MCA CURRICULUM & SYLLABUS

KALASALINGAM ACADEMY OF RESEARCH AND EDUCATION

(Under Section 3 of the UGC Act 1956)

Anand Nagar, Krishnankoil-626126

Srivilliputtur(via); Virudhunagar(Dt.), Tamil Nadu, INDIA

(www.kalasalingam.ac.in)

MCA CURRICULUM

(2 Years)

2020 - 2021

(Kalasalingam Academy of Research and Education)

VISION

To be Centre of Excellence of International Repute in Education and Research.

MISSION

To produce Technically Competent Socially Committed Technocrats and Administrators through Quality Education and Research

DEPARTMENT OF COMPUTER APPLICATIONS

VISION

To be a Center of Excellence in education and research in the field of Computer Applications to produce high quality competitive software professionals for the national growth.

MISSION

To produce socially committed technocrats to meet the Industrial challenges or an administrator in the field of Information Technology with adequate technical knowledge and skills through quality education and research.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO1: The students will be successful software professionals to compete the industry needs.

PEO2: To promote students awareness on ethical and professional responsibilities and ability to relate computer applications to broader social context for the growth of nation.

PEO3: The students will utilize professional skills and new innovations in research through sustained learning.

PEO4: The students will achieve peer recognition to become an administrator in various sectors of IT Industry through analytical design and implementation skills.

PROGRAMME OUTCOMES (PO)

PO1: Ability to apply knowledge of mathematical, algorithmic and computing principles to solve real time problems

PO2: Ability to identify, formulate, analyze and interpret data by applying critical thinking to solve complex problems in relevant domain disciplines.

PO3: Ability to design and evaluate solutions for computing systems to meet the industry requirement as per needs and specification which undergoes various phases of software development.

PO4: Ability to use research based knowledge and apply research methods to investigate the complex problems to provide valid conclusion.

PO5: Ability to create, select and apply modern tools and techniques to analyze and develop a software system.

PO6: Ability to adapt professional ethics and cyber regulations in computing practices.

PO7: Ability to recognize the need of independent learning for the continual development as a computing professional in the context of technological change.

PO8: Ability to apply the computing and management principles to develop managerial skills in multi-disciplinary environments.

PO9: Ability to communicate effectively about complex computing problems to the society through reports, documentation and presentations.

PO10: Ability to apply the knowledge of computing solutions to the societal, health, safety, legal and environmental issues.

PO11: Ability to work as an individual or as a member in a diverse team in the software domain through innovative approaches.

PO12: Ability to identify and apply computing practices to succeed as an employee or an entrepreneurial pursuit.

MCA CURRICULUM & SYLLABUS

S.No	Course Category	Credits (Proposed)
I	**Programme Core**	
	a) Core Courses (Includes Theory with Practical Component) - 10	34
	b) Laboratory Courses- 9	18
	c) Project Work 1. Major Project (12 Credits) 2. Mini Project1 (4 Credits)	16
II	**Supportive Courses - 2**	8
III	**Elective Courses (Programme Specific)- 3**	9
IV	**Self Study Elective – 1**	3
V	**Summer Industrial Training Programme**	2
Total Credits		**90**

MCA CURRICULUM & SYLLABUS

FIRST YEAR

I Semester

Subject Code	Subjects	Credits	Category
MCA20R4001	Mathematical Foundations of Computer Science	4	SC
MCA20R4002	Data Structures using C++	3	CORE
MCA20R4003	Computer Organization and Architecture	3	CORE
MCA20R4004	Software Engineering [TP]	4	CORE
MCA20R4005	Relational Database Management Systems	3	CORE
MCA20R4080	Data Structures with C++ Lab	2	CL
MCA20R4081	RDBMS Laboratory	2	CL
MCA20R4082	Full Stack Development Laboratory	2	CL
Total		**23**	

II Semester

Subject Code	Subjects	Credits	Category
MCA20R4006	Operations Research	4	SC
MCA20R4007	Operating Systems [TP]	4	CORE
MCA20R4008	Advanced Java Programming	4	CORE
MCA20R4009	Mobile Computing	3	CORE
MCA20R****	Elective-I	3	PSE
MCA20R4083	Mobile Application Development Laboratory	2	CL
MCA20R4084	Advanced Java Laboratory	2	CL
MCA20R4085	Data Warehouse Laboratory	2	CL
MCA20R4097	Summer Industrial Training Program	2	
Total		**26**	

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SECOND YEAR

III Semester

Subject Code	Subjects	Credits	Category
MCA20R5001	Data Mining	3	CORE
MCA20R5002	Python Programming	3	CORE
MCA20R5003	Computer Networks and Information Security [TP]	4	CORE
MCA20R****	Elective- II	3	PSE
MCA20R****	Elective- III	3	PSE
MCA20R5080	Data Mining Laboratory	2	CL
MCA20R5081	Python Programming Laboratory	2	CL
MCA20R5082	Software Testing Laboratory	2	CL
MCA20R5097	Mini Project – I	4	PROJECT
Total		**26**	

IV Semester

Subject Code	Subjects	Credits	Category
MCA20R****	Self Study Elective	3	SE
MCA20R5098	Project Work	12	PROJECT
Total		**15**	

Consolidated Credit

Semester	Credits
I	23
II	26
III	26
IV	15
Total	**90**

LIST OF ELECTIVE SUBJECTS

Sub Code	List of Electives	Credits	Category
MCA20R4101	Computer Graphics and Multimedia	3	PSE
MCA20R4102	PHP Programming	3	PSE
MCA20R4103	Cloud Computing	3	PSE
MCA20R5101	Digital Image Processing	3	PSE
MCA20R5102	Big Data Analytics	3	PSE
MCA20R5103	Artificial Intelligence and its Applications	3	PSE
MCA20R5104	Deep Learning	3	PSE
MCA20R5105	R Programming	3	PSE
MCA20R5106	Soft Computing Techniques	3	PSE
MCA20R5107	Internet of Things	3	PSE
MCA20R5108	Cyber Forensics	3	PSE
MCA20R5109	Fog Computing	3	PSE
MCA20R5110	Research Methodology	3	PSE
MCA20R5111	Programming in MATLAB	3	PSE
List of Self Study Electives			
MCA20R5112	Organizational Behavior	3	SE
MCA20R5113	Human Resource Management	3	SE
MCA20R5114	E-Commerce	3	SE

MCA20R4001	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE	L	T	P	C
		4	1	0	4
Course Category: Supportive Course		**Course Type**: Theory			

PREREQUISITE

Mathematical Foundations of Computer Science

COURSE OBJECTIVES

1. To understand the concepts of permutations, combination Mathematical induction.
2. To familiarize the students with the concept of matrices, Eigen values and vectors.
3. To grasp the concepts in probability and statistics.

COURSE OUTCOMES

CO1: Understand the concepts of set theory, functions, permutations and combinations
CO2: Understand the basics of matrix theory.
CO3: Understand the concept of Eigen values and vectors.
CO4: Understand the concept of differential calculus
CO5: Understand the concepts of probability and statistics

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M		W				S		M
CO2		M			S	M		S			W	
CO3	S		S		M		W			M		S
CO4	S		M		S		M		W		M	S
CO5	M			S		S		M		W		W

UNIT – I: SET THEORY AND FUNCTIONS **12 HOURS**

Set theory-Introduction- Basic definitions -Operations on sets-Venn diagrams - Laws of set theory - Principle of inclusion and exclusion – Partitions - Permutation and combination – Relations - Properties of relations - Closure operations on relations - Functions - Injective, surjective and bijective functions.

UNIT – II: MATRICES **12 HOURS**

Matrix algebra-Introduction- Solving a system of linear equations (Conventional method)-Types of Matrices-matrix operations- transpose of a matrix -determinant of matrix - inverse of a matrix-Cramer's rule

UNIT – III: EIGEN VALUES AND VECTORS **12 HOURS**

Rank of a matrix - Solving system of equations – Eigen values and Eigenvectors - Cayley - Hamilton Theorem - Inverse of a matrix.

UNIT – IV: DIFFERENTIAL CALCULUS **12 HOURS**

Differential calculus - Functions and limits - Simple Differentiation of Algebraic Functions — Evaluation of First and Second Order Derivatives – Maxima and Minima.

UNIT – V: PROBABILITY AND STATISTICS **12 HOURS**

Introduction to probability concepts, Combinatorial Probability including Bayes theorem-random variables, probability distributions (continuous and discrete), Expectation, mean and variance of a distribution, joint probability distributions,

TEXT BOOKS

1. J.P. Trembley, and Manohar, R, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, New Delhi, 2007.
2. P.R.Vittal, Business Mathematics and Statistics, Margham Publications, Chennai, 2012.
3. S. C. Gupta and V K Kapoor, Fundamentals of Mathematical Statistics, 10th Edition, Sultan Chand & Sons, New Delhi, 2000.

REFERENCE BOOKS

1. B.S.Vatsa, Discrete Mathematics, 4th Edition, New Age International Limited Publishers, New Delhi, 2009.
2. M.K. Venkataraman, Engineering Mathematics, 2nd Edition, Volume-II, National Publishing Company, 1989.

MCA20R4002	DATA STRUCTURES USING C++	L	T	P	C
		3	1	0	3

PREREQUISITE

C Programming

COURSE OBJECTIVES

Apply advanced data structure strategies for exploring complex data structures. Compare and contrast various data structures and design techniques in the area of Performance. Implement data structure algorithms through C++. Incorporate data structures into the applications such as binary search trees, AVL and B Trees. Implement all data structures like stacks, queues, trees, lists and graphs and compare their Performance and trade offs

COURSE OUTCOMES

CO1: Able to create array data structure and its applications.
CO2: Able to use stack data structure.
CO3: Able to demonstrate the use of Linked lists.
CO4: Understand and implement the features of tree data structures.
CO5: Able to understand graphs and its applications.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	S	M		**S**		W		S	S	M
CO2		S					S				M	
CO3	S		M					M		W	W	
CO4	M				S	S			S			S
CO5		S		M			M			M		M

UNIT– I: **ARRAYS**

Abstract Data Types and the C++ Class, An Introduction to C++ Class- Data Abstraction and Encapsulation in C++- Declaring Class Objects and Invoking Member Functions- Special Class Operations- Miscellaneous Topics- ADTs and C++Classes, The Array as an Abstract Data Type, The Polynomial Abstract Data type- Polynomial Representation- Polynomial Addition. Spares Matrices.

UNIT –II: STACKS AND QUEUES

Templates in C++, Template Functions- Using Templates to Represent Container Classes, The Stack Abstract Data Type, The Queue Abstract Data Type, Sub typing and Inheritance in C++, Evaluation of Expressions, Expression- Postfix Notation- Infix to Postfix.

UNIT –III: LINKED LISTS

Single Linked List and Chains, Representing Chains in C++, Defining a Node in C++- Designing a Chain Class in C++- Pointer manipulation in C++- Chain Manipulation Operations, The Template Class Chain, Implementing Chains with Templates- Chain Iterators- Chain Operations- Reusing a Class, Circular Lists, Available Space Lists, Linked Stacks and Queues, Polynomials, Polynomial Representation- Adding Polynomials- Circular List Representation of Polynomials, Equivalence Classes, Sparse Matrices, Sparse Matrix Representation- Sparse Matrix Input Deleting a Sparse Matrix, Doubly Linked Lists, Generalized Lists, Representation of Generalized Lists- Recursive Algorithms for Lists- Reference Counts, Shared and Recursive Lists

UNIT –IV: TREES

Introduction, Terminology, Representation of Trees, Binary Trees, The Abstract Data Type, Properties of Binary Tress, Binary Tree Representations, Binary Tree Traversal and Tree Iterators, Introduction, Inorder Traversal Preorder Traversal, Post order Traversal, Thread Binary Trees, Threads, Inorder Traversal of a Threaded Binary Tree, Inserting a Node into a Threaded Binary Tree, Heaps, Priority Queues, Definition of a Max Heap, Insertion into a Max Heap, Deletion from a Max Heap, Binary Search Trees, Definition, Searching a Binary Search Tree, Insertion into a Binary Search Tree, Deletion from a Binary Search Tree, Height of Binary Search Tree.

UNIT –V: GRAPHS

The Graph Abstract Data Type, Introduction, Definition, Graph Representation, Elementary Graph Operation, Depth First Search, Breadth First Search, Connected Components, Spanning Trees, Biconnected Components, Minimum Cost Spanning Trees, Kruskal S Algorithm, Prim s Algorithm Sollin' s Algorithm, Shortest Paths and Transitive Closure, Single Source/All Destination: Nonnegative Edge Cost, Single Source/All Destination: General Weights, All-Pairs Shortest Path, Transitive Closure. Sorting.

TEXT BOOK

1. Data structures, Algorithms and Applications in C++, S.Sahni, University Press (India) Pvt.Ltd, 2nd edition, Universities Press, Pvt. Ltd.
2. Data structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.

REFERENCES BOOKS

1. Data structures and Algorithms in C++, Michael T.Goodrich, R.Tamassia and .Mount, Wiley student edition, John Wiley and Sons.
2. Problem-solving with C++, The OOP, Fourth edition, W.Savitch, Pearson education.
3. Data structures and algorithms in C++, 3rd Edition, Adam Drozdek, Thomson
4. A Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.

MCA20R4003	COMPUTER ORGANIZATION AND ARCHITECTURE	L	T	P	C
		4	0	0	3
Course Category: Core Course		**Course Type** : Theory			

PREREQUISITE

Basic Computer Knowledge

COURSE OBJECTIVES

This course aims to make the students to understand the data representation in a digital computer and explain how operations are performed by computer circuits, analyze the internal components of a computer and evaluate the performance of CPU, memory and I/O operations

COURSE OUTCOMES

CO1: Understand the functional units of a computer and bus structures**.**
CO2: Understand the machine instructions and addressing modes.
CO3: Analyze the design of adder and subtractor.
CO4: Understand the concept of Memory Management.
CO5: Analyze the design of standard I/O interfaces and understand the concept of pipelining.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	S	M		**S**		W		S	S	M
CO2		S					S				M	
CO3	S		M					M		W	W	
CO4	M				S	S			S			S
CO5		S		M			M			M		M

UNIT – I: BASIC COMPUTER SYSTEM **12 Hours**

Computer Types - Functional Units-I/O, Memory, Control, Arithmetic and Logic unit - Basic Operational Concepts - Bus Structures – Performance.

UNIT – II: MACHINE INSTRUCTIONS **12 Hours**

Number representation – Memory locations and Addresses – Instructions and Instruction Sequencing - Addressing modes - Basic Input/output Operations - Stacks and Queues –Subroutines - Additional instructions.

UNIT – III: CENTRAL PROCESSING UNIT **12 Hours**

Arithmetic – Addition and subtraction of signed numbers - Design of Fast Adders – Multiplication of positive numbers – Booth algorithm - Fast Multiplication - Floating point numbers - Execution of a complete Instruction – Micro-programmed Control.

UNIT – IV: MEMORY MANAGEMENT **12 Hours**

Basic concepts - Semiconductor RAM memories-Internal organization of Memory Chips – static memories – DRAMS – ROM - Cache Memories – Mapping functions, Replacement algorithms - Virtual Memories -Secondary Storage.

UNIT – V: I/O ORGANIZATION **12 Hours**

DMA – Bus arbitration – Buses - Interface Circuits – Serial and Parallel port - Standard I/O Interfaces – PCI bus, SCSI bus, USB – Interrupts **–** Pipelining – Basic concepts, Data and Instruction hazards**.**

TEXT BOOK

1. C. Hamacher, Z. Vranesic, and S.Zaky, Computer Organization, 5th edition, Mcgraw Hill, 2017.

REFERENCE BOOKS

1. William Stallings, Computer Organization and Architecture, 10th edition, PHI, 2016.
2. M. Moris Mano, Computer System Architecture, 3rd edition, PHI, 2017.

MCA20R4004	SOFTWARE ENGINEERING	L	T	P	C
		4	0	2	4
Course Category: Core Course		**Course Type** : Theory with Practical			

PREREQUISITE

Basic knowledge in software development process

COURSE OBJECTIVES

This course helps to understand theories, methods, and technologies applied for professional software development and explain its importance to discuss the concepts of software products and software processes.

COURSE OUTCOMES

CO1: Understand the process to be followed in the software development life cycle
CO2: Determine the steps to define, formulate and analyze a problem
CO3: Ability to solve specific problems and manage a project
CO4: Analyze, design, verify, validate, implement, apply, and maintain software systems and to manage the development of software systems
CO5: Analyze various risk and quality factors in software management

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M		**S**		S	S	M	S	S	S	M
CO2		M			S		M				M	
CO3	M		S			M	M		W	W	W	
CO4			S	S				S				S
CO5		M			M	M		M	M	M		M

UNIT – I: SOFTWARE AND SOFTWARE ENGINEERING **12 Hours**

Introductory concepts – The evolving role of software – Its characteristics, components and applications- A layered technology – the software process – Software process models – Software development Life cycle- Software process and project metrics – Measures, Metrics and Indicators Ethics for software engineers.

UNIT – II: SOFTWAREMODELING AND DESIGN **12 Hours**

Software Project Planning – Project planning objectives – Project estimation – Decomposition techniques – Empirical estimation models - System Engineering- Risk management- Software contract management – Procurement Management. Analysis and Design – Design concept and Principles, Methods for traditional, Real time of object oriented systems – Comparisons – Metrics- Quality assurance.

UNIT – III: QUALITY MANAGEMENT **12 Hours**

Testing fundamentals – Test case design – White box testing – Basis path testing – Control structure testing – Black box testing – Strategies: Unit testing integration testing – Validation Testing – System testing – Art of debugging – Metrics, Testing tools.

UNIT IV: **Agile Project Management**

Basics and Fundamentals of Agile Process Methods, Values of Agile, Principles of Agile. Communication, Planning, Estimation Managing the Agile approach Monitoring progress, Targeting and motivating the team, Managing business involvement, Escalating issue. Quality, Risk, Metrics and Measurements, Managing the Agile approach Monitoring progress, Targeting and motivating the team, Managing business involvement and Escalating issue

UNIT – V: ADVANCED SOFTWARE IMPROVEMENT **12 Hours**

Formal Methods Clean-room Software Engineering – Software reuse – Reengineering – Reverse Engineering – standards for industry.

TEXT BOOK

1. Roger Pressman, Software Engineering - A Practitioner's Approach, 7th Edition, Tata McGraw Hill, 2017.
2. Robert C. Martin ,Agile Software Development, Principles, Patterns, and Practices Alan Apt Series (2011)

REFERENCES BOOKS

1. Richard Fairley, Software Engineering Concepts, Tata McGraw Hill, New India Edition, 2017.
2. Wendy Boggs and Michael Boggs, Mastering UML with Rational Rose, Wiley, 2009.

PRACTICAL COMPONENTS (RATIONAL ROSE)

1. Develop Use Case diagrams for ATM.

2. Draw DFD for railway reservation system.
3. Generate test case for banking process.
4. Develop Software Requirement Specification for LMS.
5. Generate report for ISO auditing process.

MCA20R4005	RELATIONAL DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		4	0	0	3

PREREQUISITE

Knowledge about Data Base Management System.

COURSE OBJECTIVES

This course is intended to provide with an understanding of the current theory and practice of database management systems. This course provides a technical overview of database management systems. In addition to technical concerns, more general issues are emphasized which include data independence, integrity, security, recovery, performance, database design principles, and database administration.

COURSE OUTCOMES

CO1: Understand the basic concepts and terms related to database design and management.
CO2: Able to create SQL queries based on demand.
CO3: Understand the objectives of relational data model.
CO4: Able to understand the storage management.
CO5: Understand the concept of Lock based protocols, Timestamp based protocols, and Validation based Protocols.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S		S	M				W				M
CO2		S		M			S				M	
CO3	S				S			M		W		
CO4					S	S			S			
CO5		S								M		M

UNIT -1: INTRODUCTION

Database-System Applications - Purpose of Database Systems - View of Data - Database Languages - Database Design - Database Engine - Database and Application Architecture - Database Users and Administrators.

UNIT -2: RELATIONAL LANGUAGES

Structure of Relational Databases - Database Schema – Keys - Schema Diagrams - Relational Query Languages - The Relational Algebra – Introduction to SQL: SQL Data Definition - Basic Structure of SQL Queries - Additional Basic Operations - Set Operations - Null Values - Aggregate Functions - Nested Sub queries, Triggers.

UNIT -3: SQL AND DATABASE DESIGN

Intermediate SQL: Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schemas. Database Design Using the E-R Model: Overview of the Design Process, The Entity-Relationship Model, and Complex Attributes, Mapping Cardinalities, Extended E-R Features.

UNIT-4: STORAGE MANAGEMENT AND INDEXING

Physical Storage Systems: Storage Interfaces, Magnetic Disks, Flash Memory, RAID - Data Storage Structures: Database Storage Architecture, File Organization, Organization of Records in Files, Data-Dictionary Storage, Database Buffer – Indexing: Ordered Indices, B+-Tree, Hash, Multiple-Key Access, Creation of Indices.

UNIT -5: TRANSACTION MANAGEMENT

A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity - Concurrency Control: Lock-Based Protocols, Deadlock Handling, Multiple Granularity - Recovery System: Failure Classification, Storage, Recovery Algorithm, Buffer Management - Parallel And Distributed Databases: Centralized Database Systems, Server System Architectures, Parallel Systems, Distributed Systems, Data Partitioning, Replication, Distributed File Systems, Parallel Key-Value Stores.

TEXT BOOKS

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts, 7th Edition, McGraw-Hill Education, 2019.
2. Silberschatz, Korth, and Sudarshan, Database System Concepts, 6th Edition, McGraw Hill International Edition, 2010.

REFERENCES BOOKS

1. Bipin Desai, An introduction to Database System, Galgotia Publications, 2012.
2. C. J. Date, An introduction to database systems, 8th Edition, Pearson Education, 2010.

MCA18R4080	DATA STRUCTURES WITH C++ LAB	L	T	P	C
		0	0	3	2

PREREQUISITE

Programming in C

COURSE OBJECTIVES

The objective is to make the students learn clearly the problem solving with object oriented approach, understand the usage of class data structures, implement the concepts of various data structures and its applications using C++.

COURSE OUTCOMES

CO1: Design of applications using Stack, array structures.
CO2: Demonstrate the use of tree traversals.
CO3: Develop programs to demonstrate the use graphs.
CO4: Demonstrate the implementation of sorting techniques
CO5: Develop programs using linked list.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	S	M		**S**		W		S	S	M
CO2		S					S				M	
CO3	S		M					M		W	W	
CO4	M				S	S			S			S
CO5		S		M			M			M		M

LIST OF EXPERIMENTS

1. 1.Write C ++ Programs to implement the following using an array. a) Stack ADT b) Queue ADT

2. Write C ++ programs to implement the following using a singly linked list. a) Stack ADT b) Queue ADT 3. Write C ++ program to implement the deque (double ended queue) ADT using a doubly linked list

3. Write a C ++ Program to perform the following operations. a) Insert an element into a binary search tree. b) Delete an element from a binary search tree. c) Search for a key element in a binary search tree.

4. Write a C ++ program to implement circular queue ADT using an array.
5. Write C ++ programs that traverse the given binary tree in. a) Preorder b) Inorder and c) Postorder.
6. Write a C ++ programs for the implementation of bfs and dfs for a given graph.
7. Write C ++ programs for implementing the following sorting methods. a) Quick sort b) Merge sort c) Heap sort d) Selection sort e) Exchange sort f) Insertion sort.
8. Write a C ++ program to perform the following operations. a) Insertion into a 2-3 tree b) Deletion from a 2-3 tree
9. Write C ++ programs to implement a) Sequential b) Binary search
10. Implement converts of infix expressions to post fix notation simple expression evaluator that can handle +, -, /, *.
11. String Operations using Linked lists.

MCA18R4081	RDBMS LABORATORY	L	T	P	C
		0	0	3	2

PREREQUISITE

Basic understanding about computer, linear algebra and mathematical concepts.

COURSE OBJECTIVES

Upon successful completion of this Lab the student will be able to Create database objects, modifying database objects, Manipulate the data, retrieve the data from the database server, perform database operations in a procedural manner using pl/sql, perform database operations (create, update, modify, retrieve, etc.,) using front-end tools like D2K, design and develop applications like library, academic system, etc.

COURSE OUTCOMES

CO1: Populate and query a database using SQL DML/DDL commands.
CO2: To understand the procedures and functions.
CO3: Create ER model and embedded SQL.
CO4: Programming PL/SQL including stored procedures, stored functions, cursors, packages.
CO5: Create applications for information systems.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	S	M		**S**		W		S	S	M
CO2		S					S				M	
CO3	S		M					M		W	W	
CO4	M				S	S			S			S
CO5		S		M			M			M		M

LIST OF EXPERIMENTS

1. Data Definition Language (DDL) commands in RDBMS
2. Data Manipulation Language (DML) and Data Control Language (DCL)
3. Procedures and Functions
4. Embedded SQL
5. Database design using E-R model and Normalization
6. High level language extensions with cursors

7. High level language extension with Triggers
8. Design and implementation of payroll processing system
9. Design and implementation of Library Information System
10. Automatic Backup of Files and Recovery of Files

MCA20R4082	FULL STACK DEVELOPMENT LABORATORY	L	T	P	C
		0	0	3	2
Course Category: Core Course		**Course Type** : Laboratory			

PREREQUISITE

Basic knowledge in computer networking and internet concepts.

COURSE OBJECTIVES

To design applications using J2EE, Struts.To develop a web application with n-tier architecture.To develop a simple application using Spring MVC.To develop a web service using JSON.

COURSE OUTCOMES

CO1: Be familiar with Strut.
CO2: Be exposed to create web applications using n-tier architecture.
CO3: Learn to create applications using database.
CO4: Learn to write PHP database functions.
CO5: Learn .Net framework and RMI

MAPPING OF COURSE OUTCOMES

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	M	S			W				M
CO2	S	M				W			S		M	
CO3		M			S					W		
CO4	M		S			M		W				
CO5			S	S	W		S			M		M

LIST OF EXPERIMENTS **36 Hours**

1. Develop a car showroom inventory web application with 2-tier architecture. Use JSP and JDBC.

2. Develop a real estate web application with n-tier architecture. Use JSP, Servlets and JDBC. The application should be able to add and search all properties such as rental/own, individual/ apartment and duplex/semi-duplex.
3. Develop a standalone java application or a web application to manage books in an online library, support CURD operations.
4. Develop a simple Spring MVC application that take user input and checks the input using standard validation annotations.
5. Develop a simple database application using Spring JDBC/Struts with CURD functionality.
6. Develop any web application which authenticates Spring LDAP.
7. Design a student identity management web application using struts framework. The application should be able to provide an identity such as student id, access to department assets with department id, access to lab assets with lab id.
8. Create an simple online bookstore using Spring MVC
9. Build an application that uses Spring's RestTemplate to retrieve a random Spring Boot quotation at http://gturnquist-quoters.cfapps.io/api/random
10. Create weather service using spring/struts which will return the temp in JSON format and XML format.

MCA20R4006	OPERATIONS RESEARCH	L	T	P	C
		4	1	0	4
Course Category: Supportive Course				**Course Type**: Theory	

PREREQUISITE

Basic understanding about operations research

COURSE OBJECTIVES

This course aims to introduce students to use quantitative methods and techniques for effective decisions–making, model formulation, applications that are used in solving business decision problems and apply operations research to solve linear programming problem, transportation problems, assignment problems, project scheduling, game theory & queuing theory.

COURSE OUTCOMES

CO1: Able to solve linear programming problems using graphical method and simplex method
CO2: Able to build and solve Transportation Models and Assignment Models.
CO3: Able to solve problems in project scheduling
CO4: Able to solve game theory related problems.
CO5: Able to solve problems using queuing models

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M		W				S		M
CO2		M			S	M		S			W	
CO3	S		S		M		W			M		S
CO4	S		M		S		M		W		M	S
CO5	M			S		S		M		W		W

UNIT – I: LINEAR PROGRAMMING PROBLEMS **12 HOURS**

Introduction-Formulation of linear programming problem (LPP), Examples, Graphical solution, Standard Form of LPP, Solution of LPP – Simplex Method, The Simplex Algorithm, Penalty Cost Method or Big M-method, Two Phase Method, Solved Problems on Minimization.

UNIT – II: TRANSPORTAION AND ASSIGNMENT PROBLEMS **12 HOURS**

Transportation Problem: Introduction, Formulation of Transportation Problem, Transportation Algorithm, the Initial Basic Feasible Solution, Moving Towards Optimality.

Assignment Problem: Introduction, Mathematical Formulation of the Problem, Hungarian Method Algorithm, Travelling Salesman Problem.

UNIT – III: PROJECT SCHEDULING **12 HOURS**

PERT-CPM: Introduction, Basic Difference between PERT and CPM, PERT/CPM Network Components and Precedence Relationship, Project Management – PERT.

UNIT – IV: GAME THEORY **12 HOURS**

Introduction, two-person zero-sum games, some basic terms, the maximin, minimax principle, games without saddle points-Mixed Strategies, graphic solution of 2 * n and m*2 games, dominance property.

UNIT – V: QUEUING THEORY **12 HOURS**

Introduction to Queueing theory -basic structure of queuing systems, roles of the Poisson and exponential distributions, classification of queues basic results of M/M/1: FIFO systems, extension to multi-server queues.

TEXT BOOK

1. H.A. Taha, Operations Research: An Introduction, 8th Edition, Pearson Education, 2011.

REFERENCE BOOKS

1. A.M. Natarajan, P. Balasubramani, and A. Tamilarasi, Operations Research, Pearson Education, Asia, 4th Edition, 2009.
2. Prem Kumar Gupta, and D. S. Hira, Operations Research, 3rd Edition, Sultan Chand and Company Ltd, New Delhi, 11th Edition, 2007.
3. KantiSwaroop, P. K. Gupta, and Man Mohan, “Operations Research”, Sultan Chand and Sons, 2010.

MCA20R4007	OPERATING SYSTEMS	L	T	P	C
		4	0	2	4

Course Category: Core Course **Course Type** : Theory with Practical

PREREQUISITE

Basic knowledge in Computer Science and Hardware.

COURSE OBJECTIVE

This course focuses on understanding the elements of operating system, synchronization, deadlocks and storage management.

COURSE OUTCOMES

CO1: Understand Operating System Structure, Operations and Services
CO2: Understand the Process Concept, Multithreaded Programming, Process Scheduling and Synchronization.
CO3: Apply the Concepts of Virtual Memory Management, Secondary Storage, I/O Systems and File Systems.
CO4: Evaluate the different Protection and Security Mechanisms for Operating System
CO5: Design and implement CPU Scheduling algorithms, Page Replacement Algorithms, Memory Allocation Algorithms, Disk Scheduling Algorithms.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M		W				S		M
CO2		M			S	M		S			W	
CO3	S		S		M		W			M		S
CO4	S		M		S		M		W		M	S
CO5	M			S		S		M		W		W

UNIT – I: AN OVERVIEW OF OPERATING SYSTEM AND ITS STRUCTURES 12 HOURS

Introduction - Definition of OS, Mainframe system, Desktop systems, Multi processor system, Distributed, Clustered, Real time systems, Handheld systems, Operating system Structure, System components, Services, System calls, System programs, System design and implementation.

UNIT – II: PROCESS MANAGEMENT 12 HOURS

Processes – Concepts, Process scheduling, Operations on processes, Cooperating processes, Inter process communication - CPU scheduling - Scheduling concepts, Criteria, Scheduling algorithms, Multiprocessor scheduling, Real time scheduling, Algorithm evaluation - Threads – Overview, Multithreading models, Threading issues.

UNIT – III: SYNCHRONIZATION AND DEADLOCKS **12 HOURS**

Process synchronization – Background, Critical section problem, Synchronization hardware, Semaphores, Classic problems of synchronization, Critical regions, Monitors – Deadlocks - System model, Characterization, Methods of handling deadlocks, Deadlock prevention, avoidance, Detection and recovery from deadlocks.

UNIT – IV: STORAGE MANAGEMENT **12 HOURS**

Memory management – Background, Swapping, Contiguous memory allocation, Paging, Segmentation, Segmentation with paging - Virtual memory – Background, Demand paging, Process creation, Page replacement, Allocation of frames, Thrashing.

UNIT – V: FILE SYSTEM INTERFACE **12 HOURS**

File system interface – File concept, Access methods, Directory structure, File sharing, Protection - File system implementation - File system structure, File system implementation, Directory implementation, Allocation methods, Free space management.

TEXT BOOK

1. Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne, Operating System Principles, 9th Edition, John Wiley and Sons (ASIA) Pvt. Ltd., 2013.

REFERENCE BOOKS

1. M. Milankovic, Operating System Concepts and Design, 2nd Edition, McGraw Hill, 2009.
2. Andrew S. Tenanbaum, Modern Operating Systems, 4th Edition, Pearson Edu, 2015.

PRACTICAL COMPONENTS (Using Linux Operating System)

1. Implementation of Process Threads.
2. Simulate the following CPU Scheduling algorithms a) Round Robin b) SJF c) FCFS d) Priority
3. Implementation of Bankers Algorithm for Dead lock avoidance.
4. Implementation of Bankers Algorithm for dead lock prevention.
5. Implementation of Producer Consumer Problem Using Semaphores.
6. Implementation of Page Replacement Algorithms.
7. Implementation of Disk Scheduling algorithms.

MCA20R4008	ADVANCED JAVA PROGRAMMING	L	T	P	C
		4	1	0	4
Course Category: Core Course				**Course Type** : Theory	

PREREQUISITE

Java Programming

COURSE OBJECTIVES

The main objectives of this course are to provide the ability to design console based, GUI based and web based applications. Students will also be able to understand integrated development environment to create, debug and run multi-tier and enterprise-level applications and also helps to gain Knowledge thorough advanced concepts like Servelet, RMI and Enterprise Java Bean (EJB) Programming.

COURSE OUTCOMES

CO1: To demonstrates the basic java swing concepts for advanced java programming
CO2: To be familiarizing with RMI and JSP
CO3: To understand Java Database connectivity.
CO4: To Understand Java Servlets.
CO5: To know about Spring.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**S**				**M**							**W**
CO2			**S**							**M**		
CO3		**W**			**W**			**S**				
CO4							**W**					
CO5	**M**			**M**								**S**

UNIT –I: INTRODUCING SWING & JAVA BEANS **12 Hours**

Exploring Swing – JLabel and ImageIcon, JTextField – The Swing Buttons – JTabbedPane - JScrollPane, JList&JcomboBox – Trees &JTables – What Is a Java Bean? – Advantages of Java Beans – Introspection, Bound and Constrained Properties – Persistence & Customizers

UNIT– III: RMI & NETWORKING **12 Hours**

Remote Method Invocation - Networking Basics – The Networking Classes and Interfaces – InetAddress – Inet4Address and Inet6Address -TCP/IP Client sockets – URL – URL Connection – HttpURLConnection – URL class- Datagrams

UNIT –IV: JDBC **12 Hours**

Presentation to JDBC CONNECTION settings – The Concept of JDBC – JDBC Driver Types – JDBC Packages – A Brief Overview of the JDBC Process – Database Connection – Associating the JDBC/ODBC Bridge with the Database – Statement Objects – Result Set.

UNIT –V: SERVLETS **12 Hours**

Background, the Life Cycle of a Servlet, Using Tomcat for servelet Development- A simple Servlet- the Servelet API- The javax.servlet Package- Reading Servlet Parameters, The javax.servlet.http Package – Handling HTTP Request and Responses – Using Cookies – Session Tracking.

UNIT V: SPRING **12 Hours**

Web Services - Consuming a RESTfull Web Service Java desktop application /JSP. Building REST Service with spring -Spring Security Architecture – Accessing relational data using JDBC with spring- Uploading Files using spring application- Validating form input - Handling form submission -Creation of Batch Service -Securing web application -Integrating Data - Accessing data with MongoDB- Creating asynchronous method-Using WebSocket to build an interactive web application.

TEXT BOOK

1. Herbert Schildt, Java 2-The complete reference, 7th Edition McGraw Hill, 2018.
2. Craig Walls, "Spring in Action, 4th Edition Kindle Edition, Manning Publication, 2015

REFERENCE BOOKS

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

MCA20R4009	MOBILE COMPUTING	L	T	P	C
		3	1	0	3
Course Category: Core Course		**Course Type** : Theory			

COURSE OBJECTIVES

To make the students aware of various mobile architectures, wireless protocols. To familiarize students with network and transport functionalities of mobile networks. To impart knowledge about Mobile Application Development Platform.

COURSE OUTCOMES

CO1: To learn the basic concepts, aware of the GSM, SMS, GPRS Architecture.

CO2: To have an exposure about wireless protocols -WLN, Bluetooth, WAP, ZigBee issues.

CO3: To Know the Network, Transport Functionalities of Mobile communication.

CO4: To impart knowledge about Mobile Application Development Platform

CO5: To impart the knowledge about basic components needed for Mobile App development

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S			M						S	
CO2							M					
CO3				M					S			
CO4						S						L
CO5	S		S							L		

UNIT I WIRELESS COMMUNICATION FUNDAMENTALS, ARCHITECTURE 12 Hours

Frequency Spectrum- Multiplexing- Spread spectrum-GSM vs CDMA - -Comparison of 2G , 3 G, 4G - GSM Architecture-Entities-Call Routing- Address and identifiers- GSM Protocol architecture-Mobility Management-Frequency Allocation- Security –GPRS Architecture (entity and Protocol).

UNIT II MOBILE WIRELESS SHORT RANGE NETWORKS 12 Hours

Introduction-WLAN Equipment-WLAN Topologies-WLAN Technologies-IEEE 802.11 Architecture-WLAN MAC-Security of WLAN, Power Management-Standards- WAP Architecture-

Bluetooth enabled Devices Network-Layers in Bluetooth Protocol-Security in Bluetooth- IrDA-ZigBee.

UNIT III MOBILE IP NETWORK LAYER, TRANSPORT LAYER 12 Hours

IP and Mobile IP Network Layer- Packet delivery and Handover Management-Location Management- Registration- Tunneling and Encapsulation-Route Optimization- Mobile Transport Layer-Conventional TCP/IP Transport Layer Protocol-Indirect, Snooping, Mobile TCP.

UNIT IV MOBILE APPLICATION DEVELOPMENT USING ANDROID 12 Hours

Mobile Applications Development - Understanding the Android Software Stack – Android Application Architecture –The Android Application Life Cycle – The Activity Life CycleCreating Android Activity -Views- Layout -Creating User Interfaces with basic views- linking activities with Intents.

UNIT V MOBILE APPLICATION DEVELOPMENT USING ANDROID 12 Hours

Services-Broadcast Receivers – Adapters – Data Storage, Retrieval and Sharing.-Location based services- Development of simple mobile applications .

TEXT BOOK

1. Asoke K Talukder, Hasan Ahmed,Roopa R Yavagal “Mobile Computing”, Tata McGraw Hill Pub, 2nd Edition Aug – 2010.
2. Barry A. Burd, Android Application Development For Dummies All in One”, Wiley, 2015.

REFERENCE BOOKS

1. Burnette,’Hello, Android: Introducing Google’s Mobile Development Platform’, third edition’ Pragmatic Programmers,2012.
2. Jochen Schillar “Mobile Communications” Pearson Education second Edition.
3. Jerome(J.F) DiMarzio “Android A programmer’s Guide” Tata McGraw-Hill 2010 Edition.
4. Maritn Sauter, ―From GSM to LTE: An Introduction to Mobile Networks and Mobile Broadband‖, John Wiley and Sons, 2011 .
5. Raj Kamal “Mobile Computing” Oxford Higher Education, Second Edition, 2012.
6. Reto Meier,Professional Android 2 Application Development, Wrox’s Programmer to Programmer series.

MCA20R4083	**MOBILE APPLICATION DEVELOPMENT LABORATORY**	**L**	**T**	**P**	**C**
		0	0	3	2

PREREQUSITE

Basic knowledge in Programming using Java

COURSE OBJECTIVES

Know the components and structure of mobile application development frameworks like Android /windows /ios. Understand how to work with various mobile application development frameworks.Learn the basic and important design concepts and issues of development of mobile applications. Understand the capabilities and limitations of mobile devices.Write applications for the platforms used, simulate them, and test them on the mobile hardware where possible.

COURSE OUTCOMES

CO1: Gain the knowledge about various types of Wireless Data Networks and Voice Networks

CO2: Understand the architectures, the challenges and the Solutions of Wireless

CO3: Communication Realize the role of Wireless Protocols in shaping the future Internet.

CO4: Able to develop simple Mobile Application Using Android

CO5: Able to develop games using Android.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S									S		
CO2			S			M						
CO3								S				
CO4		M		S								
CO5					M							S

LIST OF EXPERIMENTS **36 HOURS**

1. Develop an application that uses Layout Managers.

2. Develop an application that uses event listeners.

3. Develop an application that uses Adapters ,Toast.

4. Develop an application that makes use of database.

5. Develop an application that makes use of RSS Feed.

6. Implement an application that implements Multi threading.

7. Develop a native application that uses GPS location information.

8. Implement an application that writes data to the SD card.

9. Implement an application that creates an alert upon receiving a message.

10. Develop a game application.

MCA20R4084	ADVANCED JAVA LABORATORY	L	T	P	C
		0	0	3	2

Course Category: Core Course **Course Type**: Laboratory

PREREQUISITE

Gain the knowledge and implement the concept to solve the industrial and basic problems using Advanced Java Programming

COURSE OBJECTIVES

This course is designed to help in formulating and solving problems using Advanced Java programming. It enables to effectively choose programming concepts that efficiently solves computing problems in real-world.

COURSE OUTCOMES

CO1: Ability to develop programs using applets and Event Handling methods
CO2: To write the basic java programs swing concepts
CO3: Ability to create the programs for java servlet
CO4: Implement the programming concepts for RMI.
CO5: To be familiarizing with database connectivity.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S		S	M			W				M
CO2			S		M		S				M	
CO3	S	S						M		W		
CO4		S	S						S			
CO5		S								M		M

LIST OF EXPERIMENTS **36 HOURS**

1. Write a Program to draw a Home using Applet.
2. Write a Program to display layout and menus.
3. Write a Java swing program to implement textbox, text field, radio button and checkbox.
4. Write a Program in Java to implement Calculator using Swing technology
5. Write a program to perform database operation in jsp use appropriate user interface.
6. Write a java application to illustrate client/server communication.

7. Write a program for on RMI Application
8. Write a Java swing program for student information management, use JDBC.
9. Write servlet program for Session tracking.
10. Design a User Interface for a survey use jQuery.
11. Design User Interface with Bootstrap Grid system.

MCA20R4085	DATA WAREHOUSE LABORATORY	L	T	P	C
		0	0	3	2
Course Category: Core Course		**Course Type** : Laboratory			

PREREQUISITE

Knowledge in Data Warehouse

COURSE OBJECTIVES

This course aims to introduce advanced Data Warehouse concepts such as data mining techniques, clustering, classifications and its real time applications.

COURSE OUTCOMES

CO1: Able to gain basic knowledge about data warehouse.
CO2: Develop skills in data warehouse techniques.
CO3: Extract knowledge using data ware house techniques.
CO4: Understand the concept of multidimensional data model.
CO5: Explore recent trends in data warehouse.

LIST OF EXPERIMENTS **36 HOURS**

1. Design a data ware house for simple organization.
2. Design fact dimension table for financial data.
3. Implement OLAP operations - roll up and drill down.
4. Implement slice and dice operations.
5. Construct a multidimensional data warehouse.
6. Implement data generalization and summarization technique.
7. Implement star schema for customer table.
8. Implement snowflake schema for sales table.
9. Design a pivot table for sales data.
10. Consider a data warehouse storing data about sales, where the total items sold are stored, organized by customer order and product. Each customer order includes the name of the customer and the date of the order; each product includes a description of the product and its price.
    i. Devise the relational schema (specifying the relations, the attributes, the primary keys, and the foreign keys) of the above data warehouse using the star schema.

ii. Write a SQL query to answer the following question: ”Which customer(s) made an Order containing at least five products with different descriptions?”

iii. Write a SQL query for the following report: ”Which customer(s) made the largerst order (i.e., those that would result in the largest bill)?”

iv. Consider to add new level product categories to the product dimension. Devise the new relational star schema, and write a SQL query for the following report: “Select the total number of products sold per product category”.

MCA20R5001	DATA MINING	L	T	P	C
		4	0	0	3
Course Category: Core Course				**Course Type** : Theory	

PREREQUISITE

Knowledge in Database Management Systems

COURSE OBJECTIVES

The main objective of this course is to expose the students to some popular machine learning methods used in Industry. This course will pave foundation for introducing more modern methods being used Data Analytics industry

COURSE OUTCOMES

CO1: Understand the nature of data types and metrics
CO2: Understand the need for hierarchical clustering methods and various approaches of clustering.
CO3: Understand partitioning clustering and its applications in real life situations
CO4: Learning various types of classifiers and their application in different domains
CO5: Understand the usage of support vector machines.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S	S						M			
CO2				S				M		S	S	
CO3	S				S		M			S	S	
CO4			S			M	M			S	S	S
CO5			S									S

UNIT – I: INTRODUCTION TO DATA MINING **12 Hours**

Introduction to Data Mining – Data Types – Distance Metrics- Various approaches of data mining.

UNIT – II: HIERARCHICAL CLUSTERING **12 Hours**

Hierarchical Clustering – Agglomerative Nesting – Divisive Analysis – Single Linkage – Complete Linkage – Average Linkage- Detailed study on Wards Clustering – Dendrograms

UNIT – III: CLUSTERING **12 Hours**

Partitioning algorithms – k means clustering - implementation and issues – k medoids clustering - validity measures like entropy, purity, precision, recall, F measure and Silhouette coefficient and their interpretations.

UNIT – IV: CLASSIFICATION **12 Hours**

Introduction to classification – Applications – Neighborhood based classification- k-nn classifier - Naïve Bayesian classification - Decision trees for categorical and interval valued features

UNIT – V: SVM **12 Hours**

Support Vector Machines – need for kernels – multiclass svm – svm for classification, regression and novelty detection- tuning of parameters - Association Analysis – details of a priori algorithm – applications

TEXT BOOKS

1. Rajan Chattamvelli, Data Mining Methods, Narosha Publishers, 2016.
2. M. Kaufman, and P. J. Rousseeuw, Finding Groups in Data: An Introduction to Cluster Analysis, John Wiley and Sons, 2005.
3. P.N. Tan, M. Steinbach, and V. Kumar, Introduction to Data Mining, Pearson-Addison Wesly, 2006.

REFERENCE BOOKS

1. C.C. Agarwal, Data Mining: The Text Book, Springer, 2015.
2. M.W. Berry, Survey of Text Mining,Springer, 2004.
3. R. Duda, P. Hart, and D. Stork, Pattern Classication, John Wiley and Sons, 2001.
4. J. Han, and M. Kamber, and J. Pei, Data Mining: Concepts and Techniques, Margan Kaufmann Publishers, 2012.
5. A.K Pujari, Data Mining Techniques, Universities Pres, 2010.
6. M.J Zaki and W. Meira, Data Mining and Analysis: Fundamental Concepts and Algorithms, Cambridge University Press, 2014.

MCA20R5002	PYTHON PROGRAMMING	L	T	P	C
		4	0	0	3

Course Category: Core Course **Course Type** : Theory

COURSE OBJECTIVES

This course aims to make the students develop their applications using Python Programming.

COURSE OUTCOMES

CO1: Understand the basic features of python programming
CO2: Ability to write the python programs using control structures.
CO3: Understand the python libraries NumPy, Pandas and matplotlib.
CO4: Understand and implement the Seaborn libraries.
CO5: Ability to access the packages in python.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M		M			W			M	
CO2		S	S		S	M	M			M		
CO3	S		S	M				M				W
CO4	S	M				M		S			M	
CO5		S			M		S		M			M

UNIT – I: PYTHON BASICS **12 Hours**

Python variables, Python basic Operators. Python Data Types, Declaring and using Numeric data types: int, float etc. Python Complex data types: Using string data type and string operations, Defining list and list slicing, Use of Tuple data type.

UNIT – II: CONTROL STRUCURES **12 Hours**

Python Program Flow Control Conditional blocks: if, else and else if, Simple for loops in python, for loop using ranges, string, list and dictionaries. Use of while loops in python, Loop manipulation using pass, continue, break and else. Python Functions, Organizing python codes using functions

UNIT – III: SCIPY and Pandas **12 Hours**

SciPy Introduction **- The NumPy Library:** The NumPy Installation - Ndarray – Operators –Functions - Structured Arrays - Reading and Writing Array Data on Files. **The pandas Library:** Introduction to

pandas Data Structures - Series Dataframes Index Objects – Reindexing - Dropping - Sorting and Ranking.

UNIT – IV: MATPLOTLIB and SEABORN **12 Hours**

The matplotlib Library: Installation – Architecture & Layers - matplotlib and NumPy - Working with Multiple Figures and Axes.

Seaborn - Install – Setup-Importing libraries – Figure Aesthetic – color Palette – Histogram – Kernel Density Estimates – Distribution of observations – Statistical Estimation – Linear relationship – Facet and Pair Grids.

UNIT – V: PACKAGES **12 Hours**

Python packages: Simple programs using the built-in functions of packages matplotlib, numpy, pandas etc. GUI Programming: Tkinter introduction, Tkinter and Python Programming, Tk Widgets, Tkinter examples. Python programming with IDE.

TEXT BOOKS

1. Wesley J. Chun, Core Python Applications Programming, 3rd Edition, Pearson Education, 2016.
2. Jeeva Jose & P.SojanLal, Introduction to Computing and Problem Solving with Python, Khanna Publishers, New Delhi, 2016.
3. Fabio Nelli, Python Data Analytics: With Pandas, NumPy, and Matplotlib, 2nd Edition, Apress Publisher, 2018.
4. Alberto Boschetti, Luca Massaron, Python Data Science Essentials, 3rd Edition, Packt Publisher, September 2018.

REFERENCE BOOKS

1. A. Downey, How to think like a Computer Scientist: Learning with Python, John Wiley, 2015.
2. Mark Lutz, Learning Python, 5th Edition, Orelly Publication, 2013.
3. John Zelle, Python Programming: An Introduction to Computer Science, 2nd Edition, Course Technology Cengage Learning Publications, 2013.

MCA20R5003	COMPUTER NETWORKS AND INFORMATION SECURITY	L	T	P	C
		4	0	2	4
Course Category: Core Course		**Course Type**: Theory with Practical			

PREREQUISITE

Gain the knowledge of computer networks and information security

COURSE OBJECTIVES

This course surveys the various levels of a packet-switched computer network, using the TCP/IP protocol suite as the primary model. Other network protocol stacks (e.g., Novell) may also be considered as time permits. At the Physical and Data Link Layers, various protocols such as Ethernet and Token Ring are compared, and their implications for network topology are considered. At the Network Layer, a wide variety of routing protocols and name resolution protocols are studied. At the Transport Layer, students are introduced to the various methods for building end-to-end reliability on top of less reliable lower layers.

COURSE OUTCOMES

CO1: The importance of data communications and the Internet in supporting business communications and daily activities.

CO2: Communication works in data networks and the Internet.

CO3: Recognize the different internetworking devices and their functions.

CO4: Identify the role of protocols in networking.

CO5: Evaluate security mechanisms using rigorous approaches, including theoretical derivation, modeling, and simulations.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M		**S**		W		S	M		S	S	M
CO2	M		M	S				M			M	
CO3		S			M		W			W	W	
CO4		S	S			S			S			S
CO5	M			M			M	M		M		M

UNIT – I: NETWORK PROTOCOLS AND STANDARDS **12 Hours**

Introduction to Data Communication, Network. Protocols & standards and standards organizations- Line Configuration , Topology- Transmission Mode- Classification of Network- OSI Model - Layers of OSI Model -TCP / IP Model.

UNIT – II: INTERFACE STANDARDS **12 Hours**

Parallel and Serial Transmission - DTE/DCE/such as EIA-449, EIA-53O EIA-202 and x.21 interface - Interface standards - Modems - Guided Media -Unguided Media- Performance -Types of Error- Error Detection, Error Corrections

UNIT – III: SWITCHING AND MULTIPLEXING **12 Hours**

Multiplexing - types of Multiplexing- Multiplexing Application- Telephone Systems Project 802- Ethernet - Token Bus- Token Ring- FDD IEEE 802.6- SMDS- Circuit Switching - Packet switching- Message switching Connection oriented and connectionless services.

UNIT – IV: ROUTING **12 Hours**

Repeaters -Bridges- Routers- Gateway- Routing algorithms- Transport and Application Layers of TCP/IP- Packet Layer Protocol- ATM- ATM Technology- ATM protocol - Access to ISDN - ISDN Layers- Broadband ISDN X.25 Layers

UNIT – V: NETWORK SECURITY **12 Hours**

Network Security: Security Requirements and Attacks - Confidentiality with Symmetric Encryption - Message Authentication and Hash Functions - Public -key Encryption and Digital Signatures - Secure Socket Layer and Transport Layer Security - IPv4 and IPv6 Security.

TEXT BOOKS

1. Behrouz and Forouzan, Data Communication and Networking, TMH, 4th Edition, 2012.
2. William Stallings, Cryptography and Network Security: Principles and Practices, 3rd Edition, Pearson Education, 2006.
3. Matt Bishop ,"Computer Security art and science ", 2nd Edition, Pearson Education, 2002.

REFERENCE BOOKS

1. Larry Peterson, and S. Brule Davie, Computer Networks – A System Approach, MarGankangmann – Harcourt Asia, 2009.
2. S. Andrew Tanenbaum, Computer Networks, 4th Edition, Tata McGraw Hill, 2010.
3. Wade Trappe and Lawrence C. Washington, Introduction to Cryptography with Coding Theory, 2nd Edition, Pearson Education, 2007.
4. Jonathan Katz, and Yehuda Lindell, Introduction to Modern Cryptography, CRC Press, 2007.
5. Douglas R. Stinson,"Cryptography Theory and Practice, 3rd Edition, Chapman & Hall/CRC, 2006.

PRACTICAL COMPONENTS

1. Make a study on network devices in detail.
2. Make a study on network IP.
3. Connect computer through LAN.
4. Make a study on different types of network cable.
5. Configure a network using Distance vector routing protocol.
6. Configure a network using link state vector routing.

MCA20R5080	DATA MINING LABORATORY	L	T	P	C
		0	0	3	2
Course Category: Core Course		**Course Type** : Laboratory			

PREREQUISITE

Gain the knowledge of programming in Data Mining Applications

COURSE OBJECTIVES

This course is designed to help in formulating and solving problems using data mining tools. It enables to effectively choose programming concepts that efficiently solves computing problems in real-world.

COURSE OUTCOMES

CO1: Ability to use data mining tool for solving problems.
CO2: Develop the programs for handling classification algorithms.
CO3: Ability to create the programs for clustering algorithms.
CO4: Implement the programming concepts for data mining applications.
CO5:.Ability to create programs using prediction.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S		S	M				W				M
CO2		S		M			S				M	
CO3	S				S			M		W		
CO4					S	S			S			
CO5		S								M		M

LIST OF EXPERIMENTS: **36 HOURS**

1. Learning the usage of *knn* function in R.

   Use the below data as training data set and perform knn classification for the following data set assuming the k value as 6 in the following manners.

   (a) Using the default calls
   (b) Classification should be done only when we have a minimum of 4 votes.
   (c) Probabilities used for classification should be printed
   (d) Must make use of all neighbors with smallest six distances for classification

r	gravity	Ph	osmo	cond	urea	calc
0	1.008	5.87	241	5.1	159	0.83
0	1.02	5.44	781	29	349	3.04
1	1.025	7.9	721	23.6	301	9.04
1	1.026	5.16	822	26	301	14.34
0	1.019	5.98	579	15.5	297	3.93
0	1.023	5.68	749	29	239	1.52
1	1.027	5.4	840	24.5	395	7.64
1	1.019	5.47	760	33.8	199	0.81
0	1.01	6.61	225	9.8	72	0.17
0	1.008	6.4	341	14.6	125	1.02
1	1.02	5.66	702	23.6	330	3.98
0	1.007	6.63	253	8.4	133	1.05
1	1.011	5.51	408	12.6	224	2.15
1	1.021	5.53	775	31.2	302	6.19
0	1.007	5.35	283	9.9	147	1.47

2. Given the following data matrix

Loan _ID	Gender	Married	Dependents	Education	Self_Employed	Property _Area	Loan Status
LP001002	Male	No	0	Graduate	No	Urban	Y
LP001003	Male	Yes	1	Graduate	No	Rural	N
LP001005	Male	Yes	0	Graduate	Yes	Urban	Y
LP001006	Male	Yes	0	Not Graduate	No	Urban	Y
LP001008	Male	No	0	Graduate	No	Urban	Y
LP001011	Male	Yes	2	Graduate	Yes	Urban	Y
LP001013	Male	Yes	0	Not Graduate	No	Urban	Y
LP001018	Male	Yes	2	Graduate	No	Urban	Y
LP001020	Male	Yes	1	Graduate	No	Semiurban	N
LP001024	Male	Yes	2	Graduate	No	Urban	Y
LP001028	Male	Yes	2	Graduate	No	Urban	Y
LP001029	Male	No	0	Graduate	No	Rural	N
LP001030	Male	Yes	2	Graduate	No	Urban	Y
LP001032	Male	No	0	Graduate	No	Urban	Y
LP001034	Male	No	1	Not Graduate	No	Urban	Y
LP001036	Female	No	0	Graduate	No	Urban	N
LP001038	Male	Yes	0	Not Graduate	No	Rural	N
LP001043	Male	Yes	0	Not Graduate	No	Urban	N
LP001046	Male	Yes	1	Graduate	No	Urban	Y
LP001047	Male	Yes	0	Not Graduate	No	Semiurban	N

LP001066	Male	Yes	0	Graduate	Yes	Semiurban	Y
LP001068	Male	Yes	0	Graduate	No	Semiurban	Y
LP001073	Male	Yes	2	Not Graduate	No	Urban	Y
LP001086	Male	No	0	Not Graduate	No	Urban	N

Identify the four nearest objects in the above data set to each one of the following three objects using a suitable metric of your choice. [Concept of neighborhood for binary data]

Loan ID	Gender	Married	Dependents	Education	Self Employed	Property _Area	Loan Status
LP001095	Male	No	0	Graduate	No	Urban	N
LP001097	Male	No	1	Graduate	Yes	Rural	N
LP001098	Male	Yes	0	Graduate	No	Semiurban	Y

3. Learn to tune the knn classifier using e1071
   Using the last five columns of the hsb data set as the training set and the ses as class attribute tune the knn classifier with k values ranging from 5 to 10 and identify the best choices of k under (a) 12 – fold cross validation (b) boot with nboot as 5 and (c) fixed

4. Learning how to handle mixed data types using knn.
   Identify any three columns with nominal variables and scores in five subjects of the hsb data set. Take a sample of 50 objects from the corresponding columns of hsb data set randomly as test set.. Propose a solution for performing knn classification based on a suitably defined metric and classify all of them by taking k=5.

5. Consider the following two-class data related to mushrooms

	class	cap.shape	cap.surface	cap.color	bruises	odor
1687	e	f	S	g	f	n
1554	e	f	F	w	f	n
4947	p	f	Y	n	f	n
7352	p	k	S	e	f	y
6422	p	f	Y	e	f	s
7446	e	k	S	w	f	n
4458	p	f	F	g	f	f
6443	p	x	S	n	f	y
2068	p	f	S	n	t	p
2435	e	x	F	g	t	n
6644	p	f	S	n	f	f
3424	e	f	Y	g	t	n
3203	e	f	Y	e	t	n
1108	e	f	F	g	f	n

7997	e	f	S	n	f	n
4872	e	f	Y	n	t	n
5103	p	f	Y	y	f	f
684	e	b	S	y	t	a
606	e	b	S	w	t	a
5806	p	x	S	g	t	f
2381	e	f	F	n	t	n
7653	e	f	S	n	f	n
4774	p	x	Y	y	f	f
6877	p	x	S	n	f	y
4694	p	x	F	y	f	f
5002	p	x	Y	n	f	n
6822	p	f	S	e	f	s
6041	e	x	S	n	f	n
6074	p	f	S	n	f	s
6820	p	f	S	n	f	y
5638	p	f	Y	w	t	n
670	e	x	Y	w	t	a
6434	p	f	Y	e	f	f
6811	p	f	s	e	f	f
1196	p	x	s	n	t	p
1931	p	f	y	w	t	p
1920	e	f	f	n	t	n
1972	e	f	f	n	f	n
5966	p	f	y	g	f	f
2587	e	x	y	g	t	n
3261	e	f	y	g	t	n
7161	p	f	s	e	f	s
3830	p	x	F	g	f	f
2522	e	f	F	n	t	n
3519	e	x	F	e	t	n
6293	p	x	S	n	f	s
2356	e	x	F	e	t	n
4911	p	f	F	y	f	f
3604	e	f	Y	e	t	n
7402	p	c	Y	y	f	n

Develop Naïve Bayes Classifier and classify the following objects.

cap.shape	cap.surface	cap.color	bruises	odor
f	y	g	F	f

x	f	g	F	n
x	y	w	T	l
f	y	n	F	y
x	s	w	T	f
f	f	g	T	n
x	y	g	F	f
k	f	g	F	n
x	f	e	T	n
f	f	n	T	n

6. Create a data frame consisting of 500 objects by randomly selecting the first eight columns of the mushroom data set and use it as training data set and obtain the naïve Bayesian classifier. Obtain (1) Entropy(2) Purity(3) Precision(4) Recall and (5) F measurewithout Laplace smoothing and with Laplace smoothing with any three values of your choice by using the training set itself as test test.

7. Construct the decision tree for the following data which is popularly known as kyphosis data

sno	Kyphosis	Age	Number	Start
1	absent	71	3	5
2	absent	158	3	14
3	present	128	4	5
4	absent	2	5	1
5	absent	1	4	15
6	absent	1	2	16
7	absent	61	2	17
8	absent	37	3	16
9	absent	113	2	16
10	present	59	6	12
11	present	82	5	14
12	absent	148	3	16
13	absent	18	5	2
14	absent	1	4	12
15	absent	168	3	18
16	absent	1	3	16
17	absent	78	6	15
18	absent	175	5	13
19	absent	80	5	16
20	absent	27	4	9
21	absent	22	2	16
22	present	105	6	5
23	present	96	3	12
24	absent	131	2	3

25	present	15	7	2
26	absent	9	5	13
27	absent	8	3	6
28	absent	100	3	14
29	absent	4	3	16
30	absent	151	2	16
31	absent	31	3	16
32	absent	125	2	11
33	absent	130	5	13
34	absent	112	3	16
35	absent	140	5	11
36	absent	93	3	16
37	absent	1	3	9
38	present	52	5	6
39	absent	20	6	9
40	present	91	5	12
41	present	73	5	1
42	absent	35	3	13
43	absent	143	9	3
44	absent	61	4	1
45	absent	97	3	16
46	present	139	3	10
47	absent	136	4	15
48	absent	131	5	13
49	present	121	3	3
50	absent	177	2	14
51	absent	68	5	10
52	absent	9	2	17
53	present	139	10	6
54	absent	2	2	17
55	absent	140	4	15
56	absent	72	5	15
57	absent	2	3	13
58	present	120	5	8
59	absent	51	7	9
60	absent	102	3	13
61	present	130	4	1
62	present	114	7	8
63	absent	81	4	1
64	absent	118	3	16
65	absent	118	4	16
66	absent	17	4	10
67	absent	195	2	17

68	absent	159	4	13
69	absent	18	4	11
70	absent	15	5	16
71	absent	158	5	14
72	absent	127	4	12
73	absent	87	4	16
74	absent	206	4	10
75	absent	11	3	15
76	absent	178	4	15
77	present	157	3	13
78	absent	26	7	13
79	absent	120	2	13
80	present	42	7	6
81	absent	36	4	13

Draw the decision tree using the output given by the rpart function and write down all the rules. Predict the status of the following test data.

8. The following data (head) contains 7 columns selected from SPAM E-MAIL DATABASE. The first 3 columns represent percentage of matches in the e-mail that match WORD (a string of alphanumeric words bounded by non-alphanumeric characters or end of string). The columns 4 to 6 give average length of uninterrupted sequences of capital letters, length of longest uninterrupted sequence of capital letters and total number of capital letters in the e-mail. The last column gives the class attribute spam (1) or not (0).

	V5	V8	V50	V55	V56	V57	V58
3080	0	0	0	1.8	5	9	0
302	1.03	0.34	0.116	1.888	6	68	1
1582	0	0	0	2.23	12	29	1
3223	0	0	0	1.333	4	12	0
1480	0.26	1.04	0.234	3.554	54	981	1
1725	4.08	0	0	6.588	68	112	1

The complete data is available in “spamtrain.data”. Train the svm using radial basis kernel and using the best machine predict the status of the mails given in the test data set given below.

Id	V5	V8	V50	V55	V56	V57	class
3526	0	0	0	1.37	3	37	0
2675	0	0	0.419	2.133	12	64	0

2486	0	0	0	5.888	29	53	0
1681	0	0	0	1.6	4	32	1
3810	0	2.63	0	2.023	14	85	0
266	0	0	0.204	2.962	73	400	1

9. Train the svm using sigmoid kernel for predicting the classes in Species data set and identify the best machine using 12-fold cross validation. Compare the performances of the best machine and the default machine with the help of appropriate validity measures.

10. Simulate a data set consisting of 40 vectors consisting of 4 components X_1, X_2, X_3 and X_4 from four different normal populations with mean 15,20,18 and 17 having standard deviations 2,3,1and 4 respectively. Regress the simulated values on the predictor variable Y using the relation $Y = 10.6X_1 - 5.3X_2 + 17.6X_3 + e$ where $e \sim N(0,1)$. Train the SVM using the simulated data set using polynomial kernel with appropriate values and compare the simulated values and predicted values.

11. Use the grocery data set available the package arules and using apriori algorithm

(a) list all the rules corresponding to support 0.05 and confidence 0.40
(b) 5 rules with maximum support
(c) 5 rules with maximum confidence
(d) Means of support, confidence, lift and count
(e) Number of rules

12. Create Market Basket Data using R

ITEMS

[1] {citrus fruit,semi-finished bread,margarine,ready soups}
[2] {tropical fruit,yogurt,coffee}
[3] {whole milk}
[4] {pip fruit,yogurt,cream cheese ,meat spreads}
[5] {other vegetables,whole milk,condensed milk,long life bakery product}
[6] {whole milk,butter,yogurt,rice,abrasive cleaner}
[7] {rolls/buns}
[8] {other vegetables,UHT-milk,rolls/buns,bottled beer,liquor (appetizer)}
[9] {pot plants}
[10] {whole milk,cereals}
[11] {tropical fruit,other vegetables,white bread,bottled water,chocolate}
[12] {citrus fruit,tropical fruit,whole milk,butter,curd,yogurt,flour,bottled water,dishes}
[13] {beef}
[14] {frankfurter,rolls/buns,soda}
[15] {chicken,tropical fruit}
[16] {butter,sugar,fruit/vegetable juice,newspapers}
[17] {fruit/vegetable juice}
[18] {packaged fruit/vegetables}

[19] {chocolate}
[20] {specialty bar}
[The first 20 elements of Groceries]

(a) Deduct all possible rules with support 0.1 and confidence 0.5
(b) Obtain the minimum, average and maximum confidence
(c) Obtain the minimum, average and maximum lefts
(d) List the rules with maximum support, confide

MCA20R5081	PYTHON PROGRAMMING LABORATORY	L	T	P	C
		0	0	3	2

Course Category: Core Course **Course Type** : Laboratory

COURSE OBJECTIVES

This course is designed to help in formulating and solving problems using Python programming. It enables to effectively choose programming concepts that efficiently solves computing problems in real-world.

COURSE OUTCOMES

CO1: Understand the basic features of python programming
CO2: Ability to write the python programs using NumPy.
CO3: Understand the python libraries, Pandas.
CO4: Understand and implement the Seaborn libraries.
CO5: Ability to access the Tkinter in python.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S		S	M				W				M
CO2		S		M			S				M	
CO3	S				S			M		W		
CO4					S	S			S			
CO5		S								M		M

LIST OF EXPERIMENTS: **36 HOURS**

1. Creating and manipulating lists.
2. Creating and manipulating tuples.
3. Creating and manipulating sets.
4. Creating and manipulating dictionaries.
5. Compute the following statistical measures using numpy, scipy and pandas.

   i) Distance ii) Shape iii) Location
6. Write a NumPy program to compute the following:

   i) Determinant of matrix ii) Inverse of matrix iii) Decomposition of matrix
7. Write a Pandas program to find the positions of numbers that are multiples of 5 of a given series.

8. Write a Python Pandas program for the manipulation of dataframes:
   i) selection using iloc, ii) conditional selections iii) unconditional selections etc.
9. Creating basic charts using matplotlib.
10. Write a Python program to find the correlation between variables of iris data. Also create a hitmap using Seaborn to present their relations.
11. Write a Python program to create a Principal component analysis (PCA) of iris dataset.
12. Write a Python program to create a joinplot using "kde" to describe individual distributions on the same plot between Sepal length and Sepal width.

    Note: The kernel density estimation (kde) procedure visualize a bivariate distribution. In seaborn, this kind of plot is shown with a contour plot and is available as a style in jointplot().
13. Write a Python program to create a box plot (or box-and-whisker plot) which shows the distribution of quantitative data in a way that facilitates comparisons between variables or across levels of a categorical variable of iris dataset. Use seaborn.
14. Write a Python program using seaborn to create a kde (Kernel Density Estimate) plot of sepal_length versus sepal width for setosa species of flower.
15. Write a Python program to create a joinplot and add regression and kernel density fits using "reg" to describe individual distributions on the same plot between Sepal length and Sepal width.
16. Write a Python GUI program to create three single line text-boxes to accept a value from the user using tkinter module.
17. How to develop a simple GUI for arithmetic operation using Tkinter?

MCA20R5082	SOFTWARE TESTING LABORATORY	L	T	P	C
		0	0	3	2
Course Category: Core Course		**Course Type** : Laboratory			

PREREQUISITE

Basic Knowledge in Software Testing.

COURSE OBJECTIVES

To describe the principles of system and component testing.

COURSE OUTCOMES

CO1: Understanding Selenium tool to perform testing.
CO2: Writing test suits for applications.
CO3: Construct and test simple programs.
CO4: Understanding the use of bug tracking and testing tool Bugzilla, Jira.
CO5: To understand the essential characteristics of tool used for test automation.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S		S	M				W				M
CO2		S		M			S				M	
CO3	S				S			M		W		
CO4					S	S			S			
CO5		S								M		M

List of Experiments **36 Hours**

1. Using Selenium IDE, write a test suite containing minimum 4 test cases.
2. Using Selenium write a simple test script to validate each field of the registration page (Eg: facebook registration page)
3. Conduct a test suite for any two web sites.
4. Write and test a program to login a specific web page.
5. Write test cases to validate a mobile number using one time pin identification(OTP)
6. Write and Test a program to find out list of employees having salary greater than Rs 50,000 and age between 30 to 40 years.

7. Write and test a program to update 10 student records into table into Excel file.
8. Write and test a program to select the number of students who have scored more than 60 in any one subject (or all subjects).
9. Write and test a program to provide total number of objects present / available on the page.
10. Write and test a program to get the number of list items in a list / combo box.
11. Write and test a program to count number of items present on a desktop.
12. Understanding the use of bug tracking and testing tool Bugzilla and Jira
13. Open ended experiment: Mini Project –Test cases for Admission form, Shopping cart, Travel Booking, Hotel Booking, Utility Bill Payment.

MCA20R4101	COMPUTER GRAPHICS AND MULTIMEDIA	L	T	P	C
		4	0	0	3
Course Category: Major Elective				**Course Type** : Theory	

PREREQUISITE

Programming and Problem solving

COURSE OBJECTIVES

This course aims to make the students be aware of the concepts of underlying modern Computer Graphics. Students can gain skills to design algorithms for digital image processing problems in various domains. This course contains 2D geometric transformations, algorithms for clipping, 3D geometric, modeling transformation and Illumination models etc.

COURSE OUTCOMES

CO1: Understand contemporary graphics hardware.
CO2: Ability to develop interactive graphics applications using 2D concepts
CO3: Implement projections and 3D concepts.
CO4: Develop multimedia applications.
CO5: Understand and be able to demonstrate compression formats and techniques.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M		**S**		W		S	M		S	S	M
CO2	M		M	S				M			M	
CO3		S			M		W			W	W	
CO4		S	S			S			S			S
CO5	M			M			M	M		M		M

UNIT – I: COMPUTER GRAPHICS INTRODUCTION **12 Hours**

Overview of graphics system - various Display Devices – Interactive Input devices –Line drawings algorithms - DDA Algorithm - Bresenham's Line Drawing Algorithm – Parallel line Algorithm– Circle Drawing Algorithm and Ellipse drawing Algorithms.

UNIT – II: 2D CONCEPTS **12 Hours**

Two-dimensional Transformations – Filling Algorithms – Windowing – Clipping – Line Clipping and Polygon Clipping

UNIT – III: 3D CONCEPTS **12 Hours**

Projections- 3D object representations –Polygon surfaces-Quadric surfaces-Fractals – Three dimensional Transformations

UNIT – IV: BASICS OF MULTIMEDIA **12 Hours**

Multimedia hardware and software - Components of multimedia – Text-Image – Graphics – Audio – Video – Animation.

UNIT – V: DATA COMPRESSION **12 Hours**

Multimedia communication systems – JPEG Compression-MPEG Compression –Applications of Multimedia, Multimedia Integration.

TEXT BOOKS

1. Donald Hearn, and M. Pauline Baker, Computer Graphics, Pearson Education, 2nd Edition, 2011.
2. Raff Steinmetz, and Klara Nahrstedt, Computing, Communication and Application – Multimedia, Pearson Education, 5th Edition, 2009.

REFERENCE BOOKS

1. Tom McReynolds, and David Blythe, Advanced Graphics Programming Using OpenGL, Elsevier, 2015.
2. Parag Havaldar and Gerard Medioni, Multimedia Systems Algorithms, Standards and Industry Practices, Course Technology, Cengage Learning, 2016.

MCA20R4102	PHP PROGRAMMING	L	T	P	C
		4	0	0	3
Course Category: Core Course-Major Elective				**Course Type** : Theory	

COURSE OBJECTIVES

This course aims to make the students understand the concepts of PHP Programming. It helps to develop the interactive web applications with database.

COURSE OUTCOMES

CO1: Able to read, write, execute by hand simple PHP programs using control structures.
CO2: Establish the connection between PHP and databases.
CO3: Demonstrate the concepts of Cookies, Sessions, and Headers.
CO4: Demonstrate the XML and Handling Errors program.
CO5: Understanding the Securing and Extending PHP concepts.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S		M			M		W			M	
CO2	S	S		S	M		M			M		
CO3		S			M			S	M			W
CO4	S	M		S		M		S			M	
CO5		S	M		M		S		M			M

UNIT – I: PHP BASICS & CONTROL STRUCTURES **12 Hours**

PHP Features - Basic Development Concepts- Storing Data in Variables - Understanding PHP's Data Types - Using Constants - Manipulating Variables with Operators. Conditional Statements: if Statement, The switch-case Statement. Loops: The while Loop - The do-while Loop - The for Loop-Combining Loops, The while Loop - The do-while Loop - The for Loop.

UNIT – II: FILES AND DATABASES **10 Hours**

Reading Files: Reading Local Files - Reading Remote Files - Reading Specific Segments of a File - Writing Files - Introducing Databases and SQL: Understanding Databases, Records, and Primary Keys - Understanding Relationships and Foreign Keys - Understanding SQL Statements - Creating the Database -Adding Tables - Adding Records.

UNIT – III: WORKING WITH COOKIES, SESSIONS, AND HEADERS **10 Hours**

Working with Cookies: Cookie Basics - Cookie Attributes - Cookie Headers - Setting Cookies - Reading Cookies Removing Cookies - Working with Sessions: Session Basics - Creating Sessions and Session Variables - Removing Sessions and Session Variables - Using HTTP Headers.

UNIT – IV: WORKING WITH XML AND HANDLING ERRORS 10 Hours

XML Basics - Anatomy of an XML Document - Well-Formed and Valid XML - XML Parsing Methods - XML Technologies- Using PHP's SimpleXML Extension - Working with Elements- Working with Attributes. Handling Errors: Handling Script Errors - Controlling Error Reporting - Using a Custom Error Handle - Using Exceptions - Using Custom Exceptions - Logging Errors - Debugging Errors.

UNIT – V: SECURING AND EXTENDING PHP 10 Hours

Securing PHP: Sanitizing Input and Output - Securing Data - Securing Configuration Files - Securing Database Access - Securing Sessions - Validating User Input - Working with Required Fields - Working with Numbers - Working with Strings - Working with Dates - Configuring PHP Security. Extending PHP: Using PEAR- Installing PEAR Packages-Using PECL -Installing PECL Extensions.

TEXT BOOK

1. Vikram Vaswani, PHP: A Beginner's Guide. McGraw Hill Professional, 2010.

REFERENCE BOOKS

1. Luke Weiling and Lara Thomson, PHP and MySQL Development, Sams Publishing, 2004.
2. Shasankar, Krishna, Zend Framework 2.0 by Example: Beginner's Guide. Packt Publishing Ltd, 2013.
3. Juravich, Tim, CouchDB and PHP Web Development Beginner's Guide. Packt Publishing Ltd, 2012.

MCA20R4103	CLOUD COMPUTING	L	T	P	C
		4	0	0	3
Course Category: Core Course			**Course Type** : Theory		

PREREQUISITE

Data Communication and Networks

COURSE OBJECTIVES

The objective of this course is to provide the comprehensive and in-depth knowledge of Cloud Computing concepts, technologies, architecture and applications by introducing and researching state-of-the-art in Cloud Computing fundamental issues, technologies, applications and implementations. Another objective is to expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research.

COURSE OUTCOMES

CO1: Understand basic concepts and security implications in cloud computing

CO2: Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.

CO3: Analyze the trade-offs inherent in Cloud Computing

CO4: Understand the core issues of cloud computing such as usage, services, security, privacy, and interoperability

CO5: Analyze some of the online facilities offered by cloud environment in online to solve some problems.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S								M			
CO2			W		M							
CO3		S						S			S	
CO4				M		W						
CO5			S							W		M

UNIT-I: UNDERSTANDING CLOUD COMPUTING

Cloud Computing – History of Cloud Computing – Cloud Architecture – Cloud Storage – Why Cloud Computing Matters – Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Services.

UNIT-II: DEVELOPING CLOUD SERVICES

Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service – Platform as a Service – Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon Ec2 – Google App Engine – IBM Clouds.

UNIT-III: CLOUD COMPUTING FOR EVERYONE

Centralizing Email Communications – Collaborating on Schedules – Collaborating on To-Do Lists – Collaborating Contact Lists – Cloud Computing for the Community – Collaborating on Group Projects and Events – Cloud Computing for the Corporation.

UNIT-IV: USING CLOUD SERVICES

Collaborating on Calendars, Schedules and Task Management – Exploring Online calendar applications- Exploring Online Scheduling Applications – Exploring Online Planning and Task Management – Collaborating on Event Management – Collaborating on Contact Management – Collaborating on Project Management – Collaborating on Word Processing - Collaborating on Databases – Storing and Sharing Files.

UNIT-V: OTHER WAYS TO COLLABORATE ONLINE

Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services – Evaluating Web Conference Tools – Collaborating via Social Networks and Groupware – Collaborating via Blogs and Wiki.

TEXT BOOKS

1. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.
2. Kamal Kant Hiran, Ruchi Doshi, Temitayo Fagbola, and Mehul Mahrishi, Cloud Computing: Master the Concepts, Architecture and Applications with Real-World Examples and case Studies, Bpb Publications, 2019.

REFERENCE BOOK

1. Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.

MCA20R5101	DIGITAL IMAGE PROCESSING	L	T	P	C
		4	0	0	3
Course Category: Major Elective		**Course Type** : Theory			

PREREQUISITE

Linear algebra and matrix operations, linear time-invariant systems, Fourier transform analysis and filtering

COURSE OBJECTIVES

This course is to make students learn fundamentals of image processing such as formation, restoration, segmentation, morphology.

COURSE OUTCOMES

CO1: Understand the basic concepts in digital image processing.

CO2: Analyze the histogram, filtering techniques, the image Degradation/Restoration process for image enhancement

CO3: Synthesize the various image compression and segmentation methods.

CO4: Apply the knowledge of representation and description of images.

CO5: Analyze and interpret objects through pattern classes.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**S**		W		S	M		S	S	M		M
CO2	M	S		S		M				M		
CO3			M		W			W	W			
CO4	S						S				S	S
CO5		M		M	M	M		M	M	M		M

UNIT – I: DIGITAL IMAGE FUNDAMENTALS **12 Hours**

Digital Image Processing – Fundamental steps and Components, Elements of visual perception, simple image formation model, Image sampling and quantization, Basic relationship between pixels, Image formation, Image transforms – 2-d Discrete Fourier transforms.

UNIT – II: IMAGE ENHANCEMENT AND RESTORATION 12 Hours

Basic Intensity transformation functions, Histogram processing - Spatial filtering - smoothing spatial filters – Sharpening spatial filters, Frequency domain filtering – smoothing frequency filters – Sharpening frequency filters. Image restoration – Degradation/Restoration process – Noise models – spatial and frequency domain restoration filters.

UNIT – III: IMAGE COMPRESSION AND SEGMENTATION 12 Hours

Fundamentals - Compression Methods – Huffman, Golomb, Arithmetic, LZW, Run-length, Symbol-based, Bit-plane coding, Image segmentation – Detection of discontinuities - Edge linking and boundary detection - Thresholding – Region based segmentation.

UNIT – IV: REPRESENTATION AND DESCRIPTION 12 Hours

Representation schemes – Chain code - Polygonal Approximations - Signatures- Boundary Segments -skeletons - Boundary descriptors - Regional descriptors - Relational descriptors, Principle Components Analysis for description. Patterns and pattern classes - Decision - Theoretic methods - Structural methods, computing distance Measure- Recognition based on Decision- - Minimum-Distance Classifiers

UNIT – V: Video Processing 12 Hours

Basic Steps of Video Processing: Analog video, Digital Video, Time varying Image Formation models : 3D motion models, Geometric Image formation , Photometric Image formation, sampling of video signals, filtering operations 2-D Motion Estimation: Optical flow, general methodologies, pixel based motion estimation, Block matching algorithm, Mesh based motion Estimation,

TEXT BOOK

1. R. C. Gonzalez, Woods, R.E., Digital Image Processing, 3rd Edition, Pearson Education, 2018.

REFERENCE BOOKS

1. K. Anil Jain, Fundamentals of Digital image Processing, Prentice Hall of India, 2013.
2. Sid Ahmed, Image Processing, McGraw Hill, New York, 2006.
3. Yao wang, Joem Ostarmann and Ya – quin Zhang, ”Video processing and communication”, 1st edition, PHI

MCA20R5102	BIG DATA ANALYTICS	L	T	P	C
		4	0	0	3

PREREQUISITE

Basic knowledge in database concepts and advanced programming.

COURSE OBJECTIVES

The course aims to cover Big Data Fundamentals, including the characteristics of Big Data, the sources Big Data (such as social media, sensor data, geospatial data etc), as well as the challenges imposed around information management, data analytics, privacy and security, as well as platforms and architectures

COURSE OUTCOMES

CO1: Understand the basic concepts of BigData.
CO2: Setup Hadoop Cluster and write Complex MapReduce programs.
CO3: Implement HBase and MapReduce Integration.
CO4: Implement best Practices for Spark Development.
CO5: Develop a NoSQL Databases on Big Data Analytics.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**S**		W		S	M		S	S	M		M
CO2	M	S		S		M				M		
CO3			M		W			W	W			
CO4	S						S				S	S
CO5		M		M	M	M		M	M	M		M

UNIT – I: INTRODUCTION

Introduction to big data: Introduction – Big Data- Characteristics of Big Data – Big data management architecture- Examining Big Data Types – Big Data Technology Components – Big data analytics – Big data analytics examples - Web Data Overview – Web Data in Action.

UNIT – II: HADOOP

Introduction – History of Hadoop - Hadoop Ecosystem- Analyzing data with Hadoop - Hadoop Distributed File System- Design - HDFS concepts - Hadoop file system –Data flow –Hadoop I / O - Data integrity – Serialization - Setting up a Hadoop cluster - Cluster specification -cluster setup and installation – YARN

UNIT – III: MAPREDUCE

Introduction – Understanding Map, Reduce functions - Scaling out - Anatomy of a MapReduce Job Run - Failures – Shuffle and sort - Mapreduce types and formats - features –counters - sorting - Mapreduce Applications – Configuring and setting the environment - Unit test with MR unit- local test.

UNIT – IV: SPARK

Installing spark – Spark applications, Jobs, Stages and Tasks –Resilient Distributed databases- Anatomy of a Spark Job Run – Spark on YARN- SCALA: Introduction- Classes and objects- Basic types and operators- built-in control structures- functions and closures- inheritance.

UNIT – V: NOSQL DATABASES

Introduction to NoSQL- MongoDB: Introduction – Data types – Creating, Updating and deleing documents -Querying – Introduction to indexing – Capped collections. Hbase: Concepts - Hbase Vs RDBMS - Creating records- Accessing data – Updating and deleting data –Modifying data- exporting and importing data, Online Streaming Data.

TEXT BOOKS

1. Bill Franks, Taming the Big Data Tidal wave, John Wiley & Sons, 2012.
2. Tom White, Hadoop: The Definitive Guide, Third Edition, O'Reilly Media 3. Martin Odersky, Lex Spoon, Bill Venners (2010), Programming in Scala, Second Edition, Artima Press, California, 2012.

REFERENCE BOOKS

1. Boris lublinsky, Kevin t. Smith, Alexey, and Yakubovich, Professional Hadoop Solutions, Wiley, 2015.
2. Chris Eaton, Dirk deroos, Understanding Big data, McGraw Hill, 2012.
3. Min Chen Big Data: Related Technologies, Challenges and Future Prospects, Springer, 2014.
4. Judith Hurwitz, Big Data for Dummies, John Wiley & Sons, 2013.

MCA20R5103	ARTIFICIAL INTELLIGENCE AND ITS APPLICATIONS	L	T	P	C
		4	0	0	3

PREREQUISITE

Basic knowledge in database management system

COURSE OBJECTIVES

To search and discover intelligent characteristics of existing AI projects, map a new problem as search and create an animation showing different search strategies for a problem, program a new game/ problem in Prolog. Evaluate different Knowledge Representation schemes for typical AI problems, design and implement a typical AI problem to be solved. Using Machine Learning Techniques design and implement a futuristic AI application

COURSE OUTCOMES

CO1: Understand the basic concepts of artificial intelligence programming.
CO2: Understand the problem-solving through search.
CO3: Implement knowledge representation using AI.
CO4: Understand the reasoning concepts.
CO5: Understand the Planning concepts.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M		S		S	S	M	S	S	S	M
CO2		M			S		M				M	
CO3	M		S			M	M		W	W	W	
CO4			S	S				S				S
CO5		M			M	M		M	M	M		M

UNIT –I: INTELLIGENT AGENTS

Reactive– deliberative– goal-driven– utility-driven– and learning agents– Artificial Intelligence programming techniques

UNIT –II: PROBLEM-SOLVING THROUGH SEARCH

Forward and backward– state-space– blind– heuristic– problem-reduction – A – A* – AO* – minimax – constraint propagation – neural – stochastic and evolutionary search algorithms – sample applications.

UNIT –III: KNOWLEDGE REPRESENTATION

Ontologies – foundations of knowledge representation and reasoning – representing and reasoning about objects – relations – events – actions – time – and space.

UNIT –IV: REASONING

Mental Objects and Modal Logic – Other modal logics – Reasoning Systems for Categories - Semantic networks – Description logics – Reasoning with Default Information – Circumscription and default logic – Truth maintenance system.

UNIT –V: PLANNING

Planning as search – partial order planning – construction and use of planning graphs. Case Study Natural Language Processing

TEXT BOOKS

1. S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall, 4th Edition, 2020.
2. I. Bratko, Prolog Programming for Artificial Intelligence (International Computer Science Series), Addison-Wesley Educational Publishers Inc; 4th edition, 2011.
3. David L. Poole, and Alan K. Mackworth, Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.

REFERENCE BOOKS

1. M. Tim Jones, Artificial Intelligence: A Systems Approach (Computer Science), Jones and Bartlett Publishers, Inc; 1st Edition, 2008
2. Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning series), The MIT Press; 2nd Edition, 2009
3. Nils J. Nilsson, the Quest for Artificial Intelligence, Cambridge University Press, 2009.
4. William F. Clocksin, and S. Christopher, Mellish, Programming in Prolog: Using the ISO Standard, Fifth Edition, Springer, 2003.

MCA20R5104	DEEP LEARNING	L	T	P	C
		4	0	0	3
Course Category: Major Elective		**Course Type** : Theory			

PREREQUISITE

Knowledge in Database Management Systems and data mining.

COURSE OBJECTIVES

To acquire knowledge on the basics of neural networks.
To implement neural networks using computational tools for variety of problems.
To explore various deep learning algorithms.

COURSE OUTCOMES

CO1: Develop algorithms simulating human brain.
CO2: Implement Neural Networks in Tensor Flow for solving problems.
CO3: Explore the essentials of Deep Learning and Deep Network architectures.
CO4: Define, train and use a Deep Neural Network for solving real world problems that require Artificial Intelligence based solutions.
CO5: Implement deep learning in various applications

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S	S						M			
CO2				S				M		S	S	
CO3	S				S		M			S	S	
CO4			S			M	M			S	S	S
CO5			S									S

UNIT – I: INTRODUCTION **12 Hours**

Basics of Deep leaning- Deep learning architectures: Convolutional Neural Networks :Neurons in Human Vision-The Shortcomings of Feature Selection-Vanilla Deep Neural Networks Don't Scale Filters and Feature Maps-Full Description of the Convolutional Layer-Max Pooling-Full Architectural Description of Convolution Networks-Closing the Loop on MNIST with Convolutional Networks-Image Preprocessing Pipelines Enable More Robust Models-Accelerating Training with Batch Normalization-Building a Convolutional Network for CIFAR-10-Visualizing Learning in

Convolutional Networks- Leveraging Convolutional Filters to Replicate Artistic Styles-Learning ConvolutionalFilters for Other Problem Domains-Training algorithms.

UNIT – II: MEMORY AUGMENTED NEURAL NETWORKS 12 Hours

Memory Augmented Neural Networks : Neural Turing Machines-Attention-Based Memory Access NTM Memory Addressing Mechanisms-Differentiable Neural Computers-Interference-Free Writing in DNCs-DNC Memory Reuse-Temporal Linking of DNC Writes-Understanding the DNC Read Head The DNC Controller Network- Visualizing the DNC in Action-Implementing the DNC in TensorFlow Teaching a DNC to Read and Comprehend.

UNIT – III: DEEP REINFORCEMENT LEARNING 12 Hours

Deep Reinforcement Learning: Deep Reinforcement Learning Masters Atari Games-What Is Reinforcement Learning?-Markov Decision Processes (MDP)-Explore Versus Exploit-Policy versus Value Learning-Pole-Cart with Policy Gradients-Q-Learning and Deep Q-Networks-Improving and Moving Beyond DQN.

UNIT – IV: NEURAL NETWORKS IN TENSORFLOW 12 Hours

Implementing Neural Networks in TensorFlow : What Is TensorFlow?-How Does TensorFlow Compare to Alternatives?-Installing TensorFlow-Creating and Manipulating TensorFlow Variables-TensorFlow Operations-Placeholder Tensors-Sessions in TensorFlow-Navigating Variable Scopes and Sharing Variables-Managing Models over the CPU and GPU-Specifying the Logistic Regression Model in TensorFlow-Logging and Training the Logistic Regression Model

UNIT – V: APPLICATIONS 12 Hours

Applications: Deep learning for computer vision, Deep Learning Applications at the Enterprise Scale, Deep Learning Models for Healthcare Applications.

TEXT BOOK

1. Nikhil Buduma, and Nicholas Locascio, Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms, O'Reilly Media, 2017.

REFERENCE BOOK

1. Ian Goodfellow, Yoshua Bengio, and Aaron Courville, Deep Learning (Adaptive Computation and Machine Learning series, MIT Press, 2017.

MCA20R5105	R PROGRAMMING	L	T	P	C
		4	0	0	3

Course Category: Major Elective **Course Type** : Theory

PREREQUISITE

Basic Knowledge of programming and Statistics

COURSE OBJECTIVES

This course aims to provide a practical introduction to the R programming language. By the end of course, the student will be comfortable operating in the R environment, including importing external data, manipulating data for specific needs, and running summary statistics and visualizations.

COURSE OUTCOMES

CO1: Capable to understand basic concepts of R.
CO2: Implementing the concept of vectors and matrix.
CO3: Able to create list, data frames and implement the same.
CO4: Ability to do simulation with R.
CO5: Able to work with string functions and graphs.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S								M		
CO2			S									
CO3								L				
CO4						M			S			
CO5					M							S

Unit - I: INTRODUCTION

The R Programming Language- Basic concepts, definitions and notations, R as a calculator, Identifiers, constants, R data types, R- Objects: Vectors, Lists, Matrices, Arrays, Factors, Data Frames; Atomic and Recursive Variables, R-Operators.

UNIT– II: FUNCTION IN R

Function in R Programming- Components of a Function, Built in and user defined Functions, Vector and . Matrix creations - manipulations, slicing and matrix operations including decompositions, R - strings and string manipulation functions- Lists and their manipulations with exposure to apply functions of various types.

UNIT– III: PACKAGES IN R

Package in R- Installing and Loading Packages in R, using help, access functions from packages. Getting Data In and Out of R - Importing data from excel, Working with data from files, importing larger Data Sets, loading data from databases, Working with structured and unstructured data, Reading from URL

Data Frames: Creating Data frames using scripts – importing data from external sources like Excel spread sheets, text files and other sources - Exploring data frames-Accessing columns in a Data frame-slicing of data frame, operation on data frames using ***dplyr*** package. .

UNIT –IV: EXPLORING DATA

Data Visualization using base package and ggplot2 – Charts of various types – pie charts, histograms, bee sworm chart, frequency polygon, density curves – simple and multiple bar charts – box plot – scatter plot - creating subplots - Drawing inferences from plots and charts - R for managing data-Data cleansing, Treating missing values, data transformations, sampling data for modeling- test and training splits, creating sample groups, Data reduction.

UNIT – V: R FOR BASIC STATISTICS

Descriptive Statistics: arithmetic mean, median, Measure of dispersion - Minimum and Maximum values, quantiles, percentiles, IQR, standard deviation, variance. Linear regression – using linear and logistic regression and making predictions. Characterizing prediction quality. Using correlation to find relations between variables –Pearson, Kendall and Spearman tests

TEXT BOOKS

1. Andrew Oleksy, Data Science with R: A Step By Step Guide with Visual Illustrations & Examples, 2018.
2. Roger D. Peng, R Programming for Data Science, Lean publishing, 2015.
3. Nina Zumel and John Mount, Practical Data Science with R, Dreamtech/Manning, 2014.
4. Jeffrey S.Saltz, and Jeffre M. Stanton, An Introduction to Data Science, Sage Publications, 2018.
5. S. G. Purohit, Gore,S.D. and S. R. Dehmuk, Statistical Analysis using R,Narosha Publishing, 2019.

REFERENCE BOOKS

1. Galit Shmueli, Data Mining for Business Analytics: Concepts, Techniques and Applications in R, Wiley India, 2018.
2. Hadley Wickham and Garett Grolemund, R for Data Science, O'Reilly, 2017.

MCA20R5106	SOFT COMPUTING TECHNIQUES	L	T	P	C
		4	0	0	3
Course Category: Core Course			**Course Type** : Theory		

PREREQUISITE

Basic knowledge of problem solving, design and analysis of algorithms.

COURSE OBJECTIVES

The objective of the course is to familiarize with soft computing concepts, to introduce the ideas of neural networks, fuzzy logic and use of heuristics based on human experience. This course introduces the concepts of Genetic algorithm and its applications in soft computing.

COURSE OUTCOMES

CO1: Implement numerical methods in soft computing.
CO2: Understand the fuzzy set theory
CO3: Design the neural networks and supervised and unsupervised learning networks
CO4: Comprehend neuro fuzzy modeling
CO5: Demonstrate some applications of computational intelligence

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S				M							W
CO2			W							M		
CO3		W			W			S				
CO4							W					
CO5	M			M								S

UNIT – I: SOFTCOMPUTING AND CONVENTIONAL AI

Evolution of Computing – Soft Computing Constituents – From Conventional AI to Computational Intelligence – Derivative based optimization: Descent Methods, Newton's method – Step size determination – Derivative free optimization.

UNIT– II: FUZZY SYSTEMS

Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions – Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making.

UNIT – III: ARTIFICIAL NEURAL NETWORKS

Machine Learning Using Neural Network, Adaptive Networks – Feed forward Networks – Supervised Learning Neural Networks – Radial Basis Function Networks – Reinforcement Learning – Unsupervised Learning Neural Networks.

UNIT– IV:- NEURO - FUZZY MODELING

Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms – Rule based Structure Identification – ANFIS Applications.

UNIT – V: GENETIC ALGORITHMS

Evolutionary Computation – Genetic Algorithms – Terminologies and Operators of GA – Classification of GA: Simple GA, Parallel and Distributed GA, Adaptive GA – Ant Colony Optimization – Particle Swarm Optimization – Application of GA: Machine Learning, Image Processing, Data Mining and Wireless networks.

TEXT BOOKS

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, and Eiji Mizutani, Neuro-Fuzzy and Soft Computing, 1st Edition, Prentice Hall of India, 2003.
2. Chander Mohan, An Introduction to Fuzzy Set Theory and Fuzzy Logic, Viva Books Private Limited, Second Edition, ISBN: 9789387153691, 2017.

REFERENCE BOOKS

1. Samir Roy and Udit Chakraborty, Introduction To Soft Computing: Neuro-Fuzzy And Genetic Algorithms, Pearson, 1st Edition, 2013
2. Sivanandam & Paulraj, Introduction to Artificial Neural Networks, Vikas Publishing House Pvt Limited, 2009.
3. J.Yen, and R.Langari, Fuzzy Logic Intelligence Control And Information, PEARSON INDIA, 2002.

MCA20R5107	INTERNET OF THINGS	L	T	P	C
		4	0	0	3
Course Category: Major Elective				**Course Type** : Theory	

PREREQUISITE

Basic Knowledge of Internet, Sensors, Microcontrollers

COURSE OBJECTIVES

This course aims Students will be explored to the interconnection and integration of the physical world and the cyber space. They are also able to design & develop **IOT** Devices.

COURSE OUTCOMES

CO1: Able to understand the application areas of IoT.
CO2: Able to understand building blocks of IoT and their protocols
CO3: To build simple IoT Systems using Arduino and Raspberry Pi.
CO4: Able to understand data analytics in IoT
CO5: To develop IoT infrastructure for popular applications

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S				L							**S**
CO2		S								**M**		
CO3			S		L				**M**			
CO4						S						
CO5				S				**M**			**M**	

UNIT – I: INTRODUCTION

What is IoT?, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack.

UNIT –II: FUNDAMENTAL DEVICES IN IOT

Smart Objects: The ―Things in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies, Smart City IoT Architecture.

UNIT –III: PROTOCOLS FOR IOT

IP as the IoT Network Layer, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods.

UNIT –IV: DATA AND NETWORK ANALYTICS IN IOT

An Introduction to Data Analytics for IoT, Machine Learning, Network Analytics, Securing IoT, A Brief History of OT Security, Common Challenges in OT Security, IT and OT Security Practices.

UNIT –V: IMPLEMENTING IOT

IoT Physical Devices and Endpoints. IoT Physical Devices and Endpoints - RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Connecting Raspberry Pi via SSH.

TEXT BOOKS

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, and Jerome Henry, IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, 1st Edition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743).
2. K. G. Srinivasa, Internet of Things, CENGAGE Leaning India, 2017.

REFERENCE BOOKS

1. Vijay Madisetti and Arshdeep Bahga, Internet of Things (A Hands-on-Approach), 1st Edition, VPT, 2014.
2. Raj Kamal, Internet of Things: Architecture and Design Principles, 1st Edition, McGraw Hill Education, 2017.

MCA20R5108	CYBER FORENSICS	L	T	P	C
		4	0	0	3
Course Category: Major Elective				**Course Type : Theory**	

PREREQUISITE

Basic knowledge in Security in Computer Networks

COURSE OBJECTIVE

To understand the fundamentals of Computer Forensics and computing Investigations.

COURSE OUTCOMES

CO1: Understand of the role of computer forensics.
CO2: Identify some of the current techniques and tools
CO3: Describe and identify basic principles of good professional practice for a forensic computing practitioner
CO4: Demonstrate an understanding of issues related to privacy and determine how to address them technically and ethically.
CO5: Apply some forensic tools in different situations.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M		W				S		M
CO2		M				M		S			W	
CO3	S				M		W			M		S
CO4	S		M		S				W			
CO5	M			S		S		M				W

UNIT – I: INTRODUCTION **12 HOURS**

The Scope of Computer Forensics - Windows Operating and File Systems –Handling Computer Hardware – Anatomy of Digital Investigation.

UNIT – II: INVESTIGATIVE SMART PRACTICES **12 HOURS**

Forensics Investigative Smart Practices – Time and Forensics – Incident closure Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls.

UNIT – III: LAWS AND PRIVACY CONCERNS **12 HOURS**

Laws Affecting Forensic Investigations – Search Warrants and Subpoenas – Legislated Privacy Concerns – The admissibility of Evidence – First Response and Digital Investigator

UNIT – IV: DATA ACQUISITION AND REPORT WRITING **12 HOURS**

Data Acquisition – Finding Lost Files – Document Analysis – Case Management and Report Writing – Building a Forensics Workstation

UNIT – V: TOOLS AND CASE STUDIES **12 HOURS**

Tools of the Digital Investigator - Licensing and Certification – Case Studies: E-mail Forensics – Web Forensics – Searching the Network – Excavating a Cloud – Mobile device Forensics.

TEXT BOOK

1. Michael Graves, Digital Archaeology: The Art and Science of Digital Forensics, Addison-Wesley Professional, 2014.

REFERENCE BOOKS

1. Darren R. Hayes, Practical Guide to Computer Forensics Investigation, Pearson, 2015.
2. Albert J. Marcella and Frederic Guillossou, Cyber Forensics: From Data to Digital Evidence, Wiley Publishers, 2015.
3. Bill Nelson, Amelia Phillips and Christopher Steuart, Guide to Computer Forensics and Investigations, Fourth Edition, Cengage Learning, 2013.

MCA20R5109	FOG COMPUTING	L	T	P	C
		4	0	0	3
Course Category: Major Elective		**Course Type** : Theory			

PREREQUISITE

Basic Knowledge in Cloud Computing

COURSE OBJECTIVES

This course gives an overview of Fog Computing and its architecture, challenges and applications in different context.

COURSE OUTCOMES

CO1: Become familiar with the concepts of Fog
CO2: Understand the architecture and its components and working of components and its performance
CO3: Explore Fog on security, multimedia and smart data
CO4: Model the fog computing scenario
CO5: Implementation of Fog

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M		W				S		M
CO2		M				M		S			W	
CO3	S				M		W			M		S
CO4	S		M		S				W			
CO5	M			S		S		M				W

UNIT – I: INTRODUCTION TO FOG COMPUTING **12 HOURS**

Fog Computing-Definition-Characteristics-Application Scenarios - Issues -Fog Computing and Internet of Things-Pros and Cons-Myths of Fog Computing -Need and Reasons for Fog Computing Fog Computing and Edge Computing-IoT , FOG, Cloud- Benefits.

UNIT – II: ARCHITECTURE **12 HOURS**

Working Procedure -Performance Evaluation Components- Software Systems – Architecture-Modeling and Simulation – Need for Fog and Edge Computing Middleware - State-of-the-Art Middleware Infrastructures - Proposed Architecture - Challenges.

UNIT – III: FOG PROTOCOLS **12 HOURS**

Fog Protocol-Fog Kit- Proximity Detection Protocols- DDS/RTPS computing protocols- Integrated

C2F2T Literature by Modeling Technique - Integrated C2F2T Literature by Metrics - Network Slicing in Software - Network Slicing Management in Edge and Fog -Defined Clouds.

UNIT – IV: OPTIMIZTION IN FOG **12 HOURS**

Introduction - The Case for Optimization in Fog Computing- Formal Modeling Framework for Fog Computing- Metrics- Further Quality Attributes- Optimization Opportunities along the Service Life Cycle- Optimization Techniques- Toward a Taxonomy of Optimization Problems in Fog Computing- Future Research Directions.

UNIT – V: FOG COMPUTING REALIZATION FOR BIG DATA ANALYTICS **12 HOURS**

Introduction - Big Data Analytics - Data Analytics in the Fog - Prototypes and Evaluation - Architecture - Configurations - Case Studies - Future Research Directions.

TEXT BOOK

1. Rajkumar Buyya, and Sathish Narayana Siramma, Fog and Edge Computing Principles and Paradigms, Wiley 2017.

REFERENCE BOOKS

1. Assad Abbas, Samee U.Khan, Albert Y. Zomaya, Fog Computing Theory and Practice, Wiley Pubshilers, 2019.

MCA20R5110	RESEARCH METHODOLOGY	L	T	P	C
		4	0	0	3
Course Category: Major Elective		**Course Type** : Theory			

PREREQUISITE

Basic Knowledge in research methodologies

COURSE OBJECTIVES

This course gives an overview of research methodologies.

COURSE OUTCOMES

CO1: Able to understand and design the basic research concepts.
CO2: Able to identify the problem domain through information retrieval.
CO3: Able to reach the data collection and experimental research.
CO4: Capable to prepare and write the Dissertation and Research Papers.
CO5: Collect the information regarding plagiarism and patent.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M		**S**		S	S	M	S	S	S	M
CO2		M			S		M				M	
CO3	M		S			M	M		W	W	W	
CO4			S	S				S				S
CO5		M			M	M		M	M	M		M

UNIT – I: RESEARCH BASICS

Meaning of Research, Types of Research, Research Process, Problem definition, Objectives of Research, Research Questions, Research design, Approaches to Research, Quantitative vs. Qualitative Approach, Understanding Theory, Building and Validating Theoretical Models, Exploratory vs. Confirmatory Research, Experimental vs Theoretical Research, Importance of reasoning in research.

UNIT – II: RESEARCH FORMULATION

Problem Formulation, Understanding Modeling & Simulation, Conducting Literature Review, Referencing, Information Sources, Information Retrieval, Role of libraries in Information Retrieval, Tools for identifying literatures, Indexing and abstracting services, Citation indexes

UNIT – III: EXPERIMENTAL RESEARCH

Cause effect relationship, Development of Hypothesis, Measurement Systems Analysis, Error Propagation, Validity of experiments, Statistical Design of Experiments, Field Experiments, Data/Variable Types & Classification, Data collection, Numerical and Graphical Data Analysis: Sampling, Observation, Surveys, Inferential Statistics, and Interpretation of Results.

UNIT – IV: DOCUMENT WRITING

Preparation of Dissertation and Research Papers, Tables and illustrations, Guidelines for writing the abstract, introduction, methodology, results and discussion, conclusion sections of a manuscript. References, Citation and listing system of documents.

UNIT – V: INTELLECTUAL PROPERTY RIGHTS

Intellectual property rights (IPR) – patents -copyrights-Trademarks-Industrial design geographical indication. Ethics of Research- Scientific Misconduct- Forms of Scientific Misconduct. Plagiarism, Unscientific practices in thesis work, Ethics in science.

TEXT BOOKS

1. K. S. Bordens, and B. B. Abbott, Research Design and Methods – A Process Approach, 8th Edition, McGraw-Hill, 2011.
2. C. R. Kothari, Research Methodology – Methods and Techniques, 2nd Edition, New Age International Publishers, 2005.
3. M. Davis, K. Davis, and M. Dunagan, Scientific Papers and Presentations, 3rd Edition, Elsevier Inc., 2012.

REFERENCE BOOKS

1. Michael P. Marder, Research Methods for Science, Cambridge University Press, 2011.
2. T. Ramappa, Intellectual Property Rights Under WTO, 2008.
3. R. P. Merges, P. S. Menell, and M.A. Lemley, Intellectual Property in New Technological Age, Aspen Law & Business; 6th Edition July 2012.

MCA20R5111	PROGRAMMING IN MATLAB	L	T	P	C
		4	0	0	3
Course Category: Major Elective		**Course Type** : Theory			

COURSE OBJECTIVES

This course aims to make the students understand the concepts of MATLAB Programming. It helps to perform data handling in MATLAB environment, solve simple matrix problems and use built-in toolboxes.

COURSE OUTCOMES

CO1: Understanding the workspace, environment, array, and data types.

CO2: Able to create 2D and 3D plots.

CO3: Demonstrate the concepts of control structures and files.

CO4: Compute the complex data using algebra and interpolation.

CO5: Ability to create animation and visualization.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S		M		M			W			M	
CO2		S			S	M			M	M		
CO3	S			M				M				W
CO4	S		M			M	S			S		
CO5		S			M				M		M	M

UNIT – I: MATLAB BASICS **10 Hours**

Definition of MATLAB - Problem Solving in Engineering and Science. Functions: Using Built-In Functions - Elementary Math Functions - Trigonometric Functions - Data Analysis Functions - Random Numbers - Complex Numbers - Computational Limitations. Data Types - Multidimensional Arrays - Character Arrays Cell Arrays.

UNIT – II: MATRICS AND PLOTS **10 Hours**

Manipulating Matrices - Problems with Two Variables - Special Matrices - Two-Dimensional Plots - Subplots - Other Types of Two-Dimensional Plots - Three-Dimensional Plotting - Editing Plots from the Menu Bar - Saving Your Plots.

UNIT – III: CONTROL STRUCURES AND FILES **10 Hours**

Selection Structures - For Loops - While Loops - Break and Continue - Midpoint Break Loops - Nested Loops - Improving the Efficiency of Loops. User defined inputs – output options –graphical input – reading and writing data from files.

UNIT – IV: SYMBOLIC ALGEBRA **10 Hours**

Symbolic Algebra - Solving Expressions and Equations - Symbolic Plotting - Calculus – Interpolation - Curve Fitting - Using the Interactive Fitting Tools - Differences and Numerical Differentiation.

UNIT – V: GRAPHICS **10 Hours**

Images - Handle Graphics - Animation - Other Visualization Techniques - Introduction to Volume Visualization

TEXT BOOK

1. Holly Moore, MATLAB for Engineers, 3rd Edition, Pearson Publications, 2018.

REFERENCE BOOKS

1. Stephen J. Chapman, MATLAB Programming for Engineers, 4th Edition –Thomson learning, 2015.
2. Herniter, Marc E, Programming in MATLAB, Brooks/Cole Publishing Co., 2000.

MCA20R5112	ORGANIZATIONAL BEHAVIOR	L	T	P	C
		4	0	0	3

PREREQUISITE

Basic knowledge in business administration

COURSE OBJECTIVES

This course aims to provide a definition of motivation, distinguish between the various theories of motivation presented, apply some of these theories to the case study presented, determine how learning theory may be useful to an organization and explain why goal setting has been used in many organizations.

COURSE OUTCOMES

CO1: To provide an overview of the influential theoretical perspectives and research findings in the field of organizational behavior.

CO2: To offer a set of conceptual frameworks, methodological approaches, and analytical skills which are useful in increasing our understanding of human behavior in organizations.

CO3: To provide opportunities to practice the use of these conceptual frameworks through their application to organizational problems.

CO4: To challenge the student to think analytically and creatively about significant issues facing

CO5: To demonstrate organizational development

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S		M		M			W			M	
CO2		S			S	M			M	M		
CO3	S			M				M				W
CO4	S		M			M	S			S		
CO5		S			M				M		M	M

UNIT – 1: FOCUS AND PURPOSE

Organizational Behavior - Need and importance, nature and scope, framework.

UNIT -2: INDIVIDUAL BEHAVIOUR

Personality – types, factors influencing personality, theories – Learning – types of learners, learning theories – Organizational Behavior modification - Attitudes – characteristics, components, formation and measurement - Perceptions – importance, factors influencing perception, interpersonal perception – Motivation - Importance, types, and effects on work behavior.

UNIT – 3: GROUP BEHAVIOUR

Groups in organizations, influence, group dynamics – emergence of informal leaders and working norm, group decision making techniques - Interpersonal relations – communication, control.

UNIT – 4: DYNAMICS OF ORGANIZATIONAL BEHAVIOUR

Leadership styles – theories, leaders Vs managers, sources of power, power centers, power and politics - Organizational climate – factors affecting organizational climate, importance, job satisfaction, determinants, measurements, and influence on behavior.

UNIT – 5: ORGANIZATIONAL DEVELOPMENT

Organizational development - Importance, characteristics, objectives, stability Vs change, proactive Vs reaction change , the change process, resistance to change, managing change, team building - Organizational effectiveness, perspective, effectiveness Vs efficiency, approaches, the time dimension, achieving organizational effectiveness.

TEXT BOOKS

1. Fred Luthans, Organizational Behavior, 9th edition, Tata McGraw Hill publishing company Ltd., New Delhi, 2011.
2. Stephen P.Robins, Organizational Behavior, 9th edition, Prentice Hall of India, New Delhi, 2008.

REFERENCE BOOKS

1. Sekaran, Uma, Organizational Behavior, 4th edition, Tata McGraw Hill publishing company Ltd., New Delhi, 2011.
2. Hellriegel, Slocum and Woodman, Organizational Behavior, 11th edition, South-Western, Thomson Learning, New Delhi, 2010.
3. Schermerhorn, Hunt and Osborn, Organizational Behavior, 9th Edition, John Wiley, New Delhi, 2011.

MCA20R5113	HUMAN RESOURCE MANAGEMENT	L	T	P	C
		4	0	0	3

REREQUISITE

Basic understanding of human's nature

COURSE OBJECTIVE

This course aims to get ability of problem-solving human resource challenges, to develop effective written and oral communication skills, to develop decision making capability.

COURSE OUTCOMES

At the end of the course, the student able to

CO1: The student able to synthesize information regarding the effectiveness of recruiting methods and the validity of selection procedures, and make appropriate staffing decisions.

CO2: Design a training program using a useful framework for evaluating training needs, designing a training program, and evaluating training results.

CO3: Properly interpret salary survey data and design a pay structure with appropriate pay grades and pay ranges.

CO4: Evaluate a company's implementation of a performance-based pay system.

CO5: Demonstrate knowledge of employee benefit concepts, plan design, administrative considerations and regulations governing employee benefit practices.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S		M		M			W			M	
CO2		S			S	M			M	M		
CO3	S			M				M				W
CO4	S		M			M	S			S		
CO5		S			M				M		M	M

UNIT -1: INTRODUCTION TO HRM

Nature and Scope of Human Resource Management – Evolution of Human Resource Management – HR environment – Functions of a human resources management – Role of HR professionals – Emerging HR Trends.

UNIT -2: ACQUISITION OF HUMAN RESOURCES

Human Resource Planning – Strategic Human Resource Management – HR Policies – Job analysis and Design – Use of Human Resource Information System – Recruitment: sources and choice – Selection process: types of tests, Group discussion, Interviews and its types and medical test.

UNIT -3: HUMAN RESOURCE DEVELOPMENT

Socializing – Training and development – HRD programmes – Performance appraisal – Career Planning and Development – Disciplinary Procedures – Collective Bargaining.

UNIT -4: MOTIVATING HUMAN RESOURCES

Motivation Theories – Hawthorne Studies – Motivation and Morale – Participative Management – Quality Circle – Empowerment.

UNIT -5: MAINTENANCE OF WORKERS

Compensation Management – Reward system – Labour relations – Knowledge creation and Management – Employee Welfare, Safety and Health – Employee benefits and services – Promotion, Transfers and separation – Human resource Accounting and Audit – Ethical issues in HR Management and International Human Resource Management.

TEXT BOOKS

1. L. M. Prasad, Human Resource Management, 2nd Edition, Sultan Chand, New Delhi, 2001.
2. Ivancevich, Human Resource Management, 9th Edition, McGraw-Hill, New Delhi, 2003.

REFERENCE BOOKS

1. Biswajeet Pattanayak, Human Resource Management, 3rd Edition, Eastern Economy Edition, New Delhi, 2006.
2. Dessler, Human Resource Management, 3rd Edition, Pearson Education Limited, New Delhi, 2002.
3. Aswathappa, Human Resource and Personnel Management, 7th Edition, Tata McGraw Hill, New Delhi, 2005.
4. Ivancevich, Human Resource Management, 9th Edition, McGraw-Hill, New Delhi, 2003.
5. Leon G. Schiffman, Consumer Behaviour, 9th Edition, Prentice Hall India Ltd., New Delhi, 2007.

MCA20R5114	E-COMMERCE	L	T	P	C
		4	0	0	3

PREREQUISITE

Basic knowledge in internet concepts

COURSE OBJECTIVES

This course aims the students to illustrate management's role in the networked economy, identify strategies involved in running an e-commerce company, explain the four infrastructures influencing strategy, describe the history and basic technology of the Internet, and create a market analysis in the new online environment.

COURSE OUTCOMES

CO1: Learning the scope of e-commerce in the realm of modern business.
CO2: Ability to develop and deliver e-commerce applications.
CO3: Knowing the marketing methods used in e-commerce.
CO4: Gaining the knowledge about legal and regulatory framework.
CO5: Ability to know methods and metrics used to measure effectiveness of e-commerce activities.

MAPPING OF COURSE OUTCOMES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S		M		M			W			M	
CO2		S			S	M			M	M		
CO3	S			M				M				W
CO4	S		M			M	S			S		
CO5		S			M				M		M	M

UNIT – 1: E-BUSINESS

The difference between e-commerce and e-business - Types of e-commerce - Origins and Growth of E-commerce - Impact of E-commerce on Consumer, Organization and Society - Benefits and Limitations of E-commerce to Consumer, Organization and Society - Barriers to E-commerce - E-commerce business models and concepts.

UNIT – 2: SYSTEM ANALYSIS AND DESIGN

Planning - Systems analysis and design - Building the system: In-house vs. outsourcing - Website hosting: In-house vs. outsourcing - System Testing - Implementation and maintenance - Website optimization factors - Choosing web server software - Logistics and Order Fulfillment - Overview of E-commerce website development tools.

UNIT – 3: ELOCTRONIC TRANSFER

Payment systems - Merchant Accounts, Payment Gateways, Credit Cards Processing & Third Party Payment Processors - E-commerce digital payment in the B2C arena-Electronic Check, E-Cash, SET based payment systems

UNIT – 4: MARKETING CONCEPTS

The Internet audience - Internet traffic patterns - Basic marketing concepts - On-site Marketing Techniques – customer feedback, links, banner ads, affiliate programs, newsletters, emails

UNIT – 5: POLICY AND ISSUES

Impact of E-commerce on society - Legal/policy issues in e-commerce - Auctions- Portals - Communities

TEXT BOOK

1. Ravi Kalakota, Andrew B Whinston, Frontiers of E Commerce, Pearson Education 7th Edition 2011.

REFERENCE BOOK

1. Kenneth Laudon and Carol Guercio Traver, E-Commerce 2009: Business, Technology, and Society, 2009.