: Concepts and Design", Pradeep K Sinha. PHI Learning Pvt. Limited, 2012, ISBN :9788120313804 Chapter 1 : 1.1, 1.3, 1.5-1.6, Chapter 3 : 3.2 – 3.11, Chapter 4 : 4.2-4.15, 4.20, Chapter 5 : 5.2 – 5.8, Chapter 6 : 6.2-6.6, Chapter 7 : 7.2-7.3, Chapter 8 : 8.2-8.3, Chapter 9 : 9.3-9.6

REFERENCE BOOKS

1	Andrew S Tanenbaum	"Distributed Operating system", Andrew S Tanenbaum, Prentice Hall, 1995, ISBN 0136374069, 9780136374060

Course Outcomes:

Upon completion of this course the student will be able to:

CO1: **Analyse** the definition and architecture of distributed operating systems.

CO2: **Differentiate** between Centralized systems and Distributed systems.

CO3: **Analyse** how memory synchronization and clock synchronization occur in Distributed systems.

CO4: **Demonstrate** how data communication takes place between the end users of the Distributed systems like RPCs, Message passing and shared memory.

CO5: **Analyse** the concepts like distributed shared memory, synchronization, resource management and distributed file systems.

BIG DATA AND ANALYTICS

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE22	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Provide a basic understanding of the types of digital data, the characteristics of big data, the challenges confronting the enterprises embracing big data.
2. Determine the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
3. Introduce programming tools in Hadoop echo system for storage, analysis and manipulation of data.
4. Enable skills to solve complex real-world problems.

UNIT I

Getting an Overview of Big Data:

What is Big Data? History of Data Management-Evolution of Big Data, Structuring Big Data-Types of Data, Elements of Data, Advantages of Big Data Analytics

Introducing Technologies for Handling Big Data

Distributed and Parallel Computing for Big Data, Introducing Hadoop, Cloud Computing and Big Data: Features of Cloud Computing, Cloud Deployment Models, Cloud Delivery Models, Cloud Services for Big Data, Cloud Providers in Big Data Market.

8 Hrs.

UNIT II

Understanding Hadoop Ecosystem

Hadoop Ecosystem, Hadoop Distributed File System, HDFS Architecture, MapReduce, Hadoop YARN, Introducing HBase- HBase Architecture, Regions, Storing Big Data with HBase, Interacting with the Hadoop Ecosystem, HBase in Operation-Programming with HBase, Combining HBase with HDFS, Hive, Pig and Pig Latin, Sqoop, ZooKeeper, Flume, Oozie

8 Hrs.

UNIT III

Understanding MapReduce Fundamentals and HBase

The MapReduce Framework: Exploring the features of MapReduce, working of MapReduce, Exploring Map and Reduce Functions, Techniques to optimize MapReduce Jobs: Hardware/ Network Topology, Synchronization, File System, Uses of MapReduce, Role of HBase in Big Data Processing: Characteristics of HBase, Installation of HBase.

Exploring Hive

Introducing Hive, Getting Started with Hive: Hive Variables, Hive Properties, Hive Queries, Data Types in Hive, Built-in Functions inHive, Hive DDL, Data Manipulation in Hive, Data Retrieval Queries, Using JOINS in Hive.

8 Hrs.

UNIT IV

Analyzing Data with Pig

Introducing Pig: The Pig Architecture, Benefits of Pig, Properties of Pig, Running Pig, Getting Started with Pig Latin, Working with Operators in Pig, Debugging Pig, Working with Functions in Pig, Error Handling in Pig.

Using Oozie

Introducing Oozie: Main Functional Components of Oozie, Benefits of Oozie, Installing and Configuring Oozie, Understanding the Oozie Workflow, Oozie Coordinator, Oozie Bundle, Oozie Parameterization with EL, Oozie Job Execution Model, Accessing Oozie, Oozie SLA.

8 Hrs.

UNIT V

NoSQL Data Management

Introducing to NoSQL, Types of NoSQL Data Models, Characteristics of NoSQL, Schema-less Databases, Materialized Views, Distribution Models, CAP theorem, Sharding.

Cassandra

Apache Cassandra - An Introduction, Features of Cassandra, CQL Data types, CQLSH, Keyspaces, CRUD (Create, Read, Update and Delete) Operations.

7 Hrs.

TEXT BOOKS

1	DT Editorial Services	Big Data: Black Book: Dreamtech Press, Edition 2016 (Chapters 1,3,4,5,12,13,14,15)
2	Seema Acharya, Subhashini Chellappan	Big Data and Analytics, Infosys Limited, Publication: Wiley India Private Limited, Edition 1, 2015. (Chapters 6,7)

REFERENCE BOOKS

1	Alex Holmes	Hadoop in Practice, Manning Publications Co., Edition 2, September 2014
2	Alan Gates	Programming Pig, O'Reilly, Kindle Publication, 2016
3	Dean Wampler	Programming Hive, O'Reilly, Kindle Publication, September 2012.

Course Outcomes:

Upon completion of this course the student will be able to:

CO1: **Identify** the different types of digital data, sources, challenges, elements and technologies for handling Big Data

CO2: **Demonstrate** the Hadoop Ecosystem and have broad comprehension of HDFS, MapReduce Fundamentals and HBase

CO3: **Apply** Pig and Hive scripts with Hadoop Distributed File System to analyse stored Big Data.

CO4: **Describe** Hadoop jobs using Oozie and basic concepts of NoSQL Data Management.

CO5: **Create** NoSQL Databases and explore Cassandra

ADVANCED COMPUTER ARCHITECTURE

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE23	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Understand and discuss the different parallel computer models and related fundamental issues.
2. Discuss and comprehend different system Interconnect architectures, advanced processors and memory technologies.
3. Understand and Apply the concept of Pipelining and super scalar techniques to solve the problems.
4. Discuss cache coherence and synchronization problems in multiprocessors and multi computers.
5. Gain insight into different Parallel Algorithm Design models.

UNIT I

Parallel Computer Models

The State of Computing, Computer Development Milestones, Elements of Modern Computers, Evolution of Computer Architecture, System Attributes to Performance Multiprocessors and Multicomputer Shared – Memory Multiprocessors, Distributed Memory Multiprocessors, A Taxonomy of MIMD Computers, Multi vector and SIMD computers, Vector Supercomputers, SIMD Supercomputers.

Program and Network Properties

Conditions of Parallelism, Data and Resource Dependences, Hardware and Software Parallelism, the Role of Compilers, Program Partitioning and Scheduling, Grain Sizes and Latency, Grain Packing and Scheduling. Program flow Mechanisms, Control Flow Versus Data Flow, Demand-Driven Mechanisms Comparisons of Flow Mechanisms. (Ref 1: 1.1-1.3, 2.1-2.3). **08 Hrs.**

UNIT II

System Interconnect architectures: Network properties and routing, Static connection network and dynamic connection networks. Processor and Memory Technologies

Advanced Processor Technology Design space of Processors, Instruction-Set Architectures CISC Scalar Processor (exclude CISC Microprocessor Families) RISC Scalar Processor (exclude Sun Microsystems SPARC Architecture) Superscalar and Vector Processor: Superscalar Processors (exclude IBM RS/6000 Architecture) VLIW Architecture Memory Hierarchy Technology: Memory Technology, Inclusion, Coherence and Locality, memory capacity planning. (Ref 1: 2.4.1-4.3).

08 Hrs.

UNIT III

Pipelining and Superscalar Techniques

Linear Pipeline Processors, Asynchronous and Synchronous Models, Clocking and Timing control, Speed up, Efficiency and Throughput, Non-linear Pipeline Processors, Reservation and Latency Analysis, Collision-Free Scheduling, Instruction Pipeline Design. Mechanism for Instruction Pipelining, Arithmetic Pipeline Design, Computer Arithmetic Principles, Static Arithmetic Pipeline (Ref 1:6.1-6.4).

08 Hrs.

UNIT IV

Multiprocessors and Multi-computers

Cache Coherence and Synchronization Mechanisms, The Cache Coherence, Problem, Snoopy Bus Protocol, Directory-based protocols, Hardware Synchronization Mechanisms, Message Passing Schemes, Message Routing Schemes, Deadlock and Virtual Channels, Flow Control Strategies, Parallel Models. (Ref 1: 7.2, 7.4).

08 Hrs.

UNIT V

Parallel Algorithm Design: Introduction, the Task/Channel model, Foster's design methodology, partitioning, communication, agglomeration & mapping, boundary value problem, finding the maximum, the n-Body problem. (Ref 2: 3.1-3.7).

07 Hrs.

TEXT BOOKS		
1	Kai Hwang	Advanced Computer Architecture Parallelism, Scalability: Programmability, Tata Mc Grawhill, 2003. (Ch 1.1 to 1.3, Ch 2.1 to 2.4, : Ch 4.1 to 4.3, Ch 6.1 to 6.4, Ch 7.2, 7.4 and 10.1, 10.2)

REFERENCE BOOKS		
1	John P Hayes,	Computer Architecture and Organization, 3rd Edition, McGrawHill, 1998.
2	V Rajaraman, C Siva Ram Murthy	Parallel Computers – Architecture and Programming, PHI, 2000.

Course Outcomes:

Upon completion of this course the student will be able to:

CO1: **Apply** the concept of parallel computer models.
CO2: **Illustrate** the concept of System Interconnect Architectures, advanced processors and memory technologies.
CO3: **Apply** the concept of Pipelining and super scalar techniques to solve the problems.
CO4: **Discuss** cache coherence and synchronization problems in multiprocessors and multi computers.
CO5: **Comprehend** Parallel Algorithm Design models.

BIOINFORMATICS

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE24	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Understand basics of genetic materials.
2. Analyze the fundamental concept of database searches and use of different algorithms.
3. Learn different patterns of substitutions within genes.
4. Understand need of strategies for fast searches.
5. Analyze basic concepts of Genomics 1 & 2.

UNIT I

The genetic material, gene structure and information content, protein structure and function, chemical bonds, molecular biology tools. **7 Hrs.**

UNIT II

Dot plots, simple alignments, gaps, scoring matrices, the Needleman and Wunsch algorithm, semiglobal alignments, the Smith and Waterman algorithm, database searches – BLAST and FASTA.

8 Hrs.

UNIT III

Patterns of substitutions within genes, estimating substitution numbers, molecular clocks, Molecular phylogenetics, phylogenetic trees, distance matrix methods, maximum likelihood approaches.

8 Hrs.

UNIT IV

Parsimony, Inferred Ancestral Sequences, strategies for fast searches – branch and bound and heuristic searches, consensus trees, tree confidence, molecular phylogenies.

Genomics – 1: Prokaryotic genomes, prokaryotic gene structure, GC content and prokaryotic genomes, prokaryotic gene density, eukaryotic genomes. **8 Hrs.**

UNIT V

Genomics – 2: Eukaryotic gene structure Open reading frames, GC contents in eukaryotic genomes, gene expression, transposition, repetitive elements

Amino acids, polypeptide composition, secondary structure, tertiary and quaternary structures, algorithms for modeling protein folding.

8 Hrs.

TEXT BOOKS

1	Dan E. Krane, Michael L. Raymer	Fundamental Concepts of Bioinformatics, Pearson Education, 2008.

REFERENCE BOOKS

1	T K Attwood, D J Parry Smith	Introduction to Bioinformatics, Pearson Education, 2004.
2	Gary B. Fogel, David W. Corne	Evolutionary Computation in Bioinformatics, Morgan Kaufmann Publishers, 2002.

Course Outcomes:

Upon completion of this course the student will be able to:

CO1: **Analyze** the structure and function of genes and proteins.
CO2: **Apply** alignment sequence and different algorithms for analyzing the alignment sequence.
CO3: **Analyze** patterns of substitutions and also distance based methods of phylogenetics.
CO4: **Identify** character-based methods of phylogenetics.
CO5: **Apply** genomics and gene recognition, protein and RNA structure prediction.

INTELLIGENT AGENT SYSTEMS

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE25	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Understand the fundamental concepts in the study of intelligent agents.
2. Familiar with the basic concepts, methods, techniques, and tools for the use of intelligent agents in computer-based systems.
3. Understand the components and functions of intelligent agents.
4. Study in the design, implementation, and application of agent-based systems.

UNIT I

Intelligent Agents: Intelligent Agents, Agents and Objects, Agents and Expert Systems, Agents as Intentional Systems. Abstract Architectures for Intelligent Agents, How to Tell an Agent What to Do.

Deductive Reasoning Agents: Agents as Theorem Provers. Agent-Oriented Programming, Concurrent MetateM.

Practical Reasoning Agents:

Practical Reasoning=Deliberation+Means-Ends Reasoning, Means-Ends Reasoning, Implementing a Practical Reasoning Agent, The Procedural Reasoning System.

08 Hrs.

UNIT II

Reactive and Hybrid Agents: Reactive Agents, Hybrid Agents.

Communication and Cooperation: Understanding Each Other. Ontology Fundamentals, Ontology Languages, RDF, Constructing an Ontology, Software Tools for Ontologies.

Communicating: Speech Acts, Agent Communication Languages

Working Together: Cooperative Distributed Problem Solving, Task Sharing and Result Sharing, Result Sharing, Combining Task and Result Sharing, Handling Inconsistency, Coordination, Multiagent Planning and Synchronization.

08 Hrs.

UNIT III

Methodologies: When is an Agent-Based Solution Appropriate? Agent-Oriented Analysis and Design, Pitfalls of Agent Development, Mobile Agents.

Applications: Agents for Workflow and Business Process Management, Agents for Distributed Sensing, Agents for Information Retrieval and

Management. Agents for Electronic Commerce. Agents for Human-Computer Interfaces, Agents for Virtual Environments, Agents for Social Simulation. Agents for X.

Multiagent Interactions: Utilities and Preferences. Setting the Scene. Solution Concepts and Solution Properties, Competitive and Zero-Sum Interactions, The Prisoner's Dilemma, Other Symmetric 2 x 2 Interactions, Representing Multiagent Scenarios, Dependence Relations in Multiagent Systems.

08 Hrs.

UNIT IV

Making Group Decisions: Social Welfare Functions and Social Choice Functions, Voting Procedures, Desirable Properties for Voting Procedures, Strategic Manipulation.

Forming Coalitions: Cooperative Games, Computational and Representational Issues, Modular Representations. Representations for Simple Games, Coalitional Games with Goals, Coalition Structure Formation.

Allocating Scarce Resources: Classifying Auctions, Auctions for Single Items, Combinatorial Auctions, Auctions in Practice.

08 Hrs.

UNIT V

Bargaining: Negotiation Parameters. Bargaining for Resource Division. Bargaining for Task Allocation. Bargaining for Resource Allocation.

Arguing: Types of Argument. Abstract Argumentation. Deductive Argumentation Systems. Dialogue Systems. Implemented Argumentation Systems.

Logical Foundations: Logics for Knowledge and Belief. Logics for Mental States. Logics for Cooperation. Putting Logic to Work.

07 Hrs.

TEXT BOOK

1	Michael Wooldridge	An Introduction to Multi-Agent Systems, 2nd Edition, Wiley Publication, 2009, ISBN 978-0-470-51946-2.

REFERENCE BOOKS

1	Stuart Russell and Peter Norvig	Artificial Intelligence: A Modern Approach, 3rd Edition, Prentice Hall, 2002, ISBN 978-0136042597.
2	Lin Padgham and Michael Winikoff	Developing Intelligent Agent Systems: A Practical Guide, 2nd Edition, John Wiley & Sons Ltd, 2004, ISBN 0-470-86120-7 (HB).

Course Outcomes:

Upon completion of this course the student will be able to:

CO1: **Discuss** the notion of an agent, how agents are distinct from other software paradigms and characteristics of applications.

CO2: **Identify** key issues in development of autonomous agents.

CO3: **Illustrate** the key issues and approaches to high-level communication in multi-agent systems and identify the main application areas of intelligent agents.

CO4: **Describe** the main techniques for automated decision making in multiagent environment.

CO5: **Exemplify** bargain for resource allocation, develop dialogue systems and argumentation systems.

HUMAN COMPUTER INTERACTION

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE26	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Describe the process of human computer interaction through graphical computer interfaces
2. Explain and apply core theories and models from the field of HCI
3. Design and implement useful, usable, and engaging graphical computer interfaces
4. Explain standards, guidelines, and golden rules followed in human computer interaction
5. Analyze the goals of evaluation and evaluation through user participation

UNIT I

Foundations: The Human, Introduction, Input–output channels, Human memory, Thinking: reasoning and problem solving, Emotion, Individual differences, Psychology and the design of interactive systems.

7 Hrs.

UNIT II

The Computer: Positioning, Pointing and drawing, Display Devices, Devices for virtual reality, Physical controls, sensors and special devices, Memory, Processing and networks.

4 Hrs.

The Interaction: Introduction, Models of Interaction, Frameworks and HCI, Ergonomics, Interactive style, Elements of the WIMP interface, Interactivity, The context of the Interaction.

4 Hrs.

UNIT III

Design Process: Interactive design basics, What is design? The process of Design, Scenarios, Navigation design**.**

2 Hrs.

HCI in the Software process: The software life cycle usability engineering, Interactive design and prototyping, Design rationale.

7 Hrs.

UNIT IV

Design rules: Principles to support usability. Standards, Guidelines, Golden Rules and Heuristics, HCI patterns. **5 Hrs.**

Implementation support: Elements of windowing systems, Programming the application Using toolkits, User interface management systems.

3 Hrs.

UNIT V

Evaluation Techniques: What is evaluation? Goals of evaluation, evaluation through expert analysis, evaluation through user

participation, Choosing an evaluation method.

7 Hrs.

TEXT BOOKS

1	Alan Dix, Janet Finaly, Gregory D. Abowd, Russel Beale,	Human Computer Interaction, 3rd Edition Pearson Education 2004

REFERENCE BOOKS

1	B. Shneiderman,	Designing the User Interface, Addison Wesley 2000(Indian Reprint)

Course Outcomes:

Upon completion of this course the student will be able to:

1. **Illustrate** the Computer components' functionalities and its interaction with human
2. **Investigate** to understand human needs in particular contexts and identify effective style, Models of Interaction and Frameworks.
3. **Identify** the information sources available and explain the methodologies and technologies supporting HCI.
4. **Construct** design sketches and prototypes to manifest design ideas for a specific application.
5. **Evaluate** user interfaces by choosing appropriate evaluation method.

NATURAL LANGUAGE PROCESSING WITH PYTHON

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE27	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Understand the trends and systems in natural language processing.
2. Understand the concepts of morphology, syntax, semantics and pragmatics of the language.
3. Recognize the significance of pragmatics for natural language understanding
4. Classify and extracting the meaning of the text.

UNIT I

Language Processing and Python

Computing with Language: Texts and Words, A Closer Look at Python: Texts as Lists of Words, Computing with Language: Simple Statistics, Back to Python: Making Decisions and Taking Control, Automatic Natural Language Understanding

Accessing Text Corpora and Lexical Resources

Accessing Text Corpora, Conditional Frequency Distributions, More Python: Reusing Code, Lexical Resources, WordNet **8 Hrs.**

UNIT II

Processing Raw Text

Accessing Text from the Web and from Disk, Strings: Text Processing at the Lowest Level, Text Processing with Unicode, Regular Expressions for Detecting Word Patterns, Useful Applications of Regular Expressions, Normalizing Text, Regular Expressions for Tokenizing Text, Segmentation, Formatting: From Lists to Strings

Writing Structured Programs

Back to the Basics, Sequences, Questions of Style, Functions: The Foundation of Structured Programming, Doing More with Functions, Program Development, Algorithm Design, A Sample of Python Libraries. **8 Hrs.**

UNIT III

Categorizing and Tagging Words

Using a Tagger, Tagged Corpora, Mapping Words to Properties Using Python Dictionaries, Automatic Tagging, N-Gram Tagging, Transformation-Based Tagging, How to Determine the Category of a Word

Learning to Classify Text

Supervised Classification, Further Examples of Supervised Classification Evaluation, Decision Trees, Naive Bayes Classifiers, Maximum Entropy Classifiers, Modeling Linguistic Patterns.

Extracting Information from Text

Information Extraction, Chunking, Developing and Evaluating Chunkers, Recursion in Linguistic Structure, Named Entity Recognition, Relation Extraction

9 Hrs.

UNIT IV

Analyzing Sentence Structure

Some Grammatical Dilemmas, What's the Use of Syntax?, Context-Free Grammar, Parsing with Context-Free Grammar, Dependencies and Dependency Grammar, Grammar Development

Building Feature-Based Grammars

Grammatical Features, Processing Feature Structures, Extending a Feature-Based Grammar. **7 Hrs.**

UNIT V

Analyzing the Meaning of Sentences

Natural Language Understanding, Propositional Logic, First-Order Logic, The Semantics of English Sentences, Discourse Semantics

Managing Linguistic Data

Corpus Structure: A Case Study, The Life Cycle of a Corpus, Acquiring Data, Working with XML, Working with Toolbox Data, Describing Language Resources using OLAC Metadata.

7 Hrs.

TEXT BOOKS

1	Steven Bird, Ewan Klein, and Edward Loper	Natural Language Processing with Python, 1st Edition, O'Reilly Media, 2009

REFERENCE BOOKS

1	Hardeniya, Nitin	Natural Language Processing: Python and NLTK, Packt, 2016

Course Outcomes:

Upon completion of this course the student will be able to:

CO1: **Comprehend** the basic concepts of language processing and tool kitt.

CO2: **Apply** corpora and lexical resources to access the text.

CO3: **Determine** the category of a word using tagging and classification.

CO4: **Analyze** the meaning of the sentences using different logic.

CO5: **Identify** the information from the given text.

SENSORS AND INTERNET OF THINGS

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE28	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Understand concepts and principles of different sensors.
2. Discuss the fundamental concepts of IoT
3. Familiarize with the design methodology and research directions.
4. Use Python to IoT domain.
5. Discuss different IoT Physical Devices and End points.

UNIT I

Introduction: Definition of a transducer, Block Diagram, Active and Passive Transducers, Advantages of Electrical transducers. Resistive Transducers: Potentiometers: Characteristics, Loading effect, and problems. Strain gauge: Theory, Types, applications and problems. Thermistor, RTD: Theory, Applications and Problems. **7 Hrs.**

UNIT II

Fundamentals Of IOT: Introduction, Physical design of IoT, Logical design of IoT, IoT Enabling technologies, IoT Levels and Deployment Templates, IoTvs M2M.

8 Hrs.

UNIT III

IOT Design Methodology: Need for IoT systems management, IoT Design Methodology Internet of Things Strategic Research and Innovation Agenda: Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Smart-X Applications, Internet of Things and Related Future Internet Technologies.

8 Hrs.

UNIT IV

IOT Systems: Logical Design using Python: Provides an introduction to Python, installing Python, Python data types & data structures, control flow, functions, modules, packages, file input/output, data/time operations and classes **8 Hrs.**

UNIT V

IOT Physical Devices & Endpoints: What is an IoT device, Raspberry Pi device, About the board, Linux on Raspberry Pi, Raspberry Pi interfaces, Programming Raspberry Pi with Python

8 Hrs.

TEXT BOOKS

1	Vijay Madisetti & Arshdeep Bahga	Internet of Things (A Hands-on-Approach), 1st Edition, VPT, 2014, ISBN-13: 978-0996025515.
2	A.K. Sawhney	Electrical and Electronic Measurements and Instrumentation, 18th Edition, 2008, Dhanpat Rai and Sons, ISBN: 81-7700-016-0.

REFERENCE BOOKS

1	Ovidiu Vermesan, Peter Friess,	Internet of Things – From Research and Innovation to Market Deployment, River Publishers Series in Communication, River Publishers, 2014, ISBN: 978-87-93102-94-1 (Hard copy), 978-87-93102-95-8 (Ebook) (UnitsII 2nd part).
2	Clarence W.de Silva	Sensor systems: Fundamentals and applications, 2016 Edition, CRC Press, ISBN: 9781498716246.

Course Outcomes:

Upon completion of this course the student will be able to:

CO1: **Comprehend** concepts, principles and applications of different sensors

CO2: **Apply** the fundamental concepts of IoT.

CO3: **Discuss** the design methodology and research directions.

CO4: **Apply** Python to IoT domain.

CO5: **Discuss** different IoT Physical Devices and End Points.

AGILE SOFTWARE TECHNOLOGY

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE29	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Understand traditional testing activities versus agile methodologies.
2. Apply agile development practices, design achieve agility.
3. Understand roles and responsibilities of scrum master and product owner.
4. Understand testing activities within an Agile project development.

UNIT I

Introduction

What Is Agile Testing, anyway? Agile Values What Do We Mean by Agile Testing? , A Little Context for Roles and Activities on an Agile Team, How Is Agile Testing Different, Whole-Team Approach?

Ten Principles for Agile Testers

What's an Agile Tester? The Agile Testing Mind-Set x CONTENTS, Applying Agile Principles and Values, Adding value. **7 Hrs.**

UNIT II

Organizational Challenges

Cultural Challenges, Organizational Culture, Barriers to Successful Agile Adoption by Test/QA Teams, Introducing Change, Management Expectations, Change Doesn't Come Easy.

Transitioning Typical Processes

Seeking Lightweight Processes, Metrics, Defect Tracking, Test Planning, Existing Processes and Models.

8 Hrs.

UNIT III

The Agile Testing Quadrants

The Agile Testing Quadrants.

Technology-Facing Tests that Support the Team

An Agile Testing Foundation, Why Write and Execute These Tests? Where Do Technology-Facing Tests Stop? What If the Team Doesn't Do These Tests?

Business-Facing Tests that Support the Team

Driving Development with Business-Facing Tests, The Requirements Quandary, Thin Slices, Small Chunks, How Do We Know We're Done?

8Hrs.

UNIT IV

Backdrop: The Science of Scrum

Empirical Process Control , Complex Software Development , The Skeleton and Heart of Scrum , Scrum Roles , Scrum Flow , Scrum Artifacts

New Management Responsibilities
The ScrumMaster at MetaEco, The Product Owner at MegaEnergy, The Team at Service1st

8 Hrs.

UNIT V

The ScrumMaster
The Untrained ScrumMaster at Trey Research, The Untrained ScrumMaster at Litware.
The Product Owner
Customer and Team Collaboration, Getting Service1st's Management Back in Action, Fixing the Problem of XFlow at MegaFund.
Scaling Projects Using Scrum
Scaling at MegaFund, Scrum Scaling.

8 Hrs.

TEXT BOOKS		
1	Lisa Crispin, Janet Gregory	Agile Testing: Practical guide for Testers and Agile team, Copyright © 2009 Pearson Education, Inc. ISBN-13:978-0-321-53446-0)
2	Ken Schawber, Mike Beedle	Agile Software Development with Scrum. Microsoft Press Publications. @2004 ISBN-0-7356-1993-x

REFERENCE BOOKS		
1	Robert C. Martin	Agile Software Development, Principles, Patterns, and Practices, Prentice Hall; 1st edition, 2002.
2	Craig Larman	"Agile and Iterative Development A Manger's Guide", Pearson Education, First Edition, India, 2004.

Course Outcomes:
Upon completion of this course the student will be able to:
CO1: **Analyze** the various principles of agile Testers and purpose of agile testing
CO2: **Discuss** various Organizational Challenges and Agile Testing Quadrants.
CO3: **Interpret** the business values of adopting agile development.
CO4: **Apply** the role of the scrum master in handling the real time projects.
CO5: **Apply** scrum for the Scaling the Projects and planning.

WEB TECHNOLOGY

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE30	SEE Marks	:	50

Course objectives:

This course will enable students to:

1. Acquire knowledge and skills for creation of website considering both client and server-side programming.
2. Gain ability to develop responsive web applications.
3. Acquire skills to validate and handle errors using PHP.
4. Create web services using XML, JSON and PHP.
5. Acquire knowledge and skills for creation of website considering both client and server-side programming.

UNIT I

Introduction to HTML: What is HTML and Where did it come from? HTML Syntax, Semantic Markup, Structure of HTML Documents, Quick Tour of HTML Elements, HTML5 Semantic Structure Elements.

HTML Tables and Forms: Introducing Tables, Styling Tables, Introducing Forms, Form Control Elements, Table and Form Accessibility, Microformats. **8 Hrs.**

UNIT II

Introduction to CSS: What is CSS, CSS Syntax, Location of Styles, Selectors, The Cascade: How Styles Interact, The Box Model, CSS Text Styling.

Advanced CSS Layout: Normal Flow, Positioning Elements, Floating Elements, Constructing Multicolumn Layouts, Approaches to CSS Layout, Responsive Design, CSS Frameworks. **8 Hrs.**

UNIT III

JavaScript: Client-Side Scripting: What is JavaScript and What can it do? JavaScript Design Principles, where does JavaScript Go? Syntax, JavaScript Objects, The Document Object Model (DOM), JavaScript Events, Forms,

Introduction to Server-Side Development with PHP: What is Server-Side Development, A Web Server's Responsibilities, Quick Tour of PHP, Program Control, Functions **6 Hrs.**

UNIT IV

PHP Arrays and Superglobals: Arrays, $_GET and $_POST Super global Arrays, $_SERVER Array, $_Files Array, Reading/Writing Files

Error Handling and Validation: What are Errors and Exceptions? PHP Error Reporting, PHP Error and Exception Handling

INTRODUCTION TO PHP FRAMEWORKS: What is a framework? Why frameworks? When to use Frame Work? What are the factors to be considered using frameworks? Available Open Source Frame Work: CodeIgniter **8 Hrs.**

UNIT V

Advanced JavaScript and jQuery: JavaScript Pseudo-Classes, jQuery Foundations, AJAX, Asynchronous File Transmission, Animation, Backbone MVC Frameworks.

XML Processing and Web Services: XML Processing, JSON, Overview of Web Services, Creating and Consuming Web Services in PHP, Interacting Asynchronously with Web Services.

9 Hrs.

TEXT BOOKS

1	Randy Connolly, Ricardo Hoar	Fundamentals of Web Development, Pearson Education India, 2nd Edition,2018, ISBN:978-9332575271

REFERENCE BOOKS

1	Robin Nixon	Learning PHP, MySQL &JavaScript with jQuery, CSS and HTML5", 4th Edition, O'Reilly Publications, 2015. (ISBN:978-9352130153)
2	Nicholas C Zakas,	Professional JavaScript for Web Developers, 3rd Edition, Wrox/Wiley India, 2012. (ISBN:978-8126535088)

Course Outcomes:

Upon completion of this course the student will be able to:

CO1: **Apply** HTML, CSS and JavaScript to **implement** dynamic and responsive web pages.

CO2: **Integrate** client side and server-side scripting languages to develop web applications.

CO3: **Implement** validation and error handling using PHP to build efficient server-side web applications.

CO4: **Apply** and **implement** JSON and XML scripts to share information across web applications.

CO5: **Create** web services using SOAP, Rest API and develop web applications.

JAVA AND J2EE

Contact Hours/Week	:	3	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Course Code	:	RISE31	SEE Marks	:	50

Course objectives:

This course will enable students to:

1 Understand the concept of JAVA programming language to develop applications.
2 Understand the concepts networking programs using JAVA.
3 Implement the database applications using JAVA programming.
4 Implement the web applications using JSP.

UNIT I

INTRODUCTION TO JAVA: Java and Java applications; Java Development Kit (JDK); Java is interpreted, Byte Code, JVM; Object-oriented programming; Simple Java programs.

DATA TYPES, OPERATORS AND CONTROL STATEMENTS: Introduction to Data types, type casting, operators, control statements, loop statements, arrays, strings, creating and destroying objects.

CLASSES, INHERITANCE, PACKAGES AND INTERFACES: Classes: Java classes, declaring a class, super classes, constructors, creating instances of class, inner classes. Inheritance: simple, multiple, multilevel inheritance, overriding, overloading, Packages: access protection, importing packages, interfaces. **7 Hrs.**

UNIT II

EXCEPTION HANDLING: Exception handling in Java, Try and catch statements, Multiple catch statements, Throw and throws implementation, finally, inbuilt exceptions, User defined Exceptions.

MULTI THREADED PROGRAMMING: Java thread model, creating thread, thread priorities, synchronization, interthread communication, producer-consumer problems. **8 Hrs.**

UNIT III

EVENT HANDLING: Two event handling mechanisms, delegation event model, event classes, sources of events, event listener interfaces, using the delegation event model, adapter classes.

JAVA 2 ENTERPRISE EDITION OVERVIEW, DATABASE ACCESS: Overview of J2EE and J2SE, concept of JDBC, JDBC Driver types, JDBC packages, overview of JDBC process, database connection, associating the JDBC/ODBC, bridge with the database, statement objects, ResultSet, transaction processing, metadata, data types, exceptions. **8Hrs.**

UNIT IV

JAVA SERVLETS: Java servlets and CGI programming, simple Servlet, reading data from client, reading HTTP request header, sending data to a client and writing the HTTP response header, working with cookies, tracking sessions.

JAVA SERVER PAGES: JSP tags, Tomcat, requesting strings, user sessions, cookies, session objects. **8 Hrs.**

UNIT V

NETWORKING: Networking basics, network classes and interfaces, InetAddress, TCP/IP client sockets, URL, URI class, cookies, TCP/IP server socket, datagrams.

SOAP: Basics of SOAP, Java API for XML messaging, create, send, receive SOAP message, creating attachment. **8 Hrs.**

TEXT BOOKS

1	Herbert Schildt	Java the Complete Reference, 11th Edition, Tata McGraw Hill, 2018
2	Jim Keogh	J2EE the Complete Reference, Tata McGraw Hill, 2017

REFERENCE BOOKS

1	Y. Daniel Liang	Introduction to JAVA Programming, 11th Edition, Pearson Education, 2017.
2	Stephanie Bodoff et al	The J2EE Tutorial-, 2nd Edition, Pearson Education, 2004.

Course Outcomes:

Upon completion of this course the student will be able to:

CO1: **Comprehend** the basic building blocks of JAVA programming.

CO2: **Apply** event handling, exception and multithreading concept to design applications.

CO3: **Apply** the Networking concepts to establish client-server interaction.

CO4: **Apply** the JSP and Servlet concept to develop web-based applications.

CO5: **Design** and **Develop** user friendly applications using Java and database.