Syllabus for Master of Computer Applications (2 Year Course) for Affiliated Colleges under the jurisdiction of Vikrama Simhapuri University, Nellore with effect from the Academic Year 2022 – '23

VISION

The Department contributes effectively, ethically to produce quality professionals in the field of Information and Technology to graduated techno-students to serve impact and transform the Industry and Society.

MISSION

1. The department aims to generate groomed, technically competent and skilled intellectual professionals to meet the current challenges of the modern computing industry.
2. The department strives to groom students with diverse backgrounds into competitive software professionals with moral values and committed to build a vibrant nation.
3. Providing a strong theoretical and practical background across the computer science discipline with an emphasis on software development.
4. To achieve employability by effectively developing their technical skills, communication skills and personality.
5. To encourage an entrepreneurial environment and nurture innovative ideas.
6. To synchronise concepts, logic and skills for effective decision making.

PROGRAMME OUTCOMES (POs)

PO1	**Computational Knowledge:** Understand and apply mathematical foundation, computing and domain knowledge for the conceptualization of computing models from defined problems.
PO2	**Problem Analysis**: Ability to identify, critically analyze and formulate complex computing problems using fundamentals of computer science and application domains.
PO3	**Design / Development of Solutions**: Ability to transform complex business scenarios and contemporary issues into problems, investigate, understand and propose integrated solutions using emerging technologies
PO4	**Modern Tool Usage:** Ability to select modern computing tools, skills and techniques necessary for innovative software solutions
PO5	**Professional Ethics**: Ability to apply and commit professional ethics and cyber regulations in a global economic environment.
PO6	**Life-long Learning**: Recognize the need for and develop the ability to engage in continuous learning as a Computing professional.
PO7	**Communication Efficacy:** Communicate effectively with the computing community as well as society by being able to comprehend effective documentations and presentations.
PO8	**Societal & Environmental Concern:** Ability to recognize economical, environmental, social, health, legal, ethical issues involved in the use of computer technology and other consequential responsibilities relevant to professional practice.
PO9	**Individual & Team Work:** Ability to work as a member or leader in diverse teams in multidisciplinary environment.
PO10	**Innovation and Entrepreneurship:** Identify opportunities, entrepreneurship vision and use of innovative ideas to create value and wealth for the betterment of the individual and society.

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PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1	**Domain Specific Knowledge:** Develop solutions by applying relevant technique in the domain of Algorithms, Computer Programming, Multimedia, Web and Network Security.
PSO2	**Problem Solving Skills:** The ability to employ modern computer language environments and platforms for finding solutions with specific application development using suitable models.
PSO3	**Software Product Development:** Deliver quality software product by applying the design and development principles for various applications.

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MCA - First Semester

S. No.	Components of Course	Code of the Course	Title of the Course	Hours/ Week	Credits	IA Marks	EA Marks	Total Marks
1	Mandatory Course (All Compulsory)	22RACMCA1MC1	Computer Organization	4	4	30	70	100
		22RACMCA1MC2	Data Structures using C	4	4	30	70	100
		22RACMCA1MC3	Operating Systems	4	4	30	70	100
2	Compulsory Foundation (Any One)	22RACMCA1CF1	Discrete Mathematical Structures	4	4	30	70	100
		22RACMCA1CF2	Principles of Management					
		22RACMCA1CF3	Probability and Statistics					
		22RACMCA1CF4	Management Information System					
3	Elective Foundation (Any One)	22RACMCA1EF1	Web Technologies	4	4	30	70	100
		22RACMCA1EF2	Object Oriented Programming using C++					
		22RACMCA1EF3	Object Oriented Programming using Java					
4	Life Skill Course	22RACMCA1LS	Cyber Security	4	4	30	70	100
5	Practical -I	22RACMCA1P1	Data Structures using C Lab	4	2	30	70	100
6	Practical -II	22RACMCA1P2	Elective Foundation Lab	4	2	30	70	100
7	Practical -III	22RACMCA1P3	Cyber Security Lab	4	2	30	70	100
	Total			**36**	**30**	**270**	**630**	**900**
8	Audit Course		Value Education	0	0	50	0	50

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MCA - Second Semester

S. No	Components of Course	Code of the Course	Title of the Course	Hours/ Week	Credits	IA Marks	EA Marks	Total Marks
1	Mandatory Course (All Compulsory)	22RACMCA2MC1	Computer Networks	4	4	30	70	100
		22RACMCA2MC2	Database Management Systems	4	4	30	70	100
		22RACMCA2MC3	Software Engineering	4	4	30	70	100
2	Compulsory Foundation (Any One)	22RACMCA2CF1	Artificial Intelligence	4	4	30	70	100
		22RACMCA2CF2	Computer Graphics					
		22RACMCA2CF3	Operations Research					
		22RACMCA2CF4	Design & Analysis of Algorithms					
3	Elective Foundation (Any One)	22RACMCA2EF1	Advanced Java Programming	4	4	30	70	100
		22RACMCA2EF2	Python Programming					
		22RACMCA2EF3	R Programming					
4	Life Skill Course	22RACMCA2LS	Personality Enhancement and Leadership	4	4	30	70	100
5	Practical -I	22RACMCA2P1	Database Management Systems Lab	4	2	30	70	100
6	Practical -II	22RACMCA2P2	Elective Foundation Lab	4	2	30	70	100
	Total			**32**	**28**	**240**	**560**	**800**
7	Audit Course		Constitution of India	0	0	50	0	50

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MCA - Third Semester

SNo	Components of Course	Code of the Course	Title of the Course	Hours/ Week	Credits	IA Marks	EA Marks	Total Marks
1	Mandatory Course (All Compulsory)	22RACMCA3MC1	Cloud Computing	4	4	30	70	100
		22RACMCA3MC2	Cryptography and Network Security	4	4	30	70	100
		22RACMCA3MC3	Data Mining	4	4	30	70	100
2	Generic Elective (Any One)	22RACMCA3GE1	Machine Learning	4	4	30	70	100
		22RACMCA3GE2	Digital Image Processing					
		22RACMCA3GE3	DevOps					
3	Skill Enhancement Course	22RACMCA3SE	MEAN Stack Development	4	4	30	70	100
4	Practical -I	22RACMCA3P1	Data Mining Lab	4	2	30	70	100
5	Practical -II	22RACMCA3P2	MEAN Stack Development Lab	4	2	30	70	100
6	Open Elective (Any One)	22RACMCA3OE1	* **MOOCs - I (NPTEL/ SWAYAM)**: Any 12 Week Course on Management/ Mathematics/ Applied Mathematics/ Statistics offered by other than Computer Science Department	4	4	30	70	100
		22RACMCA3OE2	Course(s) offered by other Departments in the College					
	Total			**32**	**28**	**240**	**560**	**800**

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MCA - Fourth Semester

S.No.	Components of Course	Code of the Course	Title of the Course	Hours/ Week	Credits	IA Marks	EA Marks	Total Marks
1	Compulsory Foundation	22R ACMCA4CF	# MOOCs - II (NPTEL/ SWAYAM): Any 12 Week duration course related to Computer Science which is not listed in the course structure	4	4	30	70	100
2	Industrial Project Work	22RACMCA4IPW	Major Project Work	32	16	100	200	300
Total				**36**	**20**	**130**	**270**	**400**

* Students shall complete MOOCs I (NPTEL / SWAYAM) Course before end of the third semester.
# Students shall complete the MOOCs II & III (NPTEL / SWAYAM) Courses before submission of the Major Project Work.

Note: MOOCs – I & II Courses should be approved by BOS.

Open Electives: The Open Electives offered by the Computer Science Department to other Department students are

1. Programming in C 2. Programming in Java 3. Structured Query Language 4. HTML 5. MS-Office

Semester	Hours	Credits	IA Marks	EA Marks	Total Marks
I	36	30	320	630	950
II	32	28	290	560	850
III	32	28	240	560	800
IV	36	20	130	270	400
Total	136	106	880	2020	3000

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Programme	MCA	Semester	First	
Course Code	22RACMCA1MC1	Course Name	Computer Organization	
Course Category	Mandatory	Hours/Week	L	P
			4	0
		Credits	4	

Course Objectives	1. To learn internal architecture of a digital computer. 2. To understand different number systems. 3. To understand organization of a computer, memory, I/O devices. 4. To understand different types of system softwares.
UNIT -1	**Basic Structure of Computers**- Functional Units- Basic Operational Concepts- Bus Structure- Software- Performance- Multiprocessor and Multicomputer – Historical Perspective.
UNIT -2	**Number System and Computer Arithmetic** – Signed and Unsigned Numbers, Addition and Subtraction, Multiplication, Division, Floating Point Arithmetic Operations, Logic Gates, Boolean Algebra , K-Maps. **Combinational and Sequential Circuits** – Half adder, Full adder, Flip flops, Sequential Circuits, Decoders, Encoders, Multiplexers, Registers, Shift Registers, Binary Counters.
UNIT -3	**Memory Organization** - Memory hierarchy, Main memory - RAM, ROM chips, Memory address map, memory connection to CPU, Associative Memory-Hardware logic, match, read and write logic, Cache Memory - Associative mapping, Direct mapping, Set-associative mapping, hit and miss ratio. **Micro Programmed Control:** Control memory, Address sequencing, Micro Program example, design of control unit, Hard wired control, Micro programmed control
UNIT -4	**Input - Output Organization** - Peripheral devices, input-output interface-I/O Bus and interface modules, I/O versus Memory bus, isolated versus memory mapped I/O, Modes of transfer-Programmed I/O, Interrupt-initiated I/O, priority interrupts-Daisy chaining, parallel priority, interrupt cycle, DMA- DMA control, DMA transfer, Input output processor-CPU-IOP communication. **Pipeline and Vector Processing:** Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors.
Text Books	1. Mano M.M. Computer System Architecture, 3rd edition. PHI, 1993. 2. Hamacher C, Vranesic Z, and Zaky S. Computer Organization, 5th edition, Mc Graw – Hill,2002.

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References	1. Stallings W, Computer Organization and Architecture, 6th edition. Parson Education, 2003. 2. Mano M.M. Computer System Architecture, 3rd edition. PHI, 1993. 3. Yarbrough JM, Digital Logic – Applications and Design, Thomas Lernig, 1997. 4. Heuring VP, and Jordan HF, Computer Systems Design and Architecture, Pearson Education, 1997.

Course Outcomes : After completion of the course student able to

	Course Outcome Description	**Knowledge Level**
CO1	Understands number systems, digital devices, computer organizations and system software.	K2
CO2	Apply logical principles learn from Boolean algebra.	K3
CO3	Analyze various computer performance impacting parameters.	K4
CO4	Evaluate various designing principles of Assembler, Loader and Macro Processors.	K5

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO 3
CO1	2	-	2	-	-	-	-	-	-	-	3	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	2	-
CO3	3	3	-	-	-	-	-	-	-	-	2	-	2
CO4	3	-	-	-	-	-	-	-	-	-	2	2	-

1-Low, 2-Medium, 3-High

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Programme	MCA	Semester	First	
Course Code	22RACMCA1MC2	Course Name	Data Structures using C	
Course Category	Mandatory	Hours/Week	L	P
			4	0
		Credits	4	
Course Objectives	1. To introduce the fundamental concept of data structures 2. To understand the importance of data structures in designing Algorithms. 3. To develop skills to apply appropriate data structures in problem solving 4. To understand searching and sorting techniques and solving problems.			
UNIT -1	**INTRODUCTION TO DATA STRUCTURES:** Introduction to the Theory of Data Structures, Data Representation, Abstract Data Types, Data Types, Primitive Data Types, Data Structure and Structured Type, Atomic Type, Difference between Abstract Data Types, Data Types, and Data Structures. **PRINCIPLES OF PROGRAMMING AND ANALYSIS OF ALGORITHMS:** Program Design, Algorithms, Different Approaches to Designing an Algorithm, Complexity, Big 'O' Notation, Algorithm Analysis. **ARRAYS:** Introduction to Linear and Non- Linear Data Structures, One-Dimensional Arrays, Array Operations, Two-Dimensional Arrays, Multi-Dimensional Arrays. **LINKED LISTS:** Introduction to Lists and Linked Lists, Dynamic Memory Allocation, Basic Linked List Operations, Doubly Linked List, Circular Linked List, Atomic Node Linked List, Linked List in Arrays, Linked Lists versus Arrays.			
UNIT -2	**STACKS:** Introduction to Stacks, Stack as an Abstract Data Type, Representation of Stacks through Arrays, Representation of Stacks through Linked Lists, Application of Stacks, Stacks and Recursion. **QUEUES:** Introduction, Queue as an Abstract Data Type, Representation of Queues, Circular Queues, Double Ended Queues – Deques, Priority Queues, Application of Queues.			
UNIT -3	**BINARY TREES:** Introduction to Non-Linear Data Structures, Introduction to Binary Trees, Types of Trees, Basic definition of Binary Trees, Properties of Binary Tree, Representation of Binary Trees, Operations of a Binary Search Trees, Binary Tree Traversal, Reconstruction of Binary Tree. **ADVANCED TREES, FORESTS AND ORCHARDS:** AVL Trees or Height – Balanced Trees, Representation of AVL Trees, Operations on AVL Trees, Threaded Binary Trees, Forests and Orchards, Expression Trees.			

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UNIT -4	**SEARCHING AND SORTING:** Introduction, Efficiency of sorting Algorithms, Bubble Sort, Selection Sort, Quick Sort, Insertion Sort, Merge Sort, Binary Tree Sort, Radix Sort, Shell Sort, Heap Sort, **Searching** – Introduction, Linear or Sequential Search, Binary Search, Indexed Sequential Search. **GRAPHS:** Introduction to Graphs, Terms Associated with Graphs, Sequential Representation of Graphs, Linked Representation of Graphs, Traversal of Graphs, Spanning Trees, Shortest Path, Application of Graphs.
Text Books	Data Structures using C by ISRD Group, Second Edition, McGraw Hill Education

Course Outcomes : After completion of the course student able to

	Course Outcome Description	Knowledge Level
CO1	Define data structure, various types of Data Structures and list out their applications	K1, K2
CO2	Identify suitable data structures for various applications	K3
CO3	Analyze strength, weakness and complexity of different data structures and their operations	K5
CO4	Design Algorithms for Data Structures operations	K6

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	-	-	-	-	-	-	-	-	3	-	-
CO3	3	3	3	-	-	-	-	-	-	-	3	3	-
CO4	3	3	3	3	-	3	3	-	-	2	3	3	3
1-Low, 2-Medium, 3-High													

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Programme	MCA	Semester	First	
Course Code	22RACMCA1MC3	Course Name	Operating Systems	
Course Category	Mandatory	Hours/Week	L	P
			4	0
		Credits	4	
Course Objectives	1. To understand the fundamental concepts and techniques of Operating Systems. 2. To study the concepts in process management and concurrency control mechanisms 3. To understand the concepts in memory managements and deadlocks 4. To study on file management and storage structures.			
UNIT -1	**INTRODUCTION**: Overview-Introduction-Operating system objectives, Computer System Organization, Computer System Architecture, OS Structure, OS Operations, Process Management, Memory Management, Storage Management, Protection and Security, Computing Environments. Operating System services, User and OS Interface, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation, OS Structure, OS Generation, System Boot. **PROCESS MANAGEMENT:** Process Concept, Process Scheduling, Operations on Processes, Inter process Communication, Communication in Client – Server Systems.			
UNIT -2	**CPU SCHEDULING:** Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Real-time Scheduling, Algorithm Evaluation. **PROCESS SYNCHRONIZATION:** Background, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, Atomic Transactions. **DEADLOCKS:** System Model, Deadlock Characterization, Methods for handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock			
UNIT -3	**MEMORY MANAGEMENT:** Background, Swapping, Contiguous Memory Allocation, paging, Structure of the Page Table, Segmentation, Segmentation with Paging. **VIRTUAL MEMORY:** Background, Demand Paging, Process Creation, Page Replacement, Allocation of Frames, Thrashing. **FILE SYSTEM INTERFACE:** File Concept, Access Methods, Directory Structure, File – System Mounting, File Sharing, Protection.			

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UNIT -4	**FILE SYSTEM IMPLEMENTATION:** File System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free Space Management. **MASS - STORAGE STRUCTURE:** Disk Structure, Disk Scheduling, Disk Management, Swap- Space management, RAID Structure, Stable – Storage Implementations, Tertiary Storage Structure.
Text Books	Operating System Principles by Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Seventh Edition.

Course Outcomes : After completion of the course student able to

	Course Outcome Description	Knowledge Level
CO1	Understand the concept of OS, resource management in operating systems, implementation of file systems and directories along with the interfacing of IO devices with the operating system.	K1
CO2	Evaluate various scheduling algorithms.	K3
CO3	Identify the dead lock situation and provide appropriate solution so that protection and security of the operating system is also maintained.	K4
CO4	Ability to design and solve synchronization problems, Apply memory management techniques in the design of operating systems	K6

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	1	-	3
CO2	3	-	-	-	-	-	-	-	-	-	-	2	3
CO3	-	3	2	-	-	-	-	-	-	-	-	1	-
CO4	-	3	-	-	-	-	-	-	-	-	2	-	-

1-Low, 2-Medium, 3-High

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Programme	MCA	Semester	First	
Course Code	22RACMCA1CF1	Course Name	Discrete Mathematical Structure	
Course Category	Compulsory Foundation	Hours/Week	L	P
			4	0
		Credits	4	

Course Objectives	1. To introduce concepts of mathematical logic for analyzing propositions and proving theorems. 2. To use sets for solving applied problems, and use the properties of set operations algebraically. 3. To investigate functions as relations and their properties. 4. To introduce basic concepts of graphs, digraphs and trees.
UNIT -1	**Foundations:** Basics, Sets and Operations of Sets, Relations and Functions,Some Methods of Proof and Problem – Solving Strategies, Fundamentals of Logic, Logical Inferences, Methods of Proof of an Implication, First Order Logic and Other Methods of Proof, Rules of Inference for Quantified Propositions, Mathematical Induction. **Chapter (1)** **Elementary Combinatorics:** Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multinomial Theorems, The Principle of Inclusion - Exclusion. **Chapter (2)**
UNIT -2	**Recurrence Relations:** Generating Functions of Sequences, Calculating Coefficients of Generating functions, Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, The Method of Characteristic Roots, Solution of Inhomogeneous Recurrence Relations. **Chapter (3)**
UNIT -3	**Relations and Digraphs:** Relations and Directed Graphs, Special Properties of Binary Relations, Equivalence Relations, Ordering Relations, Lattices and Enumerations, Paths and Closures, Directed Graphs and Adjacency Matrices, Operations on Relations. **Chapter (4)**
UNIT -4	**Graphs:** Basic Concepts, Isomorphisms and Subgraphs, Trees and Their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler Formula, Multigraphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four-Color problem **(Chapter 5)**
Text Books	1. Discrete Mathematics For Computer Scientists & Mathematicians (Chapter 1-5) by Joe L. Mott, Abraham Kandel and Theodore P. Baker.
References	1. Discrete Mathematics & Its Applications with Combinatorics and Graph Theory by Kenneth H Rossen (TMH). 2. Discrete Mathematical Structures with Applications to Computer Science by J. P Tremblay and R. Manohar,, MCGraw Hill Education (India) Private Limited.

Course Outcomes : After completion of the course student able to

	Course Outcome Description	Knowledge Level
CO1	Analyze logical propositions via truth tables.	K4
CO2	Prove mathematical theorems using mathematical induction.	K5
CO3	Understand sets and perform operations and algebra on sets	K2
CO4	Construct a spanning tree by using search techniques	K3

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	-	-	-	-	-	-	-	-	3	-	-
CO2	-	3	2	-	-	-	-	-	-	-	2	2	-
CO3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO4	3	-	3	-	-	-	-	-	-	-	-	3	-
1-Low, 2-Medium, 3-High													

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Programme	MCA	Semester	First	
Course Code	22RACMCA1CF2	Course Name	Principles of Management	
Course Category	Compulsory Foundation	Hours/Week	L	P
			4	0
		Credits	4	

Course Objectives	1. To help the students gain understanding of the functions and responsibilities of managers. 2. To provide them tools and techniques to be used in the performance of the managerial job. 3. To enable them to analyze and understand the environment of the organization. 4. To help the students to develop cognizance of the importance of management principles.
UNIT -1	**Fundamentals of Management** **Management:** Meaning – Definition – Nature and scope of management – characteristics of Management, Systems approach to Management **Management Functions:** Planning, Organizing, Staffing, Directing, Coordinating, Controlling Management and Administration. Principles of Management by Henry Fayol. Effective manager.
UNIT -2	**Planning** - meaning – significance– Steps in Planning, Types of Plans - Decision making – Types of Decisions - Steps in decision making process.– DSS. **Organization**–organizing - meaning –Principles of Organization – Line and Staff Organization, Departmentation.
UNIT -3	**Controlling:** Meaning – Definition – Characteristics of control – Objectives of control – Steps involved in control process – Characteristics of effective control system, Control Techniques.
UNIT -4	**Leader ship :** Meaning of Leadership : Characteristics of Leadership – Importance of Leadership – Qualities of a successful leader – Traits theory and Managerial grid Approach . **Communication :** Meaning and Importance of Communication – Characteristics of Communication – Process of Communication – Principles of effective Communication – Barriers to Communication – How to remove communication Barriers.
Text Books	1. Organization and Management by R.G. Agarwal Tata MC Graw . Hill publishing Company. 2. Essentials of Management, Harold Koontz & Heinz Weihrich, the Tata McGraw Hill publishing. 3. Principles of Management PC Tiipathi, PN Reddy, Tata McGraw Hill publishing.

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References	1. Principles and Practice of Management by Nair , Banerjee and Agrawal Pragati Prakashan. 2. Principles and Practice of Management by L.M. Prasad Sulthan Chand & Sons 3. Principles of Management by R.K.Sarma & Sashi K Gupta Kalyani Publications.

Course Outcomes : After completion of the course student able to

	Course Outcome Description	**Knowledge Level**
CO1	Understand the concepts related to Business.	K2,K1
CO2	Demonstrate the roles, skills and functions of management	K2
CO3	Analyze effective application of PPM knowledge to diagnose and solve organizational problems and develop optimal managerial decisions.	K3,K4
CO4	Understand the complexities associated with management of human resources in the organizations and integrate the learning in handling these complexities.	K5,K6

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	1	2	2	3	3	2
CO2	3	3	2	1	1	1	1	2	3	3	3
CO3	3	3	2	2	3	2	2	3	3	3	3
CO4	3	3	1	3	2	2	3	3	3	3	3

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Programme	MCA	Semester	First	
Course Code	22RACMCA1CF3	Course Name	Probability and Statistics	
Course Category	Compulsory Foundation	Hours/Week	L	P
			4	0
		Credits	4	
Course Objectives	1. To provide students with the foundations of probabilistic and statistical analysis mostly used in varied applications in engineering and science like disease modelling, climate prediction and computer networks etc. 2. To provide an understanding of the basic concepts in probability, conditional probability and independent events. 3. To understand random variable, mathematical expectation, and different types of distributions, sampling theory and estimation theory. 4. To design a statistical hypothesis about the real world problem and conduct appropriate test for drawing valid inference about the population characteristics. It is inevitable to have the knowledge of hypothesis testing for any research work.			
UNIT -1	**INTRODUCTION & PROBABILITY:** Introduction – Random Experiment – Sample Space and events – Mathematical probability – some Elementary theorems- Addition theorem of probability - Boole's Inequality - Conditional probability - Multiplication Theorem of probability, Bayesian Theorem. **PROBABILITY DISTRIBUTIONS:** Binomial and Poission Distributions			
UNIT -2	**CURVE FITTING TECHNIQUES:** Linear and Non-Linear techniques. **CORRELATION:** Definition of correlation. Scatter diagram – Karl Pearson's Coefficient of correlation – Limits for correlation coefficient- Spearman's Rank correlation coefficient. Regression: Introduction – Linear Regression – Multiple regressions.			
UNIT -3	**NULL AND ALTERNATIVE HYPOTHESIS** – Type – I error Type – II error – Critical Region – Level of significance – one tailed and two – tailed test. **SIGNIFICANCE TESTS**:Comparision between Large and Small Sample tests , t-test , F-test and chi square test.			
UNIT -4	**SAMPLING SURVEY:** Concept of Population and Sample, Sampling Frame,Census Survey and Sample Survey,Sampling and Non-Sampling Errors. **ANALYSIS OF QUALITATIVE DATA** Notations,Class,Order of Class Frequencies,Ultimate Class Frequencies,Consistency of Data,Conditions for Consistency of Data for 2 and 3 attributes only, Independence of Attributes,Association of Attributes and its measures.			
Text Books	1. Fundamentals of Mathematical Statistics, Gupta, Kapoor , S. Chand. 2. Theory and Methods of Survey Sampling, Mukhopadhyay , Parimal , Prentice Hall India Learning Private Limited			
References	1. Probability and Statistics for MCA, T. K. V. Iyengar, B. Krishna Gandhi, S. Ranganathan, M .V. S .S. N. Prasad, S. Chand and Company Ltd. 2. Press. Elements of Sampling Theory and Methods, Z. Govindarajulu,Pearson			

Course Outcomes : After completion of the course student able to

	Course Outcome Description	Knowledge Level
CO1	Apply key concepts of probability, including discrete and continuous random variables, probability distributions, conditioning, independence, expectations, and variances along with the statistical distributions.	K3
CO2	Define and explain the different linearity techniques and the regression concepts with examples..	K1,K2
CO3	Impart the concepts of statistical hypothesis and significant tests	K3,K5
CO4	Understand the concepts of sampling and data analysis testing.	K2

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	2	-	-
CO2	3		-	-	-	-	-	-	-	-	-	2	-
CO3	3	3	-	-	-	-	-	-	-	-	-	2	-
CO4	3		-	-	-	-	-	-	-	-	1	-	-

1-Low, 2-Medium, 3-High

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Programme	MCA	Semester	First	
Course Code	22RACMCA1CF4	Course Name	Management Information System	
Course Category	Compulsory Foundation	Hours/Week	L	P
			4	0
		Credits	4	
Course Objectives	1. To describe the role of information technology and decision support systems in business and record the current issues with those of the firm to solve business problems. 2. To introduce the fundamental principles of computer-based information systems analysis and design and develop an understanding of the principles and techniques used. 3. To enable students understand the various knowledge representation methods and different expert system structures as strategic weapons to counter the threats to business decision making and make business more competitive. 4. To enable the students to use information system and technology on business system electronic outcome of the information and decision making.			
UNIT -1	**Introduction to MIS** – Importance of information for management decisions – Systems Approach and Information – System Development – Information System Architecture.			
UNIT -2	**Structure of MIS:** Basic structural concepts: formal and informal information systems; public and private information systems; Information Systems– MIS Office automation – Decision Support System – Expert system- Knowledge Work Systems, Group Decision Support Systems (GDSS).			
UNIT -3	**MIS Development and System Methodology** –System development methodologies; SDLC approach; prototyping approach csf method, case methodology and user development approach.			
UNIT -4	**Implementation, Maintenance and Control of MIS** –Implementation process, evaluation, pitfalls of MIS implementation, maintenance, need and approaches-IS security (Minimum 5 cases to be dealt each from each unit so that all units will be covered)			
Text Books	1. Management Information Systems, C Laudon and Jane P.Laudon, et al, Pearson Education 2. Management Information Systems Text & Cases, W S Jawadekar, Tata McGraw-Hill. 3. Management Information Systems, Dharminder and Sangeetha, 1/e, Excel books.			
References	1. MIS, Hossein Bidgoli, Nilanjan Chattopadhyay, Cengage Learning 2. Introduction to Information Systems, Rainer, Turban, Potter, WILEY-India. 3. Management Information Systems, James A. Obrein, Tata McGraw-Hill . 4. Cases in MIS ,Mahapartra,PHI. 5. Management Information Systems, Gordon B. Davis & Margrethe H.Ol son, Tata McGraw-Hill			

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Course Outcomes : After completion of the course student able to

	Course Outcome Description	Knowledge Level
CO1	Relate the basic concepts and technologies used in the field of management information systems.	K2
CO2	Compare the processes of developing and implementing information systems.	K3
CO3	Outline the role of the ethical, social, and security issues of information systems	K2
CO4	Translate the role of information systems in organizations, the strategic management processes, with the implications for the management.	K4, K6

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO 3
CO1	1	-	-	-	2	-	-	-	3	-	-	1	-
CO2	-	2	-	2	-	-	2	-	-	-	2	-	-
CO3	-	-	2	-	-	-	-	1	-	-	-	-	1
CO4	1	-	-	-	-	1	-	3	-	1	-	-	2
1-Low, 2-Medium, 3-High													

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Programme	MCA	Semester	First	
Course Code	22RACMCA1EF1	Course Name	Web Technologies	
Course Category	Elective Foundation	Hours/Week	L	P
			4	0
		Credits	4	

Course Objectives	1. To acquaint with HTML basic tags, frames, lists, table, etc. 2. To build basic websites using HTML and Cascading Style Sheets. 3. To validate web pages with the help of javascript. 4. To creating web pages which are dynamic and interactive.
UNIT -1	**Introduction to HTML 5:** Introduction, Editing XHTML, First XHTML Example, W3C XHTML Validation Service, Headings, Linking, Images, Special Characters and Horizontal Rules, Lists, Tables, Forms, Internal Linking, Meta Elements. **Cascading Style Sheets (CSS):** Introduction, Inline Styles, Embedded Style Sheets, Conflicting Styles, Linking External Style Sheets, Positioning Elements, Backgrounds, Element Dimensions, Box Model and Text Flow, Media Types, Building a CSS Drop – Down Menu, Animations, Selectors, Transitions and Transformations,
UNIT -2	**Javascript:** Introduction to Scripting: Introduction, Simple Program, Modifying Our First Program, Obtaining User Input with prompt Dialogs, Memory Concepts, Arithmetic, Decision Making. **Javascript: Control Statements I:** Introduction, Algorithms, Pseudo Code, Control Structures, if Selection Statement, if…else Selection Statement, while Repetition Statement, Formulating Algorithms: Counter – Controlled Repetition, Sentinel – Controlled Repetition, Nested Control Statements, Assignment Operators, Increment and Decrement Operators.
UNIT -3	**Javascript: Control Statements II:** Introduction, Essentials of Counter – Controlled Repetition, for Repetition Statement, Examples Using the for Statement, switch Multiple – Selection Statement, do… while Repetition Statement, break and continue Statements, Labeled break and continue Statements, Logical Operators. **Javascript: Functions:** Introduction, Program Modules in JavaScript, Function Definitions, Random Number Generation, Scope Rules, JavaScript Global Functions, Recursion, Recursion vs. Iteration, display random images.
UNIT -4	**Javascript: Arrays:** Introduction, Arrays, Declaring and Allocating Arrays, Examples Using Arrays, Random Inage Generator Using Arrays, References and Reference Parameters, Passing Arrays to Functions, Sorting Arrays, Searching Arrays, Multidimensional Arrays. **Javascript: Objects:** Introduction, Math Object, String Object, Date Object, Boolean and Number Objects, document Object.
Text Books	1. P.I. DEITEL, H.M. DEITEL, "Internet and World Wide Web, How to Program, Pearson Prentice Hall, Fourth Edition." 2. Web Technologies, Uttam K Roy, Oxford University Press. 3. The Complete Reference PHP — Steven Holzner, Tata McGraw-Hill.

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

Course Outcomes : After completion of the course student able to

	Course Outcome Description	Knowledge Level
CO1	Analyze a web page and identify its elements and attributes.	K4
CO2	Illustrate validation for web pages.	K2
CO3	Build dynamic web pages using JavaScript (client side programming).	K3
CO4	Construct web sites with valid HTML, CSS, JavaScript	K6

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	-	3	-	-	-	-	-	-	-	-	3	-	-
CO2	3	2	2	-	-	-	-	-	-	-	2	2	-
CO3	-	-	3	-	-	-	-	-	-	-	-	2	2
CO4	-	-	3	-	-	-	-	-	-	-	2	-	-

1-Low, 2-Medium, 3-High

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Programme	MCA	Semester	First	
Course Code	22RACMCA1EF2	Course Name	Object Oriented Programming using C++	
Course Category	Elective Foundation	Hours/Week	L	P
			4	0
		Credits	4	

Course Objectives	1. To introduce concepts of OOPs. 2. To understand how the OOPs concepts are implemented in C++. 3. To write programme using classes, Inheritance. 4. To understand importance of Exception Handling and implement in C++.
UNIT -1	**Basics, Tokens, Expressions:** Software Crisis, Software Evolution, Procedure Oriented Programming Paradigm, Basic Concepts of OOP, Benefits of OOP, Object Oriented Languages, Features of OOP, Applications of OOP, A Simple C++ Program, Structure of C++ Program, Tokens, Keywords, Identifiers and Constants, Basic Data Types, User Defined Data Types, Derived Data Types, Dynamic Initialization of Variables, Reference Variables, Operators in C++, Scope Resolution Operator, Member Dereferencing Operators, Memory Management Operators.
UNIT -2	**Functions, Classes and Objects:** Introduction to classes, Specifying a class, Defining a member Functions, A C++ Program with Class Access Specifiers, Inline function, Nesting of Member Functions, Memory Allocation for Objects, Static Data Members, Static Member Functions, Array of Objects, Object as Function Arguments, Default Arguments, Const Arguments, Function Overloading, Friend Functions & Virtual Functions.
UNIT -3	**Constructors, Destructors, Inheritance:** Introduction, Constructors, Parameterized Constructors, Multiple Constructors in a Class, Constructors with Default Arguments, Dynamic initialization of Objects, Copy Constructors, Dynamic Constructors, Destructors, Operator Overloading, Rules for Operator Overloading, Overloading of Binary and Unary Operators, Introduction to Inheritance, Defining Derived Classes, Single Inheritance, Multiple Inheritance, Multi Level Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Abstract Classes, Constructors in Derived Classes, Containership.
UNIT -4	Derived Classes, Virtual Functions, Pure Virtual Functions. **Templates and Exception handling:** Introduction, Class Templates, Class Templates with Multiple Parameters, Function Templates, Function templates with Multiple Parameters, Member Function Templates, Basic of Exception Handling, Exception Handling Mechanism, Throwing and Catching Mechanism, Rethrowing an Exception, Specifying Exceptions.
Text Books	Object Oriented Programming in C++ by E. Balagurusamy, Published by Tata McGraw – Hill.

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Course Outcomes : After completion of the course student able to

	Course Outcome Description	**Knowledge Level**
CO1	Define Class, Object, Inheritance, Polymorphism, Function	K1
CO2	Understand syntaxes for implement statements and OOPs concepts	K2
CO3	Apply OOPs concepts while writing program	K3
CO4	Execute performance C++ program	K6

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO 3
CO1	3	3	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	-	-	-	-	-	-	-	-	3	-	-
CO3	3	3	3	-	-	-	-	-	-	-	3	3	-
CO4	3	3	3	3	-	3	3	-	-	2	3	3	3

1-Low, 2-Medium, 3-High

Programme	MCA	Semester	First	
Course Code	22RACMCA1EF3	Course Name	Object Oriented Programming using Java	
Course Category	Elective Foundation	Hours/Week	L	P
			4	0
		Credits	4	
Course Objectives	1. To impart knowledge of object-oriented paradigm in the Java programming language 2. To introduce the fundamentals of Object-Oriented Programming concepts in Java including Classes, Objects, Abstraction, Encapsulation, Inheritance, Polymorphism, and exception handling mechanisms etc. and apply them in problem solving. 3. To share knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc. 4. To provide sufficient knowledge about developing real world projects with object oriented concepts			
UNIT -1	**INTRODUCTION TO JAVA:** Features of Java, The Java Virtual Machine, Parts of Java. **FIRST STEP TOWARDS JAVA PROGRAMMING:** API Document, Starting a Java Program, Formatting the Output. **NAMING CONVENTIONS AND DATA TYPES:** Naming Conventions in Java, Data Types in Java, Literals. **OPERATORS IN JAVA:** Operators, Priority of Operators. **CONTROL STATEMENTS IN JAVA:** if...else Statement, do...while Loop, while Loop, for Loop, switch Statement, break Statement, continue Statement, return Statement. **INPUT AND OUTPUT STREAMS IN JAVA:** Accepting Input from the Keyboard, Reading Input with java.util.Scanner Class, Displaying Output with System.out.printf(), Displaying Formatted Output with String.format() **(Chapters: 2, 3, 4, 5, 6, 7 of the Text Book)**			

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UNIT -2	**ARRAYS:** Types of Arrays, Three Dimensional Arrays (3D Array), Command Line Arguments. **STRINGS:** Creating Strings, String Class Methods, String Comparison, Immutability of Strings. **STRINGBUFFER AND STRINGBUILDER:** Creating StringBuffer Objects, StringBuffer Class Methods, StringBuilder Class, StringBuilder Class Methods. **INTRODUCTION TO OOPS:** Problems in Procedure Oriented Approach, Features of Object Oriented Programming System (OOPS). **CLASSES AND OBJECTS:** Object Creation, Initializing the Instance Variables, Access Specifiers, Constructors. **(Chapters: 8, 9, 10, 11, 12 of the Text Book)**
UNIT -3	**METHODS IN JAVA:** Method Header or method Prototype, Method Body, Understanding Methods, Static Methods, Static Block, The Keyword 'this', Instance Methods, Passing Primitive Data Types to Methods, Passing Objects to Methods, Passing Arrays to Methods, Recursion, Factory Methods. **RELATIONSHIP BETWEEN OBJECTS:** Relating Objects using References, Inner Class. **INHERITANCE:** Inheritance, The Keyword 'super', The Protected Specifier, Types of Inheritance. **POLYMORPHISM:** Polymorphism with Variables, Polymorphism using Methods, Polymorphism with Static Methods, Polymorphism with Private Methods, Polymorphism with Final Methods, final Class. **TYPE CASTING:** Types of Data Types, Casting Primitive Data Types, Casting Referenced Data Types, The Object Class. **ABSTRACT CLASSES:** Abstract Method and Abstract Class. **(Chapters: 13, 14, 15, 16, 17, 18 of the Text Book)**

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UNIT -4	**INTERFACES:** Interface, Multiple Inheritance using Interfaces. **PACKAGES:** Package, Different Types of Packages, The JAR Files, Interfaces in a Package, Creating Sub Package in a Package, Access Specifiers in Java, Creating API Document. **EXCEPTION HANDLING:** Errors in a Java Program, Exceptions, throws Clause, throw Clause, Types of Exceptions, Re-throwing an Exception. **THREADS:** Single Tasking, Multi Tasking, Uses of Threads, Creating a Thread and Running it, Terminating the Thread, Single Tasking Using a Thread, Multi Tasking Using a Thread, Multiple Threads Acting on Single Object, Thread Class Methods, Deadlock of Threads, Thread Communication, Thread Priorities, Thread Group, Daemon Threads, Applications of Threads, Thread Life Cycle. **APPLETS:** Creating an Applet, Uses of Applets, <APPLET> tag, A Simple Applet Program. **(Chapters: 19, 20, 21, 26, 30 of the Text Book)**
Text Books	Core JAVA An Integrated Approach by Dr. R. Nageswara Rao, Dreamtech Publication, 2010 Edition.
References	Java Fundamentals: A Comprehensive Introduction by Herbert Schildt, Dale Skrien, MC Graw Hill Education (India) private Limited, New Delhi Sixth reprint 2015.

Course Outcomes : After completion of the course student able to

	Course Outcome Description	Knowledge Level
CO1	Understand various programming paradigms	K2
CO2	Implement the concepts of object-oriented programming	K3
CO3	Gain knowledge about basics of Java Language to write Java Programming.	K1
CO4	Ability to design and develop Object Oriented programs	K6

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO 3
CO1	3	-	-	-	-	-	-	-	-	-	2	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	2	2
CO3	3	-	-	-	-	-	-	-	-	-	-	2	-
CO4	-	-	3	-	-	-	-	-	-	-	2	2	-

1-Low, 2-Medium, 3-High

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Programme	MCA	Semester	First	
Course Code	22RACMCA1LS	Course Name	Cyber Security	
Course Category	Life Skill Course	Hours/Week	L	P
			4	0
		Credits	4	
Course Objectives				
UNIT -1	**Overview of Cyber security:** Cyber security increasing threat landscape, Cyber security terminologies- Cyberspace, attack, attack vector, attack surface, threat, risk, vulnerability, exploit, exploitation, hacker., Non-state actors, Cyber terrorism, Protection of end user machine, Critical IT and National Critical Infrastructure, Cyberwarfare, Case Studies.			
UNIT -2	**Cyber Crimes:** Cyber crimes targeting Computer systems and Mobiles- data diddling attacks, spyware, logic bombs, DoS, DDoS, APTs, virus, Trojans, ransomware, data breach., Online scams and frauds- email scams, Phishing, Vishing, Smishing, Online job fraud, Online sextortion, Debit/ credit card fraud, Online payment fraud, Cyberbullying, website defacement, Cyber- squatting, Pharming, Cyber espionage, Cryptojacking, Darknet- illegal trades, drug trafficking, human trafficking., Social Media Scams & Frauds- impersonation, identity theft, job scams, misinformation, fake newscyber crime against persons - cyber grooming, child pornography, cyber stalking., Social Engineering attacks, Cyber Police stations, Crime reporting procedure, Case studies.			
UNIT -3	**Cyber Law:** Cyber crime and legal landscape around the world, IT Act, 2000 and its amendments. Limitations of IT Act, 2000. Cyber crime and punishments, Cyber Laws and Legal and ethical aspects related to new technologies- AI/ML, IoT, Blockchain, Darknet and Social media, Cyber Laws of other countries, Case Studies.			
UNIT -4	**Data Privacy and Data Security:** Defining data, meta-data, big data, non- personal data. Data protection, Data privacy and data security, Personal Data Protection Bill and its compliance, Data protection principles, Big data security issues and challenges, Data protection regulations of other countries- General Data Protection Regulations(GDPR),2016 Personal Information Protection and Electronic Documents Act (PIPEDA)., Social media- data privacy and security issues.			
UNIT -5	**Cyber Security Management, Compliance and Governance:** Cyber security Plan- cyber security policy, cyber crises management plan., Business continuity, Risk assessment, Types of security controls and their goals, Cyber security audit and compliance, National cyber security policy and strategy.			

References	1. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. 2. Information Warfare and Security by Dorothy F. Denning, Addison Wesley. 3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. 4. Data Privacy Principles and Practice by Natraj Venkataramanan and Ashwin Shriram, CRC Press. 5. Information Security Governance, Guidance for Information Security Managers by W. KragBrothy, 1st Edition, Wiley Publication. 6. Auditing IT Infrastructures for Compliance By Martin Weiss, Michael G. Solomon, 2nd Edition, Jones Bartlett Learning.

Course Outcomes : After completion of the course student able to

	Course Outcome Description	Knowledge Level
CO1		
CO2		
CO3		
CO4		

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1													
CO2													
CO3													
CO4													

1-Low, 2-Medium, 3-High

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Programme	MCA	Semester	First	
Course Code	22RACMCA1P1	Course Name	Data Structures using C Lab	
Course Category	Practical	Hours/Week	L	P
			0	4
		Credits	2	

List of Programmes

1. Write a program to read 'N' numbers of elements into an array and also perform the following operation on an array
2. Add an element at the beginning of an array
3. Insert an element at given index of array
4. Update a element using a values and index
5. Delete an existing element
6. Write a program using stacks to convert a given either one of the following
   a. postfix expression to prefix
   b. prefix expression to postfix
   c. infix expression to postfix
7. Write Programs to implement the Stack operations using an array
8. Write Programs to implement the Stack operations using Linked List.
9. Write Programs to implement the Queue operations using an array.
10. Write Programs to implement the Queue operations using Linked List.
11. Write a program for arithmetic expression evaluation.
12. Write a program for Binary Search Tree Traversals
13. Write a program to implement dequeue using a doubly linked list.
14. Write a program to search an item in a given list using the following Searching Algorithms
    a. Linear Search
    b. Binary Search.
15. Write a program for implementation of the following Sorting Algorithms
    a. Bubble Sort
    b. Quick Sort
16. Write a program for implementation of the following Sorting Algorithms
    a. Insertion Sort`
    b. Merge Sort
17. Write a program for polynomial addition using single linked list
18. Write a program to implement Depth First Search graph traversals algorithm
19. Write a program to implement Breadth First Search graph traversals algorithm
20. Program for finding shortest path in graph.

Course Outcomes : After completion of the course student able to write programs

	Course Outcome Description	Knowledge Level
CO1	Understand various algorithms implantation process of different data structures	K2
CO2	Apply suitable data stature for a need	K3
CO3	Analyse space and time complexity of various different data structures' operations	K4
CO4	Develops applications for implantations of different data structures' operations	K6

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

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COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	2	-	-	-	3	3	3
CO2	3	3	3	-	-	-	2	-	-	-	3	3	3
CO3	3	2	3	-	-	-	2	-	-	-	3	3	3
CO4	3	2	3	-	-	-	2	-	-	-	3	3	3
1-Low, 2-Medium, 3-High													

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Programme	MCA	Semester	First	
Course Code	22RACMCA1P2	Course Name	Web Technologies Lab	
Course Category	Practical (Elective Foundation)	Hours/Week	L	P
			0	4
		Credits	2	

List of Programmes

1. a) Write a HTML5 Program to create hyperlinks to four websites.
   b) Write a HTML5 Program to link an email address.
2. Write a HTML5 Program to include images to web pages.
3. Write a HTML5 Program to create a complex table.
4. Write a HTML5 Program to insert special characters in the document.
5. Write a HTML5 Program to adding background images and indentation using CSS
6. Write a HTML5 Program to link an internal style sheet.
7. Create a simple animator of an image that moves in a diamond pattern as its changes opacity.
8. Write a HTML5 Program to skewing and transforming elements in CSS.
9. Write a HTML5 Program to add an image and float the text around the image
10. Write a HTML5 Program to multi column text layout.
11. Write a HTML5 Program to create a website registration form with optional surveys.
12. Create an autocomplete input element with an associated data list that contains days of the week.
13. Write a HTML5 Program to absolute positioning of an element.
14. Link HTML5 page to extend CSS file.
15. Draw a rectangle with a border on a canvas

Course Outcomes : After completion of the course student able to write programs

	Course Outcome Description	Knowledge Level
CO1	Analyze a web page and identify its elements and attributes.	K4
CO2	Demonstrate the ability to retrieve data from a database and present it in a web page.	K2
CO3	Create dynamic web pages using JavaScript (Client side programming).	K3
CO4	Create XML documents and Schemas	K6

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

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CO3	Implement error handling techniques using exception handling and develop programs using class and inputs from keyboard.	K3,K6
CO4	Develop Multithreaded and event driven using AWT and Swing components.	K6

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	2	-	-	-	3	3	3
CO2	3	3	3	-	-	-	2	-	-	-	3	3	3
CO3	3	2	3	-	-	-	2	-	-	-	3	3	3
CO4	3	2	3	-	-	-	2	-	-	-	3	3	3

1-Low, 2-Medium, 3-High

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Programme	MCA	Semester	First	
Course Code	22RACMCA1P3	Course Name	Cyber Security Lab	
Course Category	Practical	Hours/Week	L	P
			0	4
		Credits	2	

List of Programmes

1. Platforms for reporting cyber crimes.
2. Checklist for reporting cyber crimes online.
3. Setting privacy settings on social media platforms.
4. Do's and Don'ts for posting content on Social media platforms.
5. Registering complaints on a Social media platform
6. Prepare password policy for computer and mobile device.
7. List out security controls for computer and implement technical security controls in the personal computer.
8. List out security controls for mobile phone and implement technical security controls in the personal mobile phone.
9. Log into computer system as an administrator and check the security policies in the system.

Course Outcomes : After completion of the course student able to write programs

	Course Outcome Description	Knowledge Level
CO1		
CO2		
CO3		
CO4		

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1													
CO2													
CO3													
CO4													

1-Low, 2-Medium, 3-High

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DEPT. OF COMPUTER SCIENCE
Vikrama Simhapuri University
NELLORE-524 003

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	-	3	2	-	-	-	-	-	-	-	-	2	-
CO2	-	-	3	-	-	-	-	-	-	-	-	-	2
CO3	2	-	3	-	-	-	-	-	-	-	-	-	2
CO4	-	-	3	-	-	-	-	-	-	-	-	-	2
1-Low, 2-Medium, 3-High													

HEAD
DEPT. OF COMPUTER SCIENCE
Vikrama Simhapuri University
NELLORE-524 003

Programme	MCA	Semester	First	
Course Code	22RACMCA1P2	Course Name	Object Oriented Programming using C++ Lab	
Course Category	Practical (Elective Foundation)	Hours/Week	L	P
			0	4
		Credits	2	

List of Programmes

1. Write a C++ program for Armstrong Number.
2. Write a C++ program for calculation of reverse number.
3. Write a C++ program for reverse operation of a string.
4. Write a C++ program for Matrix Multiplication.
5. Write a C++ program for Matrix Addition.
6. Write a C++ program for swapping given values.
7. Write a C++ program for function templates.
8. Write a C++ program for operator overloading.
9. Write a C++ program for function overloading
10. Write a C++ program for display student data using arrays.
11. Write a C++ program for Multiple Inheritance.
12. Write a C++ program for Exception Handling.

Course Outcomes : After completion of the course student able to write programs

	Course Outcome Description	Knowledge Level
CO1	Define Class, Object, Inheritance, Polymorphism, Function	K1
CO2	Understand syntaxes for implement statements and OOPs concepts	K2
CO3	Apply OOPs concepts while writing program	K3
CO4	Execute Exceptions in C++ program	K6

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	2	-	-	-	3	3	3
CO2	3	3	3	-	-	-	2	-	-	-	3	3	3
CO3	3	2	3	-	-	-	2	-	-	-	3	3	3
CO4	3	2	3	-	-	-	2	-	-	-	3	3	3

1-Low, 2-Medium, 3-High

DEPT. OF COMPUTER SCIENCE
Vikrama Simhapuri University
NELLORE-524 001

Programme	MCA	Semester	First	
Course Code	22RACMCA1P2	Course Name	Object Oriented Programming using Java Lab	
Course Category	Practical (Elective Foundation)	Hours/Week	L	P
			0	4
		Credits	2	

List of Programmes

1. Write a Java Program which performs sorting of group of integer values using bubble sort technique.
2. Write a Java Program which accepts elements of a matrix and displaying its transpose.
3. Write a Java Program in which we take a 3D array which consists of department wise student marks. There are 3 departments and in each department, there are 2 students and each student has marks in 3 subjects. We want to calculate total marks of each student.
4. Write a Java Program which will help us to understand how to create strings and how to use some important methods of String class.
5. Write a Java Program for testing a string whether it is a palindrome or not.
6. Write a Java Program to illustrate constructors.
7. Write a Java Program for a method without parameters but with return type.
8. Write a Java Program to illustrate relationship between objects.
9. Write a Java Program to access the super class method and instance variable by using super key word from sub class.
10. Write a Java Program to illustrate overloading & overriding methods in Java.
11. Write a Java Program for creating sub class reference which is used to refer to the super class object.
12. Write a Java Program to illustrate the implementation of multiple inheritance using interfaces in Java.
13. Write a Java Program to illustrate the implementation of abstract class.
14. Write a Java Program where MyDate interface reference is used to object of DateImpl class.
15. Write a Java Program which tells the use of try, catch and finally block.
16. Write a Java Program which shows the use of throws clause.
17. Write a Java Program showing two threads acting upon a single object.
18. Write a Java Program depicting a situation in which a deadlock can occur.
19. Write a Java Program where the Consumer thread checks whether the data production is over or not every 10 milliseconds.
20. Write Java Program to creates an applet with some background color and foreground color with a message. The message string is stored in msg and is displayed in paint() method.

Course Outcomes : After completion of the course student able to write programs

	Course Outcome Description	Knowledge Level
CO1	Able to analyze Object oriented design principles and proper program structuring using Java	K4
CO2	Understand the concept of packages, polymorphism, interface, and inheritance.	K2

DEPT. OF COMPUTER SCIENCE
Vikrama Simhapuri University
NELLORE-524 003

VIKRAMA SIMHAPURI UNIVERSITY, NELLORE
DEPARTMENT OF COMPUTER SCIENCE

Syllabus for Master of Computer Applications (2 Year Course) for V.S. University Constituent Colleges(S) and Affiliated Colleges under the jurisdiction of Vikrama Simhapuri University, Nellore with effect from the Academic Year 2022-'23.

Programme	**MCA**	**Semester**	**Second**		
Course Code	**22RACMCA2MC1**	**Course Name**	**Computer Networks**		
Course Category	Core	Hours/Week	L	T	P
			3	1	0
		Credits	4		
Course Objectives	1. To understand the fundamental concepts, taxonomy and terminology of the Computer Networks and Data communication. 2. To learn different types of network topologies and protocols. 3. To learn OSI/ ISO Network Architecture and their layers functionalities. 4. To learn and analyze different network routing algorithms.				
UNIT -1	**Introduction:** Network Hardware, Network Software, OSI, TCP/IP Reference Models, , Internet, ARPANET. **The Physical Layer and Media:** Data and Signals - Analog and Digital, Periodic Analog signals, digital signals, Transmission Impairment, Data rate limits, performance. **Guided Transmission Media:** Twisted-pair Cable, Coaxial Cable and Fibber Optic Cable, Wireless Transmission: **Unguided Media**: Radio waves, Microwaves, Infrared waves.				
UNIT -2	**The Data Link Layer**: Design issues, framing, Error detection and correction. Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel. Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat, Example data link protocols. **Medium Access sub layer:** The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols. **Wireless LANs:** IEEE 802.11, Bluetooth, Data link layer switching.				
UNIT -3	**The Network Layer:** Design Issues, Routing Algorithms: Shortest Path Routing, Flooding, Hierarchical Routing, Broadcast, Multicast, Distance Vector Routing, Congestion Control Algorithms, Quality of Service, Internetworking, The Network Layer in the internet.				

UNIT -4	**The Transport Layer:** Transport Layer: Transport Services, Elements of Transport protocols, Connection management, TCP and UDP protocols, SCTP Protocol features and Services. **The Application Layer:** Domain Name System, SNMP, Electronic Mail, World WEB, HTTP, Streaming Audio and Video, Voice over IP.
Text Books	1. Computer Networks: Andrew S Tanenbaum David J. Wetherall, 5/e, Pearson. 2. Data Communications and Networking: Behrouz Forouzan, 5/e, McGraw Hill.
References	1. Computer Networks – A System Approach, Peterson, Bruce Davie, 2/e, Harcourt Asia. 2. Computer Communications and Networking Technologies, Gallo, Hancock, Cengage. 3. An Engineering Approach to Computer Networking, Kesha, Pearson

Course Outcomes : After completion of the course student able to

	Course Outcome Description	Knowledge Level
CO1	Knowledge on Network Architectures (TCP/IP and OSI) models, Protocol Suites.	K1
CO2	Understand functionalities of layers in each Network Architecture.	K2
CO3	Analyse routing algorithms performance.	K4
CO4	Apply suitable routing algorithms and protocols in application design.	K6

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	-	3	-	-	-	-	-	-	-	3	-	-
CO2	2	-	2	-	-	-	-	-	-	-	2	-	2
CO3	-	3	2	-	-	-	-	-	-	-	2	2	2
CO4	-	3	2	-	-	-	-	-	-	-	3	-	-

1-Low, 2-Medium, 3-High

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DEPARTMENT OF COMPUTER SCIENCE

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Programme	**MCA**	**Semester**	**Second**		
Course Code	**22RACMCA2MC2**	**Course Name**	**Database Management Systems**		
Course Category	Core	Hours/Week	L	T	P
			3	1	0
		Credits	4		
Course Objectives	**This course is designed to:** 1.Train in the fundamental concepts of database management systems 2.Demonstrate the use of SQL commands 3. Usage of formal relational Query languages 4. To create a database for real world scenario.				
UNIT -1	**Introduction to Relational Model** Introduction: Database systems applications, Purpose of Database Systems, view of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Database users and Administrators, Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations.				
UNIT -2	**Introduction to SQL** Introduction to SQL: Overview of the SQL Query Language, Data Definition, Basic Structure of SQL Queries, Set Operations, Null Values, Aggregate Functions, Nested Sub-queries, Modification of the Database. Intermediate SQL: Joint Expressions, Views, Transactions, Integrity Constraints, SQL Data types and schemas, Authorization.				
UNIT -3	Accessing SQL from a Programming Language, Functions and Procedures, Triggers, Recursive Queries, OLAP, Formal relational query languages.				

UNIT -4	**Database Design and the E-R Model, Relational Database Design** Database Design and the E-R Model: Overview of the Design Process, The Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational Schemas, Entity-Relationship Design Issues. Relational Database Design: Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional-Dependency Theory, Algorithms for Decomposition, Decomposition Using Multivalued Dependencies.
Text Books	**1.** A.Silberschatz, H.F.Korth, S.Sudarshan, "Database System Concepts",6/e, TMH 2019.
References	1. Database Management System, 6/e RamezElmasri, Shamkant B. Navathe, PEA. 2. Database Principles Fundamentals of Design Implementation and Management, Carlos Coronel, Steven Morris, Peter Robb, Cengage Learning. 3. Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke,TMH.

Course Outcomes : After completion of the course student able to

	Course Outcome Description	**Knowledge Level**
CO1	Understand the fundamental concepts of database management systems.	K1, K2
CO2	Implement structured query languages to work with databases	K3
CO3	Implement PL/SQL constructs to work with Database Objects .	K3
CO4	.Design Databases using Normal Forms and ER Model.	K6

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	1	-	-	-	-	--	-	-	-	-	-
CO2	1	1	3	-	-	-	-	-	-	-	-	-	-
CO3	1	1	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-	-
1-Low, 2-Medium, 3-High													

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Programme	MCA	Semester	Second		
Course Code	**22RACMCA2MC3**	Course Name	**Software Engineering**		
Course Category	Core	Hours/Week	L	T	P
			3	1	0
		Credits	4		
Course Objectives	1. Understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects. 2. To analyse process models, software requirements, software design, software testing software process/product metrics, risk management, quality management and UML diagrams. 3. To translate end-user requirements into system and software requirements using e.g. UML, and structure the requirements in a Software Requirements Document (SRD). 4. To identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.				
Unit-1	Software and Software Engineering: Nature of software, software application domains, unique nature of web applications, software engineering, software process, product and process, software engineering practice, software myths. Process Models: Generic process model, prescriptive process models, specialized process models, unified process, personal and team process models, product and process, Reverse Engineering.				
Unit-2	REQUIREMENTS - Requirements Development Methodology - Specifying Requirements - Eliciting Accurate Requirements -Documenting Business Requirements - Defining User Requirements - Validating Requirements – Achieving Requirements Traceability - Managing Changing Requirements - Reviews, Walkthroughs, and Inspections, SRS Vs User Stories. Agile Modeling, Extreme Programming.				
Unit-3	Scrum, Kanban, SAFe Methodology, Project Monitoring Tool using JIRA, Design Patterns - Architectural Patterns - Model Driven Architectures.				
Unit-4	A strategic approach to software testing, strategic issues, test strategies for conventional software, Black-Box and White-Box testing, validation testing, system testing. RISK MANAGEMENT IN SOFTWARE ENGINEERING PROJECTS - Project Planning and Estimation.				
Text Books	1. Software Engineering – A Practitioner's Approach by Roger Pressman, Seventh Edition, Mc Graw Hill, 2014. 2. Software Engineering By Ian Sommerville, 10th Edition, Pearson Education, 2015 3. Agile Software Development Ecosystems by Jim Highsmith First Edition, Addison Wesley.				
References	**Agile Modeling:** Effective Practices for Extreme Programming and the Unified Process by Scott Amber, First Edition, John Wiley & Sons				

Course Outcomes: After completion of the course student able to

	Course Outcome Description	Knowledge Level
CO1	Understand the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects.	K2
CO2	Apply appropriate software architectures and patterns to carry out high level design of a system.	K3
CO3	Evaluate the process of software development models.	K5
CO4	Develop UML diagrams for applications.	K6

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5-Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PS02	PS03
CO1	2	-	-	-	-	-	-	-	-	-	2	2	0
CO2	2	2	2	-	-	-	-	-	-	-	2	2	2
CO3	2	2	2	-	-	-	-	-	-	-	2	2	0
CO4	3	3	3	-	-	-	-	-	-	-	2	2	0

1-Low, 2- Medium, 3-High

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Programme	MCA	Semester	Second		
Course Code	**22RACMCA2CF1**	Course Name	**Artificial Intelligence**		
Course Category	Core	Hours/Week	L	T	P
			3	1	0
		Credits	4		
Course Objectives	1. To know the methodology of Problem solving. 2. To implement basic AI algorithms. 3. To design and carry out an empirical evolution of different algorithms on a problem. 4. To formalization.				
Unit-1	**Introduction to Artificial Intelligence**: Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of AI languages, current trends in AI. **Problem Solving:** state-space search and control strategies: Introduction, general problem solving, characteristics of problem Search Strategies: exhaustive searches, heuristic search techniques, iterative-deepening A*, constraint satisfaction.				
Unit-2	**Logic Concepts**: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, predicate logic.				
Unit-3	**Knowledge Representation**: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure.				
Unit-4	**Artificial Neural Networks (ANN):** Introduction to ANN, including the structure and functionality of feed forward and recurrent networks. Architecture, learning and inferencing. Performance measures. Convolution Neural Networks (CNN) and Deep Learning techniques. **Expert Systems:** Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems.				
Text Books	1. Artificial Intelligence, Saroj Kaushik, CENGAGE Learning. 2. Artificial Intelligence, A modern Approach , 2 nd ed, Stuart Russel, Peter Norvig,PEA. 3. Artificial Intelligence, Rich, Kevin Knight, Shiv Shankar B Nair, 3 rd ed, TMH. 4. Introduction to Artificial Intelligence, Patterson, PHI.				
References	1. Artificial intelligence, structures and Strategies for Complex problem solving, - George F Lugar, 5 th ed, PEA. 2. Introduction to Artificial Intelligence, Ertel, Wolf Gang, Springer. 3. Artificial Intelligence, A new Synthesis, Nils J Nilsson, Elsevier.				

Course Outcomes: After completion of the course student able to

	Course Outcome Description	Knowledge Level
CO1	Understand the fundamental concepts in Artificial Intelligence.	K2
CO2	Apply the mathematical logic concepts.	K3
CO3	Analyze the applications of search strategies and problem reductions.	K4
CO4	Develop the Knowledge representations in Artificial Intelligence.	K6

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5-Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PS02	PS03
CO1	2	-	-	-	-	-	-	-	-	-	2	2	0
CO2	2	2	2	-	-	-	-	-	-	-	2	2	2
CO3	2	2	2	-	-	-	-	-	-	-	2	2	0
CO4	3	3	3	-	-	-	-	-	-	-	2	2	0

1-Low, 2- Medium, 3-High

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Programme	**MCA**	**Semester**	**Second**		
Course Code	**22RACMCA2CF2**	**Course Name**	**Computer Graphics**		
Course Category	Core	Hours/Week	L	T	P
			3	1	0
		Credits	4		
Course Objectives	1. To understand primitives which are used for picture generation. 2. To know 2D and 3D transformations and 2D and 3D viewing concepts. 3. To represent 3D objects and apply geometric transformations on the object. 4. To learn different visible surface detection methods.				
UNIT -1	Introduction, Application areas of Computer Graphics, overview of graphics systems, Video-display devices, raster-scan system, radom scan system, graphics monitors and work stations and input devices. **Output Primitives:** Points and lines, line drawing alogrithms, mid-point circle and ellipe algorithms,. Filled area primitives: Scan line poliygon fill alogrithm, boundary-fill and flood-fill alogrithms.				
UNIT -2	**2-D Geometrical Transforms:** Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate system. **2-D Viewing:** The viewing pipeline, viewing coordinate reference frame, window to view – port coordinate transformation, viewing functions, Cohen-Sutherland and Cyrusbeck line clipping algorithms, Sutherland-Hodgeman polygon clipping algorithm.				
UNIT -3	**3-D Object Representation:** Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline survaces, Basic illumination models, polygon rendering methods. **3-D Geometric Transformations**: Translation, rotation, scaling, reflection and shear transformations, composite transformations. 3-D viewing: Viewing pipeline, viewing coordinates, view volume and general projection transformations and clipping.				
UNIT -4	**Visible Surface Detection Methods:** Classification, back-face detection, depth-buffer, scan-line, depth sporting, BSP-tree methods, area sub-division and octree methods.				

Text Books	1. "Computer Graphics C Version", Donald Hearn and M. Pauline Baker, pearson Education. 2. "Computer Graphics principles& Practice", second edition in C, Foley, VanDam, Feiner and Hughes, Pearson Education.
References	1. Computer Graphics, Second edition, Donald Hearn and M. Pauline Baker, PHI/Peason Education. 2. Computer Graphics, Second edition,Zhigand xiang, Roy Plastock, Schaum's outlines, Tata Ma-Graw hill

Course Outcomes : After completion of the course student able to

	Course Outcome Description	Knowledge Level
CO1	Able to understand the concepts of graphics and different types of Algorithms.	K2
CO2	Apply knowledge on 2D and 3D transformation and viewing concepts.	K3
CO3	Explore projections and visible surface detection techniques for display of 3D scene on 2D screen.	K4
CO4	Solve the problems on viewing transformations.	K5

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	3	2	-	-	-	-	-	-	-	2	2	2
CO3	2	2	2	-	-	-	-	-	-	-	2	2	2
CO4	2	2	2	-	-	-	-	-	-	-	2	2	2

1-Low, 2-Medium, 3-High

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Programme	MCA	Semester	Second		
Course Code	**22RACMCA2CF3**	Course Name	**Operations Research**		
Course Category	Core	Hours/Week	L	T	P
			3	1	0
		Credits	4		
Course Objectives	1. To understand the methodology of OR problem solving and formulate linear programming problems. 2. To develop formulation skills in transportation models and finding solutions 3. To understand the basics in the field of game theory and assignment problems 4. To know the basics of dynamic programming and simulation.				
Unit-1	**Introduction to Operations Research** - Definition and scope of Operations research; phases in Operations Research; models and their solutions. Concept of Optimal Solution, General Linear Programming Problem (LPP), Properties to Solution of LPP, Graphical Method, Simplex Method.				
Unit-2	**Transportation Problem:** Introduction, Transportation Model, finding Intial Basic feasible solutions, unbalanced Transportation problems. **Assignment Problem:** Introduction, Mathematical formulation of the problem, solution of an Assignment problem, Hungerian algorithm, Unbalanced Assignment problems, Maximization in Assignment model, Traveling sales man problem.				
Unit-3	**Project Management:** Flows in networks max-flow-min-cut theorem. Project Management; PERT and CPM, probability of project completion, PERT – crashing. **Sequencing and Scheduling Problems:** '2' Machine 'n' Job, '3' Machine 'n' Job, 'm' Machine 'n' Job Problems with Identical Machine.				
Unit-4	**Game Theory:** Decision making in the face of competition, two-person games, pure and mixed strategies, existence of solution and uniqueness of value in zero- sum games, finding solution in 2x2, and 2xm, and mxn games.				
Text Books	1. Taha H.A (1982) Operational Research: An Introduction; Macmillan. 2. Hiller F. Sand Lieberman G.J. (1962) Introduction to Operations Research; Holden Day 3. Kanti Swarup; Gupta P.K and Singh M.M (1985) Operations Research;Sultan Chand. 4. Philips D.T, Ravindran A and Solberg J Operations Research, Principlesand Practice. 5. Curchman C.W; Ackoff R.L and Arnoff E.L(1957) introduction to Operations Research; John Wiley.				
References	1. Hadley G (1964) Non-Linear and Dynamic programming Addison Wesley. 2. Mckinsey J.C.C (1952) Introduction to the theory of games Mc Graw Hill. 3. 8.P.K. Gupta; D.S. Hira Operations Research S. Chand.				

Course Outcomes: After completion of the course student able to

	Course Outcome Description	Knowledge Level
CO1	Understand the importance and value of Operations Research and linear programming in solving practical problems in industry	K2
CO2	Interpret the transportation models' solutions and infer solutions to the real-world problems.	K3
CO3	Simulation and dynamic programming can be applied in real world problems	K3
CO4	Solve game theory and assignment problems.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5-Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PS02	PS03
CO1	2	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	2	2	-	-	-	-	-	-	-	2	2	-
CO3	2	2	2	-	-	-	-	-	-	-	2	2	-
CO4	2	2	2	-	-	-	-	-	-	-	2	2	-

1-Low, 2- Medium, 3-High

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Programme	MCA	Semester	Second		
Course Code	**22RACMCA2CF4**	Course Name	**Design and Analysis of Algorithms**		
Course Category	Core	Hours/Week	L	T	P
			3	1	0
		Credits	4		
Course Objectives	1. To understand the basic ideas of algorithms, its performance analysis, the concepts of merging and sorting using parallel algorithms. 2. To understand the concepts of sorting techniques, and the concepts of Greedy method. 3. To understand graph traversal algorithms: BFS, DFS, dynamic programming and backtracking. 4. To understand the state space terminology, the concepts of NP-Hard and NP-Complete.				
Unit-1	**Introduction:** Definition of an Algorithm- Algorithm Specification - Analysis of Algorithm. PRAM Algorithms: Merging- Sorting. String Algorithms: The Naive String Matching Algorithm, Robin – Karp Algorithm.				
Unit-2	**Divide and Conquer:** Merge Sort-Quick Sort- Strassen's Matrix Multiplication – Convex Hull. Greedy Method: The General Method-Job Sequencing with Deadlines- Knapsack Problem- Minimum Cost Spanning Trees- Huffman Codes -Single Source Shortest Path Method.				
Unit-3	**Dynamic Programming:** The General Method- Optimal Binary Search Tree- 0/1 Knapsack- Traveling Sales Person Problem. Ford Fulkerson. **Backtracking:** The Eight Queens Problem - Graph Coloring - Knapsack Problem.				
Unit-4	**Branch and Bound:** 0/I Knapsack Problem- Traveling Sales Person Problem. NP Hard and NP Complete Problems: Basic Concepts- Cook's Theorem. **NP Hard Graph Problems-** CDP, NCDP, AOG.				
Text Books	1. Fundamentals of Computer Algorithms, Ellis Horowitz, SartajSahni and Sanguthevar Rajasekaran, 2nd Edition, University Press, 2008. 2. Introduction to algorithms, Cormen, Leizerson & Rivest, 3rd Edition, Prentice-Hall, 2002. 3. Algorithm Design, Jon Kleinberg and Eva Tardos, Pearson Education, 2006. 4. Algorithms, Robert Sedgewick and Kevin wayne, 4th edition, Addison Wesley Prof., (2011)				
References	Introduction to Design and Analysis of Algorithms, Anny Levitin, 2rd Edition, Person Education Press. (2007).				

Course Outcomes: After completion of the course student able to

	Course Outcome Description	Knowledge Level
CO1	Understand the concepts of mathematics to find space and time complexities of various algorithms including string matching algorithms.	K2
CO2	Apply the problems that can be solved by using Divide and Conquer and Greedy Method.	K3

CO3	Analyze the problems that can be solved by using Dynamic Programming and Backtracking.	K4
CO4	Analyze the problems that can be solved by using Branch and Bound and NP-Hard Graph problems.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5-Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PS02	PS03
CO1	3	-	-	-	-	-	-	-	-	-	2	2	-
CO2	3	3	-	-	-	-	-	-	-	-	2	2	-
CO3	2	3	3	-	-	-	-	-	-	-	2	2	-
CO4	2	3	3	-	-	-	-	-	-	-	2	2	-

1-Low, 2- Medium, 3-High

Programme	**MCA**	**Semester**	**Second**		
Course Code	**22RACMCA2EF1**	**Course Name**	**Advanced Java Programming**		
Course Category	Core	Hours/Week	L	T	P
			3	1	0
		Credits	4		
Course Objectives	1. To understand the multi-tier architecture implementation. 2. To know the Client-Server communication process. 3. To enable students to understand the concepts underlying technologies in JAVA Enterprise edition with Swings and multithreading, configuring Apache tomcat server, Java beans and Enterprise Java Beans. 4. To learn Remote Method Invocation and Database programming.				
UNIT -1	**J2EE MULTI –TIER ARCHITECTURE:** Introduction to J2EE and J2SE, Distributive Systems, The Tier, J2EE Muti – Tier Architecture, Client Tier Implementation, Web Tier Implementation, Enterprise JavaBeans Tier Implementation, Enterprise Information Systems Tier Implementation, Challenges. **J2EE BEST PRACTICES:** Enterprise Application Strategy, The Enterprise Application, Clients, Sessions Management, Web Tier and Java Server Pages, Enterprise JavaBeans Tier, The Myth of Using Inheritance, Maintainable Classes, Performance Enhancements, The Power of Interfaces, The Power of Threads, The Power of Notification.				
UNIT -2	**J2EE DATABASE CONCEPTS:** Data, Database, Database Schema, The art of Indexing. **JDBC OBJECTS:** 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, ResultSet, Transaction Processing, Metadata. **JDBC AND EMBEDDED SQL** - Model Programs, Tables, Indexing, Inserting Data into Tables, Selecting Data from a Table, Metadata, Updating Tables, Deleting Data from a Table, Joining Tables, Calculating Data, Grouping and Ordering Data, Subqueries, View.				
UNIT -3	**JAVA AND XML:** Generating an XML Document, Parsing XML, Quick Reference Guide. **JAVA SERVLETS:** Java servlets and Common Gateway Interface Programming, A Simple Java Servlet, Anatomy of a Java servlet, Reading Data from a Client, Reading HTTP Request Headers, Sending Data to a Client and Writing the HTTP Response Header, Working with Cookies, Tracking Sessions. **JAVA SERVER PAGES:** JSP, JSP Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects.				

UNIT -4	**ENTERPRISE JAVABEANS:** Enterprise JavaBeans, Deployment Descriptors, Session Java Bean, Entity Java Bean, Message – Driven Bean, The JAR File. **JAVA INTERFACE DEFINITION LANGUAGE AND CORBA:** The Concept of Object Request Brokerage, Java IDL and CORBA, The IDL Interface, The Client Side, The Server Side, Running the Code. **JAVA REMOTE METHOD INVOCATION:** Remote Method Invocation Concept, Server Side, Client Side.
Text Books	The Complete Reference J2EE by Jim Keogh, Tata McGraw – Hill Edition
References	1. H. Schildt: Java 2: The Complete Reference. Mc Graw Hill 2. Kogent Solutions Inc.: Java Server Programming Java EE 7 (J2EE 1.7), Black Book, Dreamtech Press 3. Subrahmanyam Allaramaju et al.: Professional JSP J2EE 1.3 Edition. Wrox Press 4. K. Qian et al.: Java Web Development Illuminated. Narosa 5. Robert W. Sebesta: Programming the World Wide Web. Pearson

Course Outcomes : After completion of the course student able to

	Course Outcome Description	Knowledge Level
CO1	Understanding on J2EE Architectures, Client & Server communication process, software components, Servlets, JSP.	K2
CO2	Handle Errors and Exceptions in Web Applications.	K3
CO3	Analyse effectiveness of creating dynamic web pages using Servlet and JSP	K4
CO4	Develops Web Applications using Java Servlet and JSP.	K6

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	-	3	-	-	-	-	-	-	-	-	2	3
CO2	2	2	-	-	-	-	-	-	-	-	2	-	-
CO3	3	3	-	-	-	-	-	-	-	-	2	2	-
CO4	-	-	3	-	-	-	-	-	-	-	2	-	-

1-Low, 2-Medium, 3-High

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Programme	MCA	Semester	Second		
Course Code	**22RACMCA2EF2**	Course Name	**Python Programming**		
Course Category	Core	Hours/Week	L	T	P
			3	1	0
		Credits	4		
Course Objectives	1. To understand the basics of Python. 2. To Understand the usage of Libraries and packages in Python. 3. To understand the flask framework. 4. To learn about Django in web development applications.				
Unit-1	**Introduction to Python**- Introduction to Python programming language - Setting up development environment - Basic programming concepts. Object-oriented Programming in Python - Introduction to object-oriented programming - Classes, methods, and properties in Python - Inheritance, polymorphism, and encapsulation.				
Unit-2	**Python Libraries and Packages** - Working with popular Python libraries such as NumPy, Pandas, and Matplotlib - Installing, managing, and publishing Python packages using pip - Using Python virtual environments effectively.				
Unit-3	**Introduction to Flask framework**, Flask Web Development - Flask routes and views - Templates and rendering in Flask - Forms and user input - Handling API requests.				
Unit-4	**Introduction to Django** - Overview of Django framework - Setting up a Django project - Creating apps in Django - Django models and database				
Text Books	1 Introduction to Python Programming, Gowrishankar.S, Veena A, CRCPress. 2. Flask Web Development, Miguel Grinberg, 2nd Edition, O'Reilly. 3. Django By Example: Build powerful and reliable Python web applications from scratch, Antonio Mele, 3rd Edition, Packt				
References	1. Django for Beginners: Build Websites with Python & Django, William S Vincent, Volume 1, Amazon Digital Services LLC. 2. Head First Python: A Brain-Friendly Guide, Paul Barry, 2nd Edition, O'Reilly.				

Course Outcomes: After completion of the course student able to

	Course Outcome Description	Knowledge Level
CO1	**Describe** the basics of python programming Language.	K2
CO2	**Understand and Implement** the Python packages to solve real time problems.	K2,K3
CO3	**Apply** end-to-end web applications using Flask as the primary web framework.	K3
CO4	**Apply** Python and Django framework to develop web applications using model, views, templates, URLs, forms, and databases	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5-Evaluating, K6- Creating.

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PS02	PS03
CO1	3	1	2	-	-	-	-	-	-	-	2	2	2
CO2	3	1	2	-		-	-	-	-	-	2	2	2
CO3	3	2	3	-	-	-	-	-	-	-	2	2	2
CO4	3	2	3	-	-	-	-	-	-	-	2	2	2

1-Low, 2- Medium, 3-High

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Programme	**MCA**	**Semester**	**Third**		
Course Code	**22RACMCA2EF3**	**Course Name**	**R Programming**		
Course Category	Core	Hours/Week	L	T	P
			3	1	0
		Credits	4		
Course Objectives	1. Learn Fundamentals of R. 2. Covers how to use different functions in R, how to read data into R, accessing R packages, writing functions, debugging, and organizing data using R functions. 3. Cover the Basics of statistical data analysis with examples. 4. The whole syllabus will give an idea to collect, compile and visualize data using statistical functions.				
UNIT -1	Introduction, what is R, Basic Features of R, Design of the R System, Limitation of R, R Nuts & Bolts How to run R, R Sessions and Functions, Basic Math, Getting data in and out of R, Reader Packages, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes.				
UNIT -2	**R Programming Structures**: Control Statements, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Functions are Objective, Environment and Scope Issues, No Pointers in R, Writing Upstairs, Recursion.				
UNIT -3	**Doing Math and Simulation in R**: Math Function, Functions for Statistical Distributions, Sorting, Linear Algebra Operation on Vectors and Matrices, Set Operation, Simulation Programming in R. **Input /output**: Accessing the Keyboard and Monitor, Reading and writer Files.				
UNIT -4	**String Manipulation**: An Overview of String-Manipulation Functions, Regular Expressions, Use of String Utilities in the edtdbg Debugging Tool. **Graphics**: Creating Graphs, Customizing Graphs, Saving Graphs to Files, Creating Three-Dimensional Plots.				
Text Books	1. R for Everyone, Lander, Pearson. 2. The Art of R Programming, Norman Matloff, No starch Press. 3. The Art of R Programming, A K Verma, Cengage Learning.				
References	1. R Cookbook, Paul Teetor, Oreilly. 2. R in Action, Rob Kabacoff, Manning. 3. R Programming for Data Science, Roger D. Peng Lean Publishing.				

Course Outcomes : After completion of the course student able to

	Course Outcome Description	**Knowledge Level**
CO1	Understands the features of R, Data Types in R, Data Structures in R, Control Structures, Simulation fundamentals.	K2
CO2	Apply Data Types, Data Structures, Control Structures and other features to write programs.	K3
CO3	Examine the different Data Structures, Data Sets that exist in R.	K4
CO4	Develops programs for data analysis.	K6

K1- Remembering, K2- Understanding, K3- Applying, K4- Analyzing, K5- Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	3	2	-
CO2	-	2	2	-	-	-	-	-	-	-	2	-	-
CO3	3	-	2	-	-	-	-	-	-	-	2	-	2
CO4	2	-	3	-	-	-	-	-	-	-	-	2	-

1-Low, 2-Medium, 3-High

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Programme	MCA	Semester	Second		
Course Code	**22RACMCA2LS**	Course Name	**Personality Enhancement Development And Leadership**		
Course Category	Core	Hours/Week	L	T	P
			3	1	0
		Credits	4		
Course Objectives	1. To introduce the concepts of personality enhancement and the concept of success and failure in personality enhancement. 2. To provide fundamental knowledge on significance on Motivation and Attitude. 3. To introduce the concept of self esteem and Inter personal relationship. 4. To introduce the importance of effective leadership qualities.				
Unit-1	**Introduction To Personality Enhancement** - The concept personality Dimensions of theories of Freud & Erickson- personality – significant of personality development. The concept of success and failure: What is success? - Hurdles in achieving success - Overcoming hurdles - Factors responsible for success – What is failure - Causes of failure. SWOT analyses.				
Unit-2	**Attitude & Motivation - Attitude** - Concept - Significance - Factors affecting attitudes - Positive attitude - Advantages – Negative attitude - Disadvantages - Ways to develop positive attitude - Difference between personalities having positive and negative attitude. Concept of motivation - Significance - Internal and external motives - Importance of self-motivation- Factors leading to de-motivation.				
Unit-3	**Self-Esteem** - Term self-esteem - Symptoms - Advantages - Do's and Don'ts to develop positive self-esteem – Low self esteem - Symptoms - Personality having low self esteem - Positive and negative self-esteem. Interpersonal Relationships – Defining the difference between aggressive, submissive and assertive behaviours - Lateral thinking.				
Unit-4	**Introduction To Leadership** - Definition and meaning, Importance, Leadership and Management, Leader vs Manager, Essential qualities of an effective leader. Theories of Leadership: Trait theory, Behavioral theories, Contingency theory.				
Text Books	1. Girish Batra, Experiments in Leadership, Chennai: Notion Press, 2018. 2. Mitesh Khatri, Awaken the Leader in You, Mumbai: Jaico Publishing House, 2013. 3. Carnegie Dale, Become an Effective Leader, New Delhi: Amaryllis, 2012. 4. Hall, C.S., Lindzey. G. & Campbell, J.B Theories of Personality. John Wiley & Sons, 1998. 5. Organizational Behaviour, M. Parikh and R. Gupta, Tata-McGraw-Hill Education Private Limited.				
References	Organizational Behavior, D. Nelson, J.C Quick and P. Khandelwal, Cengage Publication				
Course Outcomes: After completion of the course student able to					

	Course Outcome Description	Knowledge Level
CO1	Apply the qualities of an effective leader	K3
CO2	Apply the knowledge Attitude - Concept -Factors affecting attitudes - Positive attitude	K3
CO3	Develop term self-esteem - Symptoms -Do's and Don'ts to develop positive self-esteem.	K5
CO4	Create content relating to the concept personality Dimensions of theories	K6

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5-Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PS02	PS03
CO1	-	-	-	-	2	2	2	2	2	-	-	-	-
CO2	-	-	-	-	2	2	2	2	2	-	-	-	-
CO3	-	-	-	-	2	2	2	2	2	-	-	-	-
CO4	-	-	-	-	2	2	2	2	2	-	-	-	-

1-Low, 2- Medium, 3-High

Programme	MCA	Semester	Second		
Course Code		Course Name	**Constitution Of India (Audit Course)**		
Course Category	Core	Hours/Week	L	T	P
			3	1	0
		Credits	4		
Course Objectives	1. To familiarize the students with the key elements of the Indian constitution. 2. To enable students to grasp the constitutional provisions and values. 3. To acquaint the students with the powers and functions of various constitutional offices and institutions. 4. To make students understand the basic premises of Indian politics and role of constitution and citizen oriented measures in a democracy.				
Unit-1	**History of Making of the Indian Constitution:** History Drafting Committee, (Composition & Working)				
Unit-2	**Philosophy of the Indian Constitution:** Preamble Salient Features				
Unit-3	**Contours of Constitutional Rights & Duties:** Fundamental Rights Right to Equality Right to Freedom Right against Exploitation Right to Freedom of Religion Cultural and Educational Rights Right to Constitutional Remedies Directive Principles of State Policy Fundamental Duties.				
Unit-4	**Organs of Governance:** Parliament Composition Qualifications and Disqualifications Powers and Functions Executive President Governor Council of Ministers				
Text Books	1. The Constitution of India, 1950 (Bare Act), Government Publication. 2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015. 3. M. P. Jain, Indian Constitution Law, 7th Edn., LexisNexis, 2014.				

References	1. Dr.D.D.Basu, Introduction to the Constitution of India, LexisNexis,2015. 2. Brij Kishore Sharma, Introduction to the Constitution of India,Prentice Hall of India. 3. Granvlle Austin, Working a Democratic Constitution:A History of the Indian Experience. 4. M.V.Pylee, The Constitution of India. 5. A.C. Kapoor, Modern Constitutions.

Course Outcomes: After completion of the course student able to

	Course Outcome Description	Knowledge Level
CO1	Understand the meaning and importance of the Constitution.	K2
CO2	Explain about making of Indian Constitution - contribution of Constituent assembly on it.	K4
CO3	Describe the Salient (Outstanding) features of Indian Constitution.	K4
CO4	Describe the importance of the Preamble of the Indian Constitution and its significance.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5-Evaluating, K6- Creating

COURSE AND PROGRAMME OUTCOMES MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS01	PS02	PS03
CO1	-	-	-	-	2	-	-	2	-	-	-	-	-
CO2	-	-	-	-	2	-	-	2	-	-	-	-	-
CO3	-	-	-	-	2	-	-	2	-	-	-	-	-
CO4	-	-	-	-	2	-	-	2	-	-	-	-	-

1-Low, 2- Medium, 3-High

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Programme	MCA	Semester	Second		
Course Code	22RACMCA2P1	Course Name	**Database Management Systems Lab**		
Course Category	Core	Hours/Week	L	T	P
			0	0	4
		Credits	4		
List of Programmes					

1. reate Student (HTNO, Surname, FirstName, LastName, Percentage_of_Marks, Data_of_Joining, Department_ID) and Department(Department_ID, Dept_Name, HOD, ContactNo, E-Mail) tables with relevant Primary Key, Foreign Key and other constraints.Perform the following

   a) Insert five student details in five departments.
   b) Display all students order by department no.
   c) Display all students in each department who has highest percentage.

2. Create Student (HTNO,Surname,FirstName, LastName, Percentage_of_Marks, Data_of_Joining, Department_ID) and Department(Department_ID, Dept_Name,HOD, ContactNo, E-Mail). Perform the following.

   a) Insert five student details in five departments.
   b) Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in SQL.
   c) Alter any one of the field.
   d) Delete students who are inserted without any department information.

3. Design a database for the University Library which include tables 1)Student 2)books 3)Issue. Perform the following queries.
   A. Display all the books in the Library.
   B. Display the titles of only computer books in the Library.
   C. Display the book title which was most issued.
   D. Display the book title which was not read by any student.
4. Create two tables Patient and Doctor. Display patient and doctor details using the join concept.
5. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
6. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest,trunc, round, to_char, to_date).
7. Creation of simple PL/SQL program which includes declaration section, executable section and exception.
8. Write a PL/SQL block to obtain factorial of a number and program for Fibonacci numbers in PL/SQL.
9. Write PL/SQL procedure for exception handling.
10. Write PL/SQL procedure for an implicit cursor and explicit cursor.
11. Write PL/SQL program to generate electricity Bill.
12. Write a Pl/SQL block to check a given number is palindrome or not.
13. Write a PL/SQL procedure to eliminate the duplicates in the given array of numbers.
14. Write a PL/SQL program to pass PNR number as a parameter to a function and display the reservation details.
15. Create a trigger in PL/SQL such that on Sunday and Saturday after 1PM no transactions should take place on the Account table.

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Programme	MCA	Semester	Second		
Course Code	22RACMCA2P2	Course Name	**Advanced Java Lab**		
Course Category	Core	Hours/Week	L	T	P
			0	0	4
		Credits	4		

List of Programs

1. Write a program to implement Server and Client Chatting applications.
2. Write a program to implement database Application to Insert data into the employee database.
3. Write a program to implement database Application to Update (Modify) data into the employee data.
4. Write a program to implement a database application to delete data and Retrieve records from the employee table.
5. Write a program to implement RMI application using Registry.
6. Write a program to implement servlet cookies.
7. Write a program to implement Server and Client application using sockets.
8. Write a program to implement Generic Servlet.
9. Write a jsp program for Registration details to store details into database and retrieve data from the register user database.
10. Create a servlet that accepts patient information in a hospital such as patient id, patient name, age, date of admission, cause of admission, doctor diagnosed, treatment proposed. Place the details into a database. Allow options to insert , update ,view and delete the contents in the database.
11. Write a JSP and Servlet Program to do the following to buy a T-Shirt online:
    a) A set of checkboxes to select your T-Shirt accessories such as 'belt', 'cap','hair-band' etc.
    b) A text area / text field to enter your T-Shirt tag-line
    c) A Radio-button that allows the user to choose between T-Shirt with chest pocket and without.
    d) A Combo Box to choose your T-Shirt color
    e) Appropriate labels for these GUI Components
    f) A Button called "Click Me" which when pressed will
    g) Insert the details entered into a table called 'TShirts'.
    h) An OrderNo is generated by adding '1' to the existing 'OrderNo'
    i) If 'TShirts' table is empty the initial value of 'OrderNo' is 100.
    j) This 'OrderNo' is also inserted into the 'TShirts' table.
    k) Display all the records of the 'TShirts' table in tabular form.
12. Write a java program demonstrating the use of Cookies.
13. Write a program to implement a Java MVC application to enter Employee details.
14. Write a program to implement session management in jsp.
15. Create a server side application that accepts HallTicket Number and displays the result.

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Programme	MCA	Semester	Second		
Course Code	22RACMCA2P2	Course Name	**Python Programming Lab**		
Course Category	Core	Hours/Week	L	T	P
			0	0	4
		Credits	4		

List of programs

1. Write a Python program about Class variables using Robot Class.
2. Implement Instance variable concept for ATM Machine Class.
3. Write a program to implement Inheritance.
4. Write a program to implement Polymorphism.
5. Write a program to implement Data encapsulation.
6. Write a program to implement String manipulation operations using python library Numpy.
7. Write a program to create a series using python library Pandas.
8. Write a program to create a Data frame using python library Pandas.
9. Write a program to draw a line from position (1,3) to position (8,10) using python library Matplotlib.
10. Write a program to draw multiple lines(two lines) by specifying the x-values and y-values for both lines using python library Matplotlib.
11. Write a program to draw Bar chart horizontal and vertical bars using python library Matplotlib.
12. Write a program to draw a Scatter plot using python library Matplotlib.
13. Develop a Python Django web application: User registration with E-mail confirmation application.

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Programme	MCA	Semester	Second		
Course Code	22RACMCA2P2	Course Name	**R Programming Lab**		
Course Category	Core	Hours/Week	L	T	P
			0	0	4
		Credits	4		

List of Programmes

1. Write a Program to perform various String operations
2. Write a program to perform the List operations
3. Write a program to perform the Vector operations
4. Write a program to perform Array operations
5. Write a Program to perform the Matrix operations
6. Write a Program to perform the Data Frame operations
7. Write a Program to perform the Math functions
8. Write a Program to perform the Quick Sort
9. Write a Program to data visualization using different graphs
10. Descriptive statistics in R.
    a) Write an R script to find basic descriptive statistics using summary, str, quartile function on mtcars& cars datasets.
    b) Write an R script to find subset of dataset by using subset (), aggregate () functions on iris dataset.
11. Reading and Writing Different Types of Datasets
    a) Reading different types of data sets (.txt, .csv) from web and disk and writing in file in specific disk location.
    b) Reading Excel data sheet in R.
    c) Reading XML dataset in R.
12. Visualizations
    a) Find the data distributions using box and scatter plot.
    b) Find the outliers using plot.
    c) Plot the histogram, bar chart and pie chart on sample data.
13. Correlation and Covariance
    a) Find the correlation matrix.
    b) Plot the correlation plot on dataset and visualize giving an overview of relationships among data on iris data.
    c) Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data.
14. Classification Model
    a) Install relevant packages for classification.
    b) Choose a classifier for classification problems.
    c) Evaluate the performance of the classifier.
15. Clustering Model
    a) Clustering algorithms for unsupervised classification.
    b) Plot the cluster data using R visualizations.

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Programme	**MCA**	**Semester**	**Three**		
Course Code	**22RACMCA3MC1**	**Course Name**	**Cloud Computing**		
Course Category	Mandatory Course (Compulsory)	Hours/Week	L	T	P
			3	1	0
		Credits	4		

Course Objectives

1. To introduce the broad perceptive of cloud architecture and model.
2. To understand the concept of Virtualization and design of cloud Services.
3. To be familiar with the lead players in cloud.
4. To understand the features of cloud simulator.
5. To apply different cloud programming model as per need.
6. To learn to design the trusted cloud Computing system.

Course Outcomes

After successful completion of this course, student will be able to

1. Understand the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
2. Apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost.
3. Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.
4. Analyze various cloud programming models and apply them to solve problems on the cloud.
5. Illustrate the fundamental concepts of cloud storage and demonstrate their use in storage systems such as Amazon S3 and HDFS.

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	2	3	-	2	-	-	--	-	-	-	-	-	3	-	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	3	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-	-	-	3

UNIT -1	**Cloud Architecture and Model:** Evolution of Cloud Computing, Cloud Characteristics, Technologies for Network-Based System, System Models for Distributed and Cloud Computing, NIST Cloud Computing Reference Architecture, Architectural Design Challenges. **Cloud Models:** Characteristics, Cloud Services, Deployment Models: Public, Private and Hybrid Clouds, Public vs Private Cloud, Service Models: IaaS, PaaS, SaaS, Cloud Solutions, Cloud ecosystem, Service management, Computing on demand, Benefits of Cloud Computing.
UNIT -2	**Virtualization**: Basics of Virtualization, Types of Virtualization, Implementation Levels of Virtualization, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices, Virtual Clusters and Resource management, Virtualization for Data-center Automation.
UNIT -3	**Cloud Infrastructure:** Architectural Design of Compute and Storage Clouds, Layered Cloud Architecture Development, Design Challenges, Inter Cloud Resource Management, Resource Provisioning and Platform Deployment, Global Exchange of Cloud Resources.

UNIT -4	**Programming Model:** Parallel and Distributed Programming Paradigms, MapReduce, Twister and Iterative MapReduce, Hadoop Library from Apache, Mapping Applications, Programming Support. **Cloud Software and Computing Environments:** HDFS, MapReduce, Google App Engine (GAE), Programming Environment for GAE, Architecture of GFS, Openstack, Heroku and Docker Containers, AmazonEC2, Amazon AWS, Microsoft Azure, Google Compute Engine, Eucalyptus, Open Nebula, Aneka, CloudSim, **Security in the Cloud:** Security Overview, Cloud Security Challenges and Risks, Software-as-a Service Security, Security Governance, Risk Management, Security Monitoring, Security Architecture Design, Data Security, Application Security, Virtual Machine Security, Identity Management and Access Control, Autonomic Security.
Text Books	1. Kai Hwang, Geoffrey C Fox, Jack JDongarra, "Distributed and Cloud Computing, From ParallelProcessing to the Internet of Things", Morgan Kaufmann Publishers, 2012. 2. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management,and Security", CRC Press, 2010. 3. Toby Velte, Anthony Velte, Robert C Elsenpeter, "Cloud Computing, A Practical Approach", TMH,2009.
References	1. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005. 2. Katarina Stanoevska-Slabeva, Thomas Wozniak, Santi Ristol, "Grid and Cloud Computing – ABusiness Perspective on Technology and Applications", Springer. 3. Ronald L. Krutz, Russell Dean Vines, "Cloud Security – A comprehensive Guide to Secure CloudComputing", Wiley – India, 2010. 4. RajkumarBuyya, Christian Vecchiola, S.Thamarai Selvi, 'Mastering Cloud Computing",TMGH,2013. 5. Gautam Shroff,Enterprise Cloud Computing,Cambridge University Press,2011. 6. Michael Miller,Cloud Computing,Que Publishing,2008.

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Programme	**MCA**	**Semester**	**Third**		
Course Code	**22RACMCA3MC2**	**Course Name**	**Cryptography and Network Security**		
Course Category	Mandatory Course (Compulsory)	Hours/Week	L	T	P
			3	1	0
		Credits	4		
Course Objectives	**This course is designed to:** 1. To know the methods of conventional encryption. 2. To understand the concepts of public key encryption and number theory. 3. To know the network security tools and applications. 4. To understand the system level security practices.				
Course Outcomes	After successful completion of this course, student will be able to 1. Analyze and design classical encryption techniques and block ciphers. 2. Understand and analyze data encryption standard, public-key cryptography, RSA and other public-key cryptosystems. 3. Understand key management and distribution schemes and design User Authentication Protocols. 4. Analyze and design hash and MAC algorithms, and digital signatures. 5. Design network application security schemes, such as PGP, S/ MIME, IPSec, SSL, TLS, HTTPS, SSH, etc.				

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	-	3	3	-	-	-	-	-	-	-	-	-	-	-	3
CO5	-	3	-	-	-	-	-	-	-	-	-	-	3	-	-

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UNIT -1	Attacks on Computers & Computer Security Introduction, Need for Security, Security approaches, Principles of Security, Types of attack. **Cryptography:** Overview of Cryptography, Substitution and affine cipher , Poly-alphabetic Cipher and their cryptanalysis, Perfect Security, Block Cipher, Data Encryption Standard (DES), 2DES, 3DES, Differential and linear Cryptanalysis, Block Cipher Design Principles, Block Cipher modes of operation, Advanced Encryption Standard.
UNIT -2	**Principles of Public-Key Cryptosystems:** The RSA Algorithm, Key Management, Diffie-Hellman Key Exchange and Cryptanalysis, Authentication Functions, Message Authentication Codes (MAC), Hash Functions,MD5 algorithm, Security of Hash Functions and MAC, Secure Hash Algorithm, HMAC.

UNIT -3	**Discrete Logarithms:** ElGamal System, Schnorr signature scheme, The ElGamal signature scheme, The digital signature algorithm, Provable secure signature schemes. **Elliptic curve cryptography:** Elliptic curve over the reals, Elliptic curves modulo a prime, Properties of Elliptic cures Point compression and ECIes, Computing point multiples on Elliptic curves, Elliptic curve digital signature algorithm, ECElGamal Cryptosystem, ElGamal EC Digital signature scheme, Elliptic curve factorization, Elliptic curve primality test.
UNIT -4	**Network Security Practice:** Kerberos, X.509 Authentication Service, Public Key Infrastructure. E-Mail Security: Security Basics of mail security, Pretty Good Privacy, S/MIME. IP Security: Architecture, Authentication Header, Encapsulation Security Payload, Combining Security Associations, Key Management. Web Security: Secure Sockets Layer and Transport Layer Security. Firewalls: Introduction, Types of firewall, Firewall Configurations, DMZ Network. Applications of Cryptography: Block chain, Bitcoin and Cryptocurrency Technologies.
Text Books	1. William Stallings - Cryptography and Network Security - Pearson Education, New Delhi, 5th Edition, 2011. 2. Behrouz A. Forouzan, Debdeep Mukhopadhyay - Cryptography and Network Security -Tata McGraw-Hill Education Pvt. Ltd., 2nd Edition, 2011 3. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
References	1. Charles Pfleeger - Security in computing - Prentice Hall of India, 4th Edition, 2006. 2. Atul Kahate, "Cryptography and Network Security", McGraw Hill Education 3. D.W. Davies and W.L. Price New York : Security for Computer Networks - John Wiley and Sons, 1984. 4. C. Meyer and S. M. Matyas : "Cryptography –A New Dimension In Computer Security", John Wiley & Sons, New York (1982). Wiley. 5. Bruce Schneier: Applied Cryptography, John Wiley. 6. MICHAEL WELSCHENBACH "Cryptography in C and C++"– Apress.

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Programme	**MCA**	**Semester**	**Third**		
Course Code	**22RACMCA3MC3**	**Course Name**	**Data Mining**		
Course Category	Mandatory Course (Compulsory)	Hours/Week	L	T	P
			3	1	0
		Credits	4		

Course Objectives

1. To conceptualize data mining and the need for pre-processing and to analyze the mining techniques for realistic data.
2. To characterize the kinds of patterns that can be discovered by association rule mining.
3. To implement classification and clustering techniques on large datasets.
4. To identify business applications and trends of data mining.

Course Outcomes

Students will be able to understand data mining and the need for pre-processing and to analyze the mining techniques for realistic data.

2. Students will be able to apply the patterns that can be discovered by association rule mining.

3. Students will be able to implement classification and clustering techniques on large datasets.

4. Students will be able to identify business applications and trends of data mining.

5. Students will be able to implement the concepts of data warehousing architecture and implementation.

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	2	-	2
CO2	-	3	3	2	-	-	--	-	2	-	-	-	2	-	-
CO3	-	3	3	-	2	-	-	-	-	-	-	-	-	2	-
CO4	-	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	2	-	3	-	-	-	-	-	-	-	2	-	-

Unit-1

Introduction to Data mining and Data Preprocessing: Fundamentals of data mining, Data Mining Functionalities, Classification of Data, Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining. Data Preprocessing: Introduction to KDD Process, Knowledge Discovery from Databases, Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

Unit-2

Association Rule Mining: Introduction, Data Mining Functionalities, Association Rule Mining, Mining Frequent Item-sets with and without Candidate Generation, Mining Various Kinds of Association Rules, Constraint – Based Association Mining.

Unit-3	**Classification and Prediction:** Classification versus Prediction, Data Preparation for Classification and Prediction, Classification by Decision Tree, Bayesian Classification, Rule Based Classification, Classification by Back Propagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Prediction, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor, Ensemble Methods, Model Selection.
Unit-4	**Clustering:** Cluster Analysis, Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods: Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Model Based Clustering Methods, Clustering High-Dimensional Data, Constraint Based Cluster Analysis, Outlier Analysis. **Web data mining:** Introduction, Web terminology and characteristics, Web content mining, Web usage mining, web structure mining. **Search Engines:** Characteristics, Functionality, Architecture, Ranking of WebPages, Enterprise search.
Text Books	1. Jiawei Han, Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012. 2. Introduction to Data Mining: Pang-Ning Tan, Michael Steinbach, Vipin kumar, Addision-Wesley. 3. K. P. Soman, Shyam Diwakar, V. Ajay, "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006. 4. G. K. Gupta, "Introduction to Data Mining with Case Studies", Eastern Economy Edition, Prentice Hall of India, Third Edition, 2014.
References	1. Data Mining: Introductory and Advanced Topics, Margaret H Dunham, Pearson, 2008. 2. Fundamentals of data warehouses, 2/e, Jarke, Lenzerini, Vassiliou, Vassiliadis, Springer. 3. Colleen Mccue, "Data Mining and Predictive Analysis: Intelligence Gathering and Crime Analysis", Second Edition, Elsevier, 2015. 4.Anand Rajaraman, Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2014. 5. Ian H. Witten, Eibe Frank, Mark A. Hall, "Data Mining: Practical Machine Learning Tools and Techniques", Third Edition, Morgan Kaufmann, 2011. 6. George M. Marakas, "Modern Data Warehousing, Mining and Visualization: Core Concepts", Prentice Hall, 2002. 7. Bruce Ratner, "Statistical and Machine Learning Data Mining: Techniques for Better Predictive Modeling and Analysis of Big Data", Second Edition, CRC Press, 2012.

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Programme	**MCA**	**Semester**	**Third**		
Course Code	**22RACMCA3GE1**	**Course Name**	**Machine Learning**		
Course Category	Generic Elective	Hours/Week	L	T	P
			3	1	0
		Credits	4		

Course Objectives

1. To understand the basic concepts of machine learning and probability theory.
2. To appreciate supervised learning and their applications.
3. To understand unsupervised learning like clustering and EM algorithms.
4. To understand the theoretical and practical aspects of probabilistic graphical models
5. To learn other learning aspects such as reinforcement learning, representation learning, deep learning, neural networks and other technologies.

Course Outcomes

1. Understand the features of machine learning to apply on real world problems
2. Characterize the machine learning algorithms as supervised learning and unsupervised learning and Apply and analyze the various algorithms of supervised and unsupervised learning
3. Analyze the concept of neural networks for learning linear and non-linear activation functions
4. Learn the concepts in Bayesian analysis from probability models and methods
5. Understand the fundamental concepts of Genetic Algorithm and Analyze and design the genetic algorithms for optimization engineering problems

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	-	2
CO2	-	3	-	2	2	-	--	-	-	-	-	-	3	-	-
CO3	-	3	-	-	2	-	-	-	-	-	-	-	-	2	-
CO4	-	3	2	-	2	-	-	-	-	-	-	-	-	2	-
CO5	3	-	-	-	3	-	-	-	-	-	-	-	2	-	2

Unit-1

Introduction: Machine Learning, Types of Machine Learning, Supervised Learning, Unsupervised Learning, Basic Concepts in Machine Learning, Machine Learning Process, Weight Space , Testing Machine Learning Algorithms , A Brief Review of Probability Theory, Turning Data into Probabilities , The Bias-Variance Tradeoff.

Overview and Introduction to Bayes Decision Theory: Machine intelligence and applications, pattern recognition concepts classification, regression, feature selection, supervised learning class conditional probability distributions, Examples of classifiers bayes optimal classifier and error, learning classification approaches.

Unit-2	**Supervised Learning:** Linear Models for Regression, Linear Basis Function Models, The Bias-Variance Decomposition, Bayesian Linear Regression, Common Regression Algorithms , Simple Linear Regression, Multiple Linear Regression, Linear Models for Classification, Discriminant Functions , Probabilistic Generative Models, Probabilistic Discriminative Models , Laplace Approximation , Bayesian Logistic Regression , Common Classification Algorithms , k-Nearest Neighbors , Decision trees, Random Forest model, Support Vector Machines.
Unit-3	**Unsupervised Learning:** Mixture Models and EM, K-Means Clustering, Dirichlet Process Mixture Models, Spectral Clustering, Hierarchical Clustering, The Curse of Dimensionality, Dimensionality, Reduction, Principal Component Analysis, Latent Variable Models(LVM), Latent Dirichlet Allocation (LDA).
Unit-4	**Bayesian Networks**: Conditional Independence, Markov Random Fields, Learning, Naive Bayes Classifiers, Markov Model, Hidden Markov Model. **Advanced Learning:** Reinforcement Learning, Representation Learning, Neural Networks, Active Learning, Ensemble Learning, Bootstrap Aggregation, Boosting, Gradient Boosting Machines, Deep Learning.
Text Books	1. Ethem Alpaydin, "Introduction to Machine Learning" , Third Edition, Prentice Hall of India, 2015. 2. Christopher Bishop, "Pattern Recognition and Machine Learning", Springer, 2006. 3. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012. 4. Stephen Marsland, "Machine Learning – An Algorithmic Perspective", Second Edition, CRC Press, 2014.
References	1. Tom Mitchell, "Machine Learning", McGraw-Hill, 2017. 2.Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Second Edition, Springer, 2008. 3.Fabio Nelli, "Python Data Analytics with Pandas, Numpy, and Matplotlib", Second Edition, Apress, 2018.

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Programme	**MCA**	**Semester**	**Third**		
Course Code	**22RACMCA3GE2**	**Course Name**	**Digital Image Processing**		
Course Category	Generic Elective	Hours/Week	L	T	P
			3	1	0
		Credits	4		

Course Objectives

1. To learn the basic concepts of digital image processing and various image transforms.
2. To familiarize the student with the image enhancement techniques.
3. To expose the student to a broad range of image processing techniques and their applications.
4. To appreciate the use of current technologies that is specific to image processing systems.
5. To expose the students to real-world applications of image processing.

Course Outcomes

1. Review the fundamental concepts of a digital image processing system.
2. Analyze images in the frequency domain using various transforms.
3. Evaluate the techniques for image enhancement and image restoration.
4. Categorize various compression techniques.
5. Interpret Image compression standards and image segmentation and representation techniques.

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	2	2	3	-	-	-	-	-	-	-	-	-	2	-	-
CO3	2	3	2	-	-	-	-	-	-	-	-	-	-	-	2
CO4	2	3	-	-	2	-	-	-	-	-	-	-	-	2	-
CO5	-	2	-	2	2	-	-	-	-	-	-	-	2	3	-

UNIT -1

Introduction to Digital Image Processing: Introduction, Applications of Image Processing Steps in Image Processing Applications, Digital Imaging System, Sampling and Quantization, Pixel Connectivity, Distance Measures, Color Fundamentals and Models, File Formats, Image Operations.

UNIT -2	**Image Enhancement:** Image Transforms: Discrete Fourier Transform, Fast Fourier Transform, Discrete Cosine Transform, Image Enhancement in Spatial and Frequency Domain, Grey Level Transformations, Histogram Processing, Spatial Filtering, Smoothing And Sharpening, Frequency Domain: Filtering in Frequency Domain.
UNIT -3	**Image Restoration and Multi-Restoration Analysis:** Multi Resolution Analysis: Image Pyramids, Multi Resolution Expansion, Wavelet Transforms, Image Restoration, Image Degradation Model, Noise Modeling, Blur, Order Statistic Filters, Image Restoration Algorithms. **Color Image processing:** Color models, Converting RGB to HSI and vice-versa, Pseudo color processing, Full-color image processing, Color transformations, Smoothing and sharpening. **Image Compression:** Need for data compression, Different types of compression, Variable length coding-Huffman Coding, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Lossy Compression: Transform coding, Wavelet coding, Basics of Image compression standards: JPEG, MPEG standards.
UNIT -4	**Image Segmentation and Feature Extraction:** Image Segmentation Detection of Discontinuities, Edge Operators, Edge Linking and Boundary Detection, Thresholding, Region based Segmentation , Image Features and Extraction, Image Features, Types of Features, Feature Extraction, SIFT, SURF and Texture, Feature Reduction Algorithms. **Image Processing Applications:** Image Classifiers, Supervised Learning, Support Vector Machines, Image Clustering, Unsupervised Learning, Hierarchical and Partition based Clustering Algorithms, EM Algorithm.
Text Books	1. Digital Image Processing, Rafael C Gonzalez, Richard E Woods, 4rth Edition, Pearson Education, 2018. 2. M.Sonka, V. Hlavac, R.Boyle, Image processing Analysis and Machine Vision Thomson Learning. 3. Digital Image Processing and Analysis, B. Chanda & D. D. Majumder, PHI, 2nd Edition, 2011. 4. S. Sridhar, "Digital Image Processing", Second Edition, Oxford University Press, 2016.

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References	1. Fundamentals of Digital Image Processing, Anil K. Jain, PHI, 1994 2. Digital Image Processing, B. Jähne, 6th Edition, Springer India, 2005. 3. Pratt. W.K.,Digital Image Processing, 3rd Edition, John Wiley & Sons. 4. Rosenfled A. & Kak, A.C, 1982, Digital Picture Processing, vol .I & II, Academic Press.

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Programme	**MCA**	**Semester**	**Third**		
Course Code	**22RACMCA3GE3**	**Course Name**	**DevOps**		
Course Category	Generic Elective	Hours/Week	L	T	P
			3	1	0
		Credits	4		
Course Objectives	From the course the student will learn 1. Develop technical expertise in deploying, managing, and monitoring cloud applications. 2. Learn to review deployment methodologies, CI/CD pipelines, & observability, and use DevOps tools like Git, Docker, & Jenkins.				
Course Outcomes	1. Students will be able to Understand the concepts of DevOps and the issues it resolves, Distributed versioning system 2. Students will be able to Learn common Infrastructure Servers, Availability and Scalability 3. Students will be able to Implement Automated Installations 4. Students will be able to Develop automation using Maven 5. Students will be able to Understand Docker Containerization, Micro service Architecture				

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	-	-	-	-	2	-	--	-	-	-	-	-	3	-	-
CO3	-	3	-	-	3	-	-	-	-	-	-	-	-	3	-
CO4	-	3	3	-	3	-	-	-	-	-	-	-	-	2	2
CO5	3	-	-	-	-	-	-	-	-	-	-	-	-	-	2

Unit-1	**Overview of Devops:** Introduction to DevOps, DevOps principles, SDLC models, Agile Methodology, DevOps with Agile using Scrum, Overview of Tools we use in DevOps, CICD, DevOps Engineer Skills, DevOps Delivery Pipeline, DevOps Ecosystem. **GIT - Version Control System:** Version Control System, Git, Git Installation with different environments, Commands And Operations In Git with GitHub: Initialize, Status, Add, Commit,Clone, Pull, Push, Difference, Reset, Log, Show, Tag, Stash, Remove. Advanced Git operations: Branching, Merging, Rebasing, Merge vs Rebase, Conflict resolving, Deleting remote repositories, Fork Operation. Git integration with Eclipse.

Unit-2	**Configuration Management using Ansible:** Need configuration management, Introduction to tools like ansible, chef, puppet, Introduction to Ansible, Working of Ansible, Ansible setup and configuration, Ansible Inventory Introduction, Ansible ad-hoc commands, Managing Ansible Configuration file, Creating playbooks with structures and conditions, Managing Ansible Roles, Real-time servers management, Ansible vault to protect ansible playbooks, AWS Provisioning using Ansible. **Container Management using Docker:** Introduction to Containerization, Introduction to Docker, Docker setup in multiple environments, Docker Images, Docker file creation and deployment, Working with Docker hub, Docker ad-hoc commands like push, pull, etc., Create Your Own Private Docker Registry on windows Server, Manage Docker Volumes, Docker Compose, Manage containers using Docker Compose files, Docker Swarm.
Unit-3	**Container Orchestration using Kubernetes:** Introduction to Container Orchestration, Introduction of Kubernetes, Installing Kubernetes Cluster, Manage Kubernetes Master and Nodes, Introduction to Pod, Managing pod network , Replication Controller, ReplicaSet, Deployment, Volume management. **Continuous Integration with Jenkins:** Introduction to CICD, Introduction to Jenkins, TeamCity, Installation and configuration of Jenkins, Jenkins users and Roles Management, Adding a slave node to Jenkins, Building Delivery Pipeline, Pipeline as a Code, Implementation of Jenkins, Build the pipeline of jobs using Jenkins, Auto-Deployment with Jenkins using git, maven and Tomcat server, Jenkin node setup and configuration, Jenkins integration with GIT (SCM).
Unit-4	**Backup / Artifactory Tool:** Artifactory tools and purposes, Jfrog vs nexus, Install and setup Jfrog, Maven dependencies backup with Jfrog, Jenkin Jfrog automation job. **Monitoring Tools:** Introduction to Nagios XI and Zabbix, Installation and setup of Nagios, Adding nodes to Nagios master, Monitor Windows Servers, Monitor Linux Servers, Monitoring different metrics in Nagios. **Introduction to DevOps on Cloud:** DevOps on Cloud, Introduction to AWS, Various AWS services, DevOps using AWS.
Text Books	1. DevOps For Beginners: A Complete Guide To DevOps Best Practices by Craig Berg 2. Learning Continuous Integration with Jenkins by Nikhil Pathania Published by Packt Publishing Limited, 2017. 3. Mastering Docker, Fourth Edition by Russ McKendrick, Packt Publishing.

	4. Kubernetes Up & Running: Dive into The Future of Infrastructure by Joe Beda, Brendan Burns, and Kelsey Hightower, O'Reilly publications.
References	1. Practical DevOps: Harness the Power of DevOps to Boost Your Skill Set and Make Your IT Organization Perform Better by Joakim Verona, Packt Publishing. 2. Effective DevOps: Building a Culture of Collaboration, Affinity, and Tooling at Scale by Jennifer Davis& Ray Daniels, O'Reilly publications.

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Programme	**MCA**	**Semester**	**Third**		
Course Code	**22RACMCA3SE**	**Course Name**	**MEAN Stack Development**		
Course Category	Skill Enhancement Course	Hours/Week	L	T	P
			3	1	0
		Credits	4		

Course Objectives

From the course the student will learn

1. Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client.
2. Monitor the performance of web applications & infrastructure and Troubleshooting web application with a fast and accurate a resolution
3. Design and implementation of Robust and Scalable Front End Applications.

Course Outcomes

1 Students will be able to understand the Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client.

2 Students will be able to Implement intermediate and advanced level web development practices

3 Students will be able to Develop and fully functional website and deploy a web server

4 Students will be able to perform web applications & infrastructure and Troubleshooting web application with a fast and accurate a resolution.

5 Students will be able to Design and implementation of Robust and Scalable Front End Application

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	2	3	-
CO3	-	3	3	-	-	-	-	-	-	-	-	-	-	2	-
CO4	-	3	3	-	-	-	-	-	-	-	-	-	-	-	3
CO5	-	-	3	-	-	-	-	-	-	-	-	-	3	-	2

Unit-1

Node.js: Introduction, Advantages, Node.js Process Model, Node Package Manager, Node JS Modules, Asynchronous Programming, Callbacks, Node.js Event Loop, Streams and Buffers Connecting Node.js to Database, Web Sockets.

Express.js: Introduction to Express Framework, Express Routing, MVC Structure and Modules, ApplyingMiddleware, Different Template Engines, Error Handling , REST API , Debugging,

	Different Template Engines, Process managers for Express apps, Security.
Unit-2	**Angular.js:** Angular Benefits, Dynamic Binding, AngularJSModules, Controllers,Scope, Views, Alternatives toCustom Directives, Event Directives, Expressions, Built-in and Custom filters, Understanding the Basic Options, Form validationsand States, AngularJS service, Factories, Creating Our Own AngularJS Service, Routing Using ngRoute, Redirects.
Unit-3	**RESTful Web Services:** Using the Uniform Interface, Designing URIs, Web Linking, and Conditional Requests. **ReactJs:** Welcome to React, A Strong Foundation, React's Past and Future, Learning React: Second Edition Changes, Working with the Files, Pure Function, Page Setup, React DOM, React Elements, ReactDOM, Children, Constructing Elements with Data, React Components, Server Rendering React, Refactoring for Advanced Reusability.
Unit-4	**MongoDB:** Introduction, Architecture, Features, Simple Examples, Create a Database& Collection in Mongo DB. Application development in MongoDB: Document-oriented data, Deployment and administration.
Text Books	1. Pro Mean Stack Development, ELadElrom, Apress. 2. Restful Web Services Cookbook, Subbu Allamraju, O'Reilly 3. Express.JS Guide,The Comprehensive Book on Express.js, Azat Mardan, Lean Publishing. 4. ANGULARS JS, Gajanan A.Deshmukh, Archana Kothawade, Nirali Prakashan publishers, 2021. 5. Learning React: Modern Patterns for Developing React Apps,Alex Banks & Eve Porcello, second edition, O'Reilly, 2020. 6. MongoDB in Action, Kyle Banker Peter Bakkum Shaun Verch Douglas Garrett Tim Hawkins, Second Edition, 2016
References	1. React: Up & Running: Building Web Applications – by Stoyan Stefanov, O'Riely publications. 2. Angular: Up and Running: Learning Angular, Step by Step, Shyam Seshadri, O'Riely publications.

VIKRAMA SIMHAPURI UNIVERSITY, NELLORE
DEPARTMENT OF COMPUTER SCIENCE

Syllabus for Master of Computer Applications (2 Year Course) for V.S. University Constituent Colleges(S) and Affiliated Colleges under the jurisdiction of Vikrama Simhapuri University, Nellore with effect from the Academic Year 2022-"23.

Programme	**MCA**	**Semester**	**Third**		
Course Code	**22RACMCA3P1**	**Course Name**	**Data Mining Lab**		
Course Category	Practical-I	Hours/Week	L	T	P
			0	0	4
		Credits	4		

List of Programs

1. Demonstration of preprocessing on dataset student.arff
2. Demonstration of preprocessing on dataset labor.arf.
3. Demonstration of Association rule process on dataset contact lenses.arff using apriori algorithm.
4. Demonstration of Association rule process on dataset test.arff using apriori algorithm.
5. Demonstration of classification rule process on dataset student.arff using j48 algorithm.
6. Demonstration of classification rule process on dataset employee.arff using Id3 algorithm.
7. Demonstration of classification rule process on dataset employee.arff using naive bayes algorithm.
8. Demonstration of clustering rule process on dataset iris.arff using simple k-means algorithm.
9. Demonstrate the process of cleaning data in data mining.

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Programme	MCA	Semester	Third		
Course Code	22RACMCA3P2	Course Name	Mean Stack development Lab		
Course Category	Practical – II	Hours/Week	L	T	P
			0	0	4
		Credits	4		

List of Programs

Angular.js front end

1) Design an Angular.js application for creating user interface and fetching data in Mean Stack.

2) Design an Angular.js application for creating a toolbar using Mean Stack.

3) Design an Angular.js application to design and using forms in Mean Stack.

4) Design an Angular.js application to implement Structural Directives in Mean Stack.

Node.js & Express.js

5) Design an Node.js application to add the Node Backend in Mean Stack.

6) Design an Node.js application to fetch data from Node Backend in Mean Stack.

7) Design an Express.js application to add the Express Framework in Mean Stack.

8) Design an application using Angular Http client in Mean Stack.

9) Design an application to implement CORS (Cross Origin Resource Sharing) in Mean Stack.

10) Design an application to connect Angular to the API end point in Mean Stack.

MongoDB

11) Design an application which connects Node Express app to MongoDB.

12) Design an application which stores data into database.

13) Design an application which is used to fetch the data, edit the data from the database.

14) Design an application which is used to update data on the server.

15) Design an application which is used to delete documents from the database.