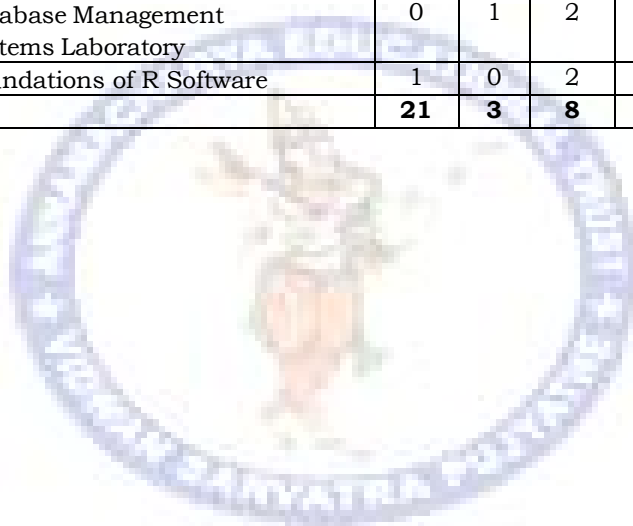


ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI
(AUTONOMOUS)
Department of Master of Computer Applications
AK22 - Course Structure and Syllabus

Semester - 1

S. No.	CC	Course Code	Course Name	Hours/Week			C	CIE	SEE	TM
				L	T	P				
1	PC	22MCA0101	Mathematical Foundations of Computer Science	4	0	0	4	40	60	100
2	PC	22MCA0102	Software Engineering	4	0	0	4	40	60	100
3	PC	22MCA0103	Web Programming	4	0	0	4	40	60	100
4	PC	22MCA0104	C and Data Structures	4	0	0	4	40	60	100
5	PC	22MCA0105	Database Management Systems	4	0	0	4	40	60	100
6	PC	22MCA0106	Web Programming Laboratory	0	1	2	2	40	60	100
7	PC	22MCA0107	C and Data Structures Laboratory	0	1	2	2	40	60	100
8	PC	22MCA0108	Database Management Systems Laboratory	0	1	2	2	40	60	100
9	MC	22MCA0109	Foundations of R Software	1	0	2	2	40	60	100
	Total			21	3	8	28	360	540	900



Course Code	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE		L	T	P	C
22MCA0101			4	0	0	4
Pre-Requisites	high school level arithmetic and algebra	Semester	I			
Course Objectives:						
<ul style="list-style-type: none"> Understand and create mathematical arguments. provides the mathematical foundations for many computer science courses including data structures, algorithms, database theory, automata theory, formal languages, compiler theory, computer security, and operating systems 						
Course Outcomes (CO): Student will be able to						
<ol style="list-style-type: none"> Understand mathematical reasoning in order to read, comprehend, and construct mathematical arguments. perform combinatorial analysis to solve counting problems and analyze algorithms work with discrete structures that include sets, permutations, relations, graphs, trees, and finite-state machines, which are the abstract mathematical structures describe how an output of a mathematical function is computed given an input 						
UNIT – I						Lecture Hrs: 12
The Foundations Logic and Proofs: Propositional Logic, Applications of Propositional Logic, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.						
UNIT – II						Lecture Hrs: 12
Basic Structures, Sets, Functions, Sequences, Sums, Matrices and Relations: Sets, Functions, Sequences & Summations, Cardinality of Sets and Matrices. Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness						
UNIT – III						Lecture Hrs: 12
Counting: The Basics of Counting, The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients and Identities. Advanced Counting Techniques: Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion-Exclusion, Applications of Inclusion-Exclusion.						
UNIT – IV						Lecture Hrs: 12
Discrete Probability and Advanced Counting Techniques: An Introduction to Discrete Probability, Probability Theory, Bayes' Theorem, Expected Value and Variance. Relations, Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings.						
UNIT – V						Lecture Hrs: 12
Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring. Modeling Computation: Languages and Grammars, Finite-State Machines with Output, Finite-State Machines with No Output, Language Recognition, Turing Machines						
TEXTBOOK(S) :						
1. Discrete Mathematics and Its Applications with Combinatorics and Graph Theory- Kenneth H Rosen, 7 th Edition, TMH.						
REFERENCES :						
<ol style="list-style-type: none"> Discrete Mathematical Structures with Applications to Computer Science-J.P. Tremblay and R. Manohar, TMH, Discrete Mathematics for Computer Scientists & Mathematicians: Joe L. Mott, Abraham Kandel, Theodore P. Baker, 2nd ed., Pearson Education. Discrete Mathematics- Richard Johnsonbaugh, 7th ed., Pearson Education. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimaldi, 5th edition, Pearson Education. 						
WEB REFERENCES :						
<ol style="list-style-type: none"> https://onlinecourses.nptel.ac.in/noc20_cs82/preview https://www.coursera.org/learn/discrete-mathematics 						

Mapping of Cos to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	1			1				1		1	1
CO2	1	1	1	2			1				1		1	1
CO3	1	3	1	1			1				1		1	1
CO4	2	2	1	1			1				1		1	1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	SOFTWARE ENGINEERING			L	T	P	C
22MCA0102				4	0	0	4
Pre-Requisites	Maths	Semester	I				
Course Objectives:							
<ul style="list-style-type: none"> To learn the basic concepts of software engineering and life cycle models To explore the issues in software requirements specification and enable to write SRS documents for software development problems To elucidate the basic concepts of software design and enable to carry out procedural and object oriented design of software development problems To understand the basic concepts of black box and white box software testing and enable to design test cases for unit, integration, and system testing To reveal the basic concepts in software project management 							
Course Outcomes (CO): Student will be able to							
<ol style="list-style-type: none"> Introduce SE and Models Discuss Techniques on SPM, Requirements analysis and Specification Highlight some important facets of Software Design Perform Testing Techniques and Quality Control Activities Discuss on Software Quality Assurance and Trends 							
UNIT – I							Lecture Hrs: 12
Introduction: Evolution, Software Development Projects, Exploratory style of Software Development, Emergence, Notable Changes in Software Development Practices, Computer Systems Engineering Software Life Cycle Models: A few basic concepts, Waterfall Model and its extensions, RAD, Agile Development Models, Spiral Model, Comparison							
UNIT – II							Lecture Hrs: 12
Software Project Management: SPM complexities, Responsibility of a software Development Manager, Project Planning, Metrics for Project Size Estimation, Project Estimation Techniques, Empirical Estimation Techniques, COCOMO, Halstead's Software Science, Staffing Level-Estimation, Scheduling, Organization and Team Structures, Risk Management, Software Configuration Management Requirement Analysis and Specification: Requirements Gathering and Analysis, SRS, Formal System Specification, Axiomatic Specification, Algebraic Specification, Executable Specification and 4GL							
UNIT – III							Lecture Hrs: 12
Software Design: Overview of the Design Process, Characterize good design, Cohesion and Coupling, Layered Arrangement of Modules, Approaches to Software Design Function-oriented Software Design: Overview, Structured Analysis, Developing the DFD model of a system, Structured Design, Detailed Design and Review User Interface Design: Characteristics, Basic Concepts, Types, Fundamentals of Component-based GUI Development, A UI Design Methodology							
UNIT – IV							Lecture Hrs: 12
Object Modeling Using UML: Unified Modeling Language (UML), UML Diagrams, Use Case Model, Class Diagrams, Interaction Diagrams, Activity Diagram, State Chart Diagram, Package, Component, and Deployment Diagrams Coding and Testing: Coding, Code Review, Software Documentation, Testing, Unit Testing, Black-Box Testing, White-box Testing, Debugging, Program Analysis Tools, Integration Testing, Testing Object-oriented Programs, System Testing, Issues associated with Testing							
UNIT – V							Lecture Hrs: 12
Software Reliability and Quality Management: Software Reliability, Statistical Testing, Software Quality, Software Quality Management System, ISO 9000, SEI Capability Maturity Model, Other Important Standards, Six Sigma Software Reuse: What can be reused, Issues, A Reuse Approach, Reuse at Organization level Emerging Trends: Client-Server Software, Architectures, CORBA, COM, DCOM, SOA, SAAS							
TEXTBOOK(S) :							
<ol style="list-style-type: none"> Fundamentals of Software Engineering, Rajib Mall, PHI Learning, 5th edition Software Engineering: A Practitioner's Approach, R S Pressman, McGraw Hill Education, 7th edition 							
REFERENCES :							
<ol style="list-style-type: none"> Software Engineering, Ian Sommerville, Pearson Education, Tenth edition Pankaj Jalote's Software Engineering: A Precise Approach, Wiley publications 							
Online Learning Resources:							
<ol style="list-style-type: none"> https://nptel.ac.in/courses/106/105/106105182/ http://peterindia.net/SoftwareDevelopment.html 							

Mapping of COs to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1		2	2	1		1		3	2
CO2	2	2	2	1	1		2	2	1		1		3	2
CO3	2	2	3	1	1		2	2	1		1		3	2
CO4	2	2	1	2	1		2	2	1		1		3	2
CO5	2	2	1	1	2		2	2	1		1		3	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	WEB PROGRAMMING			L	T	P	C
22MCA0103				4	0	0	4
Pre-Requisites	Nil	Semester	I				
Course Objectives:							
<ul style="list-style-type: none"> To design a web page that includes client-side and server-side scripting 							
Course Outcomes (CO): Student will be able to							
<ol style="list-style-type: none"> Design a Web Page using HTML Create Page with Client-side validation Create, Organize and Manage a web site Create dynamic PHP web pages Implement database connectivity with Front-end 							
UNIT – I	HTML & CSS			Lecture Hrs: 14			
Getting Started on the Web: Publishing Web Content, Understanding HTML and XHTML Connections Building Blocks of Practical Web Design: Working with Fonts, Text Blocks, and Lists - Using Tables to Display Information - Using External and Internal Links - Working with Colors, Images, and Multimedia - Working with Margins, Padding, Alignment, and Floating. Understanding Cascading Style Sheets, Understanding the CSS Box Model and Positioning - Using CSS to Do More with Lists, Text, and Navigation - Creating Fixed or Liquid Layouts							
UNIT – II	Introduction to JavaScript			Lecture Hrs: 10			
Understanding JavaScript - Understanding Dynamic Websites - Getting Started with JavaScript Programming - Working with the Document Object Model (DOM) - Using JavaScript Variables, Strings, and Arrays - Functions and Objects - Controlling Flow with Conditions and Loops							
UNIT – III	JavaScript Programming			Lecture Hrs: 12			
Responding to Events - Using Windows and Frames - Creating Print-Friendly Web Pages - Working with Web-Based Forms - Organizing and Managing a Website - AJAX: Remote Scripting							
UNIT – IV	Introduction to PHP			Lecture Hrs: 12			
Installation of XAMPP, Introduction, Expressions, Control Flow, Functions, Objects, Arrays, Date and Time Functions, File handling, System Calls							
UNIT – V	PHP with MySql			Lecture Hrs: 12			
Accessing MySql using PHP, Form Handling, Cookies, Sessions, Authentication, Validation and Error Handling, jQuery							
TEXTBOOK(S) :							
<ol style="list-style-type: none"> Sams Teach Yourself HTML, CSS and JavaScript - Julie C. Meloni, Pearson Education, 2012 Learning PHP, MySQL & JavaScript - Robin Nixon, O'Reilly Media, 4th edition, 2015 							
REFERENCES :							
<ol style="list-style-type: none"> Deitel and Deitel and Nieto, "Internet and World Wide Web - How to Program", Prentice Hall, 5th Edition, 2011. W.Jason Gilmore, Beginning PHP & MySql, APress, Fourth Edition, 2011. Herbert Schildt, "Java-The Complete Reference", Eighth Edition, Mc Graw Hill Professional, 2011. PHP 5 Recipes - A problem Solution Approach Lee Babin, Nathan A Good, Frank M.Kromann and Jon Stephens 							
Online Learning Resources:							
<ol style="list-style-type: none"> https://careerfoundry.com/en/tutorials/web-development-for-beginners/introduction-to-web-development/ https://www.geeksforgeeks.org/web-development/ https://www.edureka.co/blog/web-development-tutorial/ https://www.codecademy.com/catalog/subject/web-development 							

Mapping of Cos to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	1	2		1				1		3	2
CO2	3	1	1	2	2		1				1		3	2
CO3	3	1	1	1	2		1				1		3	2
CO4	3	1	1	1	2		1				1		3	2
CO5	2	1	1	2	2		1				1		3	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	C & DATA STRUCTURES			L	T	P	C
22MCA0104				4	0	0	4
Pre-Requisites	Maths	Semester	I				
Course Objectives:							
<ul style="list-style-type: none"> Develop programming skills which require solving a given problem. 							
Course Outcomes (CO): Student will be able to							
<ol style="list-style-type: none"> Understand the basics of C Programming Language Map the C concepts with memory usage Implement Searching and Sorting algorithms, and Linear Data Structures using arrays Implement Stacks, Queues and Tree Data Structure using Linked List Implement Graph Data structure 							
UNIT – I							Lecture Hrs: 12
Language Basics – Types, Literals, Type Conversions, Expressions, Operators, Statements, input and output, Functions							
UNIT – II							Lecture Hrs: 12
Arrays, Pointers, Structures, Unions, Bit-Fields, Dynamic Memory Management							
UNIT – III							Lecture Hrs: 12
Searching – Linear and Binary; Sorting – Bubble, Insertion, Selection, Merge, and Quick sort Data Structures – Introduction, concept, design of a suitable algorithm, Algorithm analysis, Stacks and its Applications, Queue and its Operations, Stack and Queue implementation in Arrays							
UNIT – IV							Lecture Hrs: 12
Linked List – Operations, Implementation of Linked List and its variations, Stack and Queue implementation in Linked List Trees – Introduction, Basic Terminology, Binary Trees, Representation – Linked, Linear and Traversals							
UNIT – V							Lecture Hrs: 12
Graphs - Introduction, Graph Terminology, Representation of Graphs, Operations and Applications							
TEXTBOOK(S) :							
<ol style="list-style-type: none"> C in a Nutshell, Peter Prinz and Tony Crawford, O'Reilly, 2006 Data Structures Using C, A. K. Sharma, Pearson, 2013 							
REFERENCES :							
<ol style="list-style-type: none"> The C Programming Language, Brian W. Kernighan / Dennis Ritchie, Pearson, Second Edition, 2015 Programming in C, Kamthane, Pearson, Third Edition, 2015 Data Structures Using C, Reema Thareja, Oxford Publishers, 2E, Paperback, 2014 Data Structures And Algorithms Made Easy: Data Structures And Algorithmic Puzzles, Narasimha Karumanchi, Careermonk Publications, Fifth edition, 2016 							
WEB REFERENCES :							
<ol style="list-style-type: none"> https://www.programiz.com/dsa https://www.geeksforgeeks.org/data-structures/ https://www.w3schools.com/c/ https://www.javatpoint.com/c-programming-language-tutorial 							

Mapping of Cos to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2	1		1				1		3	2
CO2	3	2	1	2	1		1				1		3	2
CO3	2	3	1	2	1		1				1		3	2
CO4	2	2	1	2	1		1				1		3	2
CO5	2	3	1	2	1		1				1		3	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	DATABASE MANAGEMENT SYSTEMS			L	T	P	C
22MCA0105				4	0	0	4
Pre-Requisites	Maths	Semester	I				
Course Objectives:							
Train in the fundamental concepts of database management systems, database modeling and design, SQL, PL/SQL and system implementation techniques. Inducting appropriate strategies for optimization of queries. Provide knowledge on transaction and concurrency techniques							
Course Outcomes (CO): Student will be able to							
1. know the fundamentals of Databases 2. Implement SQL and PL/SQL Concepts 3. Design a database for a real-world information system 4. Process and Optimize the query 5. Understand transaction and concurrency techniques in real time applications							
UNIT – I							Lecture Hrs: 12
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, Data Mining and Information Retrieval, Specialty Databases, Database users and Administrators. Introduction to Relational Model: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations							
UNIT – II							Lecture Hrs: 12
Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub-queries, Modification of the Database. Intermediate SQL: Joint Expressions, Views, Transactions, Integrity Constraints, SQL Data types and schemas, Authorization. Advanced SQL: Accessing SQL from a Programming Language, Functions and Procedures, Triggers, Recursive Queries, OLAP, Formal relational query languages.							
UNIT – III							Lecture Hrs: 12
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, More Normal Forms.							
UNIT – IV							Lecture Hrs: 12
Query Processing: Overview, Measures of Query cost, Selection operation, sorting, Join Operation, other operations, Evaluation of Expressions. Query optimization: Overview, Transformation of Relational Expressions, Estimating statistics of Expression results, Choice of Evaluation Plans, Materialized views, Advanced Topics in Query Optimization.							
UNIT – V							Lecture Hrs: 12
Transaction Management: Transactions: Concept, A Simple Transactional Model, Storage Structures, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Isolation and Atomicity, Transaction Isolation Levels, Implementation of Isolation Levels, Transactions as SQL Statements. Concurrency Control: Lock-based Protocols, Deadlock Handling, Multiple granularity, Timestamp-based Protocols, and Validation-based Protocols. Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with Loss of Nonvolatile Storage, Early Lock Release and Logical Undo Operations.							
TEXTBOOK(S) :							
1. Database System Concepts , A. Silberschatz, H.F.Korth, S.Sudarshan, 6/e, TMH 2019							
REFERENCES :							
1. Database Management System, 6/e Ramez Elmasri, 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							
WEB REFERENCES :							
1. https://onlinecourses.nptel.ac.in/noc21_cs04/preview							

Mapping of COs to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	1		1	1			1		3	2
CO2	3	2	2	1	1		1	1			1		3	2
CO3	3	3	2	1	1		1	1			1		3	2
CO4	3	2	3	1	1		1	1			1		3	2
CO5	3	2	3	1	1		1	1			1		3	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	WEB PROGRAMMING LABORATORY			L	T	P	C
22MCA0106				0	1	2	2
Pre-Requisites	Nil	Semester	1				
Course Objectives:							
<ul style="list-style-type: none"> To develop a web page with client/server validation 							
Course Outcomes (CO): Student will be able to							
<ol style="list-style-type: none"> Create a web page in HTML and css Validate Web page at client side Store/Retrieve data from databases to web page 							
List of programs to be implemented:							
<ol style="list-style-type: none"> To create a simple student bio-data form using html5. It should contain the following name (text box), address (multiline text box), gender (radio button male, female), skill sets known (check boxes – c, c++, java, C# etc), extra-curricular activities (text box), nationality (combo box), submit and reset button. To create an html page with different types of frames such as floating frame, navigation frame & mixed frame. Design the webpage by applying the different styles using inline, external & internal style sheets. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (color, bold and font size). Design a webpage with Header, unequal columns and footer and give background colors and images through external CSS. Create a page named aboutme.html that describes you. Style your page with css. Design a web page and embed various multimedia features in the page. Design signup form to validate username, password, phone number, mail id etc using Java script. Write a JavaScript program to check the total marks of a student in various examinations. The student will get A+ grade if the total marks are in the range 89..100 inclusive, if the examination is "Final-exam." the student will get A+ grade and total marks must be greater than or equal to 90. Return true if the student get A+ grade or false otherwise. Write a JavaScript program to convert a comma-separated values (CSV) string to a 2D array. Design a real-time Project with database connectivity implementing CRUD operations in PHP. 							
TEXTBOOK(S) :							
1. Web Design with HTML, CSS, JavaScript and jQuery Set 1st Edition by Jon Duckett							
WEB REFERENCES :							
<ol style="list-style-type: none"> https://www.w3resource.com/javascript-exercises/ https://www.w3resource.com/php-exercises/php-basic-exercises.php 							

Mapping of COs to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	2		2				3		3	2
CO2	3	2	1	1	2		2				3		3	2
CO3	3	2	1	1	2		2				3		3	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	C AND DATA STRUCTURES LABORATORY			L	T	P	C
22MCA0107				0	1	2	2
Pre-Requisites	Problem Solving	Semester	1				
Course Objectives:							
<ul style="list-style-type: none"> Solve a problem in C Programming by applying suitable data structure 							
Course Outcomes (CO): Student will be able to							
<ol style="list-style-type: none"> Write basic c programs Perform searching and sorting techniques on data Write programs on derived data types Implement linear and non-linear data structures 							
List of programs to be implemented:							
<ol style="list-style-type: none"> Simple C Programs Using if and Switch Constructs Programs Looping Statements Problems Functions and Recursive Programs Arrays, Strings and Matrices Programs Pointer Programs Searching and Sorting programs Programs using Structure and Union Stacks and queues implementation using arrays Implementation of Linked list and its operations Stacks and queues implementation using Linked list Tree Traversals Graph and its operations 							
TEXTBOOK(S) and REFERENCES:							
<ol style="list-style-type: none"> Ellis Horowitz, Satraj Sahni and Susan Anderson-Freed, Fundamentals of Data Structures in C, W. H. Freeman and Company. Seymour Lipschutz , Data Structures, Schaum's Outlines Series, Tata McGraw-Hill. R. Kruse et al. , Data Structures and Program Design in C, Pearson Education. Donald Knuth, The Art of Computer Programming, Volume 1 and 3, Addison-Wesley, Reading, Mass., 1973. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms, MIT Press. Ritchie and Kerningham, The C Programming Language, R. G. Dromey, How to Solve it by Computer, Prentice-Hall of India. . 							
WEB REFERENCES :							
<ol style="list-style-type: none"> https://cse.iitkgp.ac.in/~pds/notes/ https://archive.nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs25/ https://www.coursera.org/specializations/data-structures-algorithms 							

Mapping of COs to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	2		2				3		3	2
CO2	3	2	1	1	2		2				3		3	2
CO3	3	2	1	1	2		2				3		3	2
CO4	3	2	1	1	2		2				3		3	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C
22MCA0108		0	1	2	2
Pre-Requisites	Semester	1			

Course Objectives:

- Provides the foundation needed for a career in database development, data warehousing, or business intelligence.

Course Outcomes (CO): Student will be able to

1. Create and insert records into table
2. Retrieve information from table(s)
3. Use procedures to program the data access and manipulation
4. Create user interfaces and generate reports

List of programs to be implemented:

1. Queries on The Example company database:

The EMP table

The EMP table stores records about company employees. This table defines and contains the values for the attributes EMPNO, ENAME, JOB, MGR, HIREDATE, SAL, COMM and DEPTNO.

- EMPNO is a unique employee number; it is the primary key of the employee table.
- ENAME stores the employee's name.
- The JOB attribute stores the name of the job the employee does.
- The MGR attribute contains the employee number of the employee who manages that employee. If the employee has no manager, then the MGR column for that employee is left set to null.
- The HIREDATE column stores the date on which the employee joined the company.
- The SAL column contains the details of employee salaries.
- The COMM attribute stores values of commission paid to employees. Not all employees receive commission, in which case the COMM field is set to null.
- The DEPTNO column stores the department number of the department in which each employee is based. This data item acts a foreign key, linking the employee details stored in the EMP table with the details of departments in which employees work, which are stored in the DEPT table.

The DEPT table

The DEPT table stores records about the different departments that employees work in. This table defines and contains the values for the attributes as follows:

- DEPTNO: The primary key containing the department numbers used to identify each department.
- DNAME: The name of each department.
- LOC: The location where each department is based.

The data contained in the EMP and DEPT tables

The data in the EMP table contains the following 14 rows:

EMPNO	ENAME	JOB	HIREDATE	MGR	SAL	COMM	DEPTNO
7369	SMITH	CLERK	17-DEC-80	7902	800		20
7499	ALLEN	SALESMAN	20-FEB-81	7698	1600	300	30
7521	WARD	SALESMAN	22-FEB-81	7698	1250	500	30
7566	JONES	MANAGER	02-APR-81	7839	2975		20
7654	MARTIN	SALESMAN	28-SEP-81	7698	1250	1400	30
7698	BLAKE	MANAGER	01-MAY-81	7839	2850		30
7782	CLARK	MANAGER	09-JUN-81	7839	2450		10
7788	SCOTT	ANALYST	19-APR-87	7566	3000		20
7839	KING	PRESIDENT	17-NOV-81		5000		10
7844	TURNER	SALESMAN	08-SEP-81	7698	1500	0	30
7876	ADAMS	CLERK	23-MAY-87	7788	1100		20
7900	JAMES	CLERK	03-DEC-81	7698	950		30
7902	FORD	ANALYST	03-DEC-81	7566	3000		20
7934	MILLER	CLERK	23-JAN-82	7782	1300		10

The DEPT table contains the following four rows:

DEPTNO	DNAME	LOC
10	ACCOUNTING	NEW YORK
20	RESEARCH	DALLAS
30	SALES	CHICAGO
40	OPERATIONS	BOSTON

1. Create emp and dept table in SQL
2. Insert records as given in the figures above
3. List all records from the emp table
4. List all records from the dept table
5. List all employee names along with their salaries from emp table

6. List all department numbers, employee numbers and their manager's numbers in that order from emp table.
7. List department names and locations from the dept table.
8. List the employees belonging to the department 20
9. List the name and salary of the employees whose salary is more than 1000
10. List employee number and name of managers
11. List the names of the clerks working in the department 20
12. List the names of analysts and salesmen
13. List the details of the employees who have joined before the end of September 1981
14. List the name of employees who are not managers
15. List the name of the employees whose employee numbers are 7369, 7521, 7839, 7934, 7788
16. List the employee details not belonging to the department 10, 30 and 40
17. List the employee name and salary, whose salary is between 1000 and 2000
18. List employee names who have joined before 30th June 1981 and after December 1981
19. List the different jobs (designations) available in emp table
20. List the employee names who are not eligible for commission
21. List the name of the employee and job of the employee who does not report to anybody (managers is NULL)
22. List the employees not assigned to any department
23. List the employees who are eligible for commission
24. List the details of employees whose salary is greater than 2000 and commission is null.
25. List the employees whose names start with an "S"
26. List the employees whose names ending with "S"
27. List the names of employees whose names have exactly 5 characters
28. List the employee names having 'T' as the second character
29. List the name, salary and PF amount of all the employees (PF is calculated as 10% of salary)
30. List the names of employees who are more than 25 years old in the organization
31. List the empno, ename, sal in ascending order of salary
32. List the empno, ename, sal, hiredate in descending order of hiredate.
33. List the employee name, Salary, job and department no. in ascending order of deptno and then on descending order of salary
34. List the employee details in ascending order of salary
35. List the employee name, salary, PF, HRA, DA and gross; order the result in ascending order of gross. HRA is 50% of salary and DA is 30% of salary
36. List the number of employees working with the company
37. List the number of jobs available in the emp table
38. List the total salaries payable to employees
39. List the maximum salary of employees working as a salesman
40. List the minimum salary from emp table
41. List the average salary and number of employees working in the department 20
42. List the deptno(s) and number of employees in each department
43. List the department number and the total salary payable in each department
44. List the jobs and the number of employees in each job. The result should be in descending order of the number of employees:
45. List the total salary, maximum, minimum and the average salary of employees job wise
46. List the average salary from each job excluding managers
47. List the total salary, maximum, minimum and the average salary of employees job-wise, for department number 20 only
48. List the average salary for each job type within department
49. List average salary for all departments employing more than five people
50. List jobs of all the employees where maximum salary is ≥ 5000
51. List the total salary, maximum, minimum and the average salary of employees jobwise, for department number 20 only and display only those rows having average salary greater than 1000
52. For the above query, the output should be arranged in the ascending order of SUM(sal)
53. List the deptno(s) and names in department name order.
54. List the details of employees in departments 10 and 20 in alphabetical order of name
55. List names and jobs of all clerks in department 20 in alphabetical order of name
56. List the names of all employees who have LL and LT in their names
57. List names and total remuneration for all employees
58. List name, annual salary and commission of all salespeople whose monthly salary is greater than their commission, the output should be ordered by salary, highest first. If two or more employees have the same salary sort by employee name within the highest salary order
59. List lowest paid employees working for each manager, sort the output by salary
60. List the employee numbers, names, department numbers and the department name
61. List all the employees who joined the company before their manager
62. Display the different designations in department 20 and 30
63. Display empno, ename from emp where deptno is 10 and 30 in ascending order of empno
64. List the jobs common to department 20 and 30
65. List the jobs unique to department 20
66. List the employees belonging to the department of MILLER
67. List the name of employee who draws the highest salary
68. List all employee details of an employee whose salary is greater than the average salary of employees whose

hiredate is before '01-APR-1981'

69. List the job with highest average salary
70. Find the details of the department whose manager's empno is 7698
71. List the names of the employees who earn lowest salary in each department
72. List employee details who earn salary greater than the average salary
73. List all employees who have at least one person reporting to them
74. List the employee details iff more than 2 employees are present in deptno 10
75. List all the employee details who do not manage any one
76. List the employee names whose salary is greater than the lowest salary of an employee belonging to deptno 20
77. List the employee details of those employees whose salary is greater than any of the managers
78. List the employee names whose salary is greater than the highest salary of all employee belonging to dept 20
79. List the employee details of those employees whose salary is more than the highest paid manager
80. List all employees, their job and deptno, who are having same job as that of any employee of deptno 20
81. List the names and jobs of employees, together with the locations in which they work
82. Find all employees who are paid more than JONES
83. Find the details of any employees receiving the same salaries as either SCOTT or WARD
84. To display employees who earn more than the lowest salary in Department 30 (Use ANY operator)
85. Find employees who earn more than every employee in Department 30 (Use ALL operator)
86. Use a correlated sub-query, to find employees who earn a salary greater than the average salary for their department
87. Find all employees located in Dallas.
88. List the total annual pay for the Sales department (remember salary and commission data are provided as monthly figures).
89. List any departments that do not contain any employees.
90. Which workers earn more than their managers (hint: remember that the MGR attribute stores the EMPNO of an employee's manager).
91. List the total monthly pay for each department.
92. List the number of employees located in Chicago and New York.
93. Find all jobs with more than two employees.
94. List the details of the highest-paid employee.
95. Find whether anyone in department 30 has the same job as JONES.
96. Find the job with the most employees.
97. Using self join, list all the employees who have joined before their manager
98. List all employees who earn less than the average salary of all the employees
99. List all employees name along with their manager's name. Also list the name of employee who has no manager
100. Display the dept that has no employee
101. List the employee details who earn minimum salary for their job
102. List the ename, sal, deptno for those employees who earn sal greater than the avg sal of their dept. Sort the output in deptno order
103. List the employee details who earn highest salary for their job
104. List the details of those employees who are among the five highest earners of the company
105. To increase everyone's salary by 40%
106. Change the department of King to 40
107. All employees who have more than 2 people reporting to them, are to directly report to the PRESIDENT
108. Delete all records from emp
109. Delete the records of clerks
110. To add a column "experience" to the employee table
111. To drop the column "location" from the employee table
112. To modify the column salary in the employee table WITH NUMBER (15,2)
113. Add a column to the existing table emp, which will hold the grades for each employee
114. Modify the emp table, add a Primary Key constraint 'emp_c'
115. Modify the emp table, add constraint REFERENCES to deptno of table emp referring deptno of table dept
116. Modify the emp table, add constraint CHECK for sal of table emp where sal should be greater than 2500
117. Modify the sal column of the emp table to NOT NULL and increases its size to 10
118. Modify the ename column. Increase its width to varchar2(35)
119. To change the name of the table employee to my_employee
120. Arithmetic Functions, string functions, and DATE Functions in SQL

2. PROGRAMS ON PL/SQL

- a. Write a PL/SQL program to swap two numbers.
- b. Write a PL/SQL program to find the largest of three numbers.
- c. Write a PL/SQL program to find the total and average of 6 subjects and display the grade.
- d. Write a PL/SQL program to find the sum of digits in a given number.
- e. Write a PL/SQL program to display the number in reverse order.
- f. Write a PL/SQL program to check whether the given number is prime or not.
- g. Write a PL/SQL program to find the factorial of a given number.
- h. Write a PL/SQL program to accept a string and remove the vowels from the string. (When 'Hello' passed to the program it should display 'Hll' removing e and o from the word Hello).

3. PROCEDURES AND FUNCTIONS

- Write a function to accept employee number as parameter and return Basic +HRA together as single column.
- Accept year as parameter and write a Function to return the total net salary spent for a given year.
- Create a function to find the factorial of a given number and hence find NCR.

4. TRIGGERS

- Insert row in employee table using Triggers. Every trigger is created with name any trigger have same name must be replaced by new name. These triggers can be raised before insert, update or delete rows on data base. The main difference between a trigger and a stored procedure is that the former is attached to a table and is only fired when an INSERT, UPDATE or DELETE occurs.
- Convert employee name into uppercase whenever an employee record is inserted or updated. Trigger to fire before the insert or update.
- Trigger before deleting a record from employee table. Trigger will insert the row to be deleted into table called delete_emp and also record user who has deleted the record and date and time of delete.

5. PROCEDURES

- Write the PL/SQL programs to create the procedure to find sum of N natural number.
- Write the PL/SQL programs to create the procedure to find Fibonacci series.
- Write the PL/SQL programs to create the procedure to check the given number is perfect or not

6. CURSORS

- Write a PL/SQL block that will display the name, dept no, salary of fist highest paid employees.
- Update the balance stock in the item master table each time a transaction takes place in the item transaction table. The change in item master table depends on the item id is already present in the item master then update operation is performed to decrease the balance stock by the quantity specified in the item transaction in case the item id is not present in the item master table then the record is inserted in the item master table.
- Write a PL/SQL block that will display the employee details along with salary using cursors.
- To write a Cursor to display the list of employees who are working as a Managers or Analyst.
- To write a Cursor to find employee with given job and dept no.
- Write a PL/SQL block using implicit cursor that will display message, the salaries of all the employees in the 'employee' table are updated. If none of the employee's salary is updated we get a message 'None of the salaries were updated'. Else we get a message like for example, 'Salaries for 1000 employees are updated' if there are 1000 rows in 'employee' table.

7. Design a real-time application like Library Management Systems...

TEXTBOOK(S) :

- Ramez Elmasri, Shamkant, B. Navathe, "Database Systems", Pearson Education, 6th Edition, 2013.
- Peter Rob, Carles Coronel, "Database System Concepts", Cengage Learning, 7th Edition, 2008.

WEB REFERENCES :

- https://www.cs.uct.ac.za/mit_notes/database/htmls/chp03.html
- <https://www.javatpoint.com/pl-sql-tutorial>
- <https://nptel.ac.in/courses/106105175>
- <https://www.coursera.org/learn/database-management>

Mapping of COs to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	2		2	1	1		3		3	2
CO2	3	2	1	1	2		2	1	1		3		3	2
CO3	3	2	1	1	2		2	1	1		3		3	2
CO4	3	2	1	1	2		2	1	1		3		3	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	FOUNDATIONS OF R SOFTWARE			L	T	P	C
22MCA0109				1	0	2	2
Pre-Requisites	Basic Mathematics	Semester	I				
Course Objectives:							
<ul style="list-style-type: none"> Work in R Environment 							
Course Outcomes (CO): Student will be able to							
<ol style="list-style-type: none"> Understand the basics of R Implement Data Structures Implement Statistical Graphics, Control Statements and Group manipulation Implement Iteration, Data Reshaping and String Manipulation Apply basic statistics in R 							
UNIT – I			Lecture Hrs: 6				
Getting R - Downloading R, R Version, 32-bit vs. 64-bit, Installing, Microsoft R Open; The R Environment - Command Line Interface, RStudio, Microsoft Visual Studio; R Packages - Installing Packages, Loading Packages, Building a Package; Basics of R - Basic Math, Variables, Data Types, Vectors, Calling Functions, Function Documentation, Missing Data, Pipes							
UNIT – II			Lecture Hrs: 6				
Data Structures – Data Frames, Lists, Matrices, Arrays, Reading Data into R - Reading CSVs, Excel Data, Reading from Databases, Data from Other Statistical Tools, R Binary Files, Data Included with R, Extract Data from Web Sites, Reading JSON Data							
UNIT – III			Lecture Hrs:6				
Statistical Graphics - Base Graphics, ggplot2, Writing R functions - Hello, World!, Function Arguments, Return Values, do.call() Control Statements - if and else, switch, if else, Compound Tests, Loops - for Loops, while Loops, Controlling Loops Group Manipulation - Apply Family, aggregate, plyr, data.table, Faster Group Manipulation with dplyr – Pipes, tbl, select, filter, slice, mutate, summarize, group_by, arrange, do, dplyr with Databases							
UNIT – IV			Lecture Hrs: 6				
Iterating with purr – map, map with Specified Types, Iterating over a data.frame, map with Multiple Inputs, Data Reshaping - cbind and rbind, Joins, reshape2, Reshaping Data in the Tidyverse - Binding Rows and Columns, Joins with dplyr, Converting Data Formats, Manipulating Strings – paste, sprint, Extracting Text, Regular Expressions							
UNIT – V			Lecture Hrs: 6				
Probability Distributions - Normal Distribution, Binomial Distribution, Poisson Distribution, Other Distributions, Basic Statistics - Summary Statistics, Correlation and Covariance, T-Tests, ANOVA, Linear Models - Simple Linear Regression, Multiple Regression, Logistic Regression							
TEXTBOOK(S) :							
1. Jared P. Lander, R for Everyone, Pearson Education, 2 nd edition, 2017							
REFERENCES :							
<ol style="list-style-type: none"> Tilman M. Davies, The Book of R, No Starch Press, 1st edition, 2016 Andrie de Vries, R For Dummies, John Wiley & Sons, 2nd edition, 2015 Andy Field, Discovering Statistics Using R, SAGE Publications Ltd, 1st edition, 2012 Norman Matloff, The Art of R Programming, No Starch Press, 1st edition, 2011 							
WEB REFERENCES :							
<ol style="list-style-type: none"> https://in.coursera.org/learn/r-programming https://www.edx.org/learn/r-programming https://www.udemy.com/topic/r-programming-language/ https://onlinecourses.nptel.ac.in/noc19_ma33/preview 							

Mapping of COs to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	2		2				3		3	2
CO2	3	1	1	2	1		1				3		3	2
CO3	2	2	2	2	2		2				3		3	2
CO4	2	1	1	2	1		1				3		3	2
CO5	3	2	1	2	1		1				3		3	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI
(AUTONOMOUS)
Department of Master of Computer Applications
AK22 - Course Structure and Syllabus

Semester - 2

S. No.	CC	Course Code	Course Name	Hours/Week			C	CIE	SEE	TM
				L	T	P				
1	PC	22MCA0201	Mobile Application Development	4	0	0	4	40	60	100
2	PC	22MCA0202	Machine Learning	4	0	0	4	40	60	100
3	PC	22MCA0203	Object-oriented Programming through Java	4	0	0	4	40	60	100
4	PC	22MCA0204	Mobile Application Development Laboratory	0	1	2	2	40	60	100
5	PC	22MCA0205	Machine Learning Lab	0	1	2	2	40	60	100
6	PC	22MCA0206	Object-oriented Programming through Java Laboratory	0	1	2	2	40	60	100
7	SC	22MCA0207	Skill Oriented Course - I Python Programming	0	1	2	2	40	60	100
8	MC	22MCA0208	Soft Skills	0	1	2	2	50	0	50
	Total			12	5	10	22	330	420	750

MOOC:

Student is allowed to register for any number of courses mentioned below (either open or professional elective) but atleast one course's pass certificate in NPTEL platform should be submitted to the department/exam section within the programme duration (i.e., before 4th semester exam notification released).

Professional Elective *:

1. Data Structures and algorithms using Java
2. Programming in modern C++
3. Introduction to IoT
4. Blockchain and its applications
5. Introduction to Industry 4.0 and Industrial IoT
6. Data Analytics with Python

Open Elective *:

1. Principles of Management
2. Organizational Behaviour
3. Entrepreneurship
4. Management Information System
5. Numerical Methods for Engineers
6. Public Speaking

Course Code	MOBILE APPLICATION DEVELOPMENT		L	T	P	C
22MCA0201			4	0	0	4
Pre-Requisites	HTML	Semester	II			
Course Objectives:						
<ul style="list-style-type: none"> To understand fundamentals of android operating systems and programming. Illustrate the various components, layouts and views in creating android applications. create a mobile app 						
Course Outcomes (CO): Student will be able to						
<ol style="list-style-type: none"> Demonstrate knowledge on mobile platforms, mobile user interface and user interface design requirements. Design user interfaces by analyzing user requirements. Develop mobile applications for Messaging, Location-Based Services, and Networking Develop mobile applications and publish in different mobile platforms Use Android studio and iOS tools to develop mobile applications. 						
UNIT – I						Lecture Hrs: 12
Introduction to Android: The Android 4.1 jelly Bean SDK, Understanding the Android Software Stack, installing the Android SDK, Creating Android Virtual Devices, Creating the First Android Project, Using the Text view Control, Using the Android Emulator, The Android Debug Bridge(ADB), Launching Android Applications on a Handset.						
UNIT – II						Lecture Hrs: 12
Basic Widgets: Understanding the Role of Android Application Components, Understanding the Utility of Android API, Overview of the Android Project Files, Understanding Activities, Role of the Android Manifest File, Creating the User Interface, Commonly Used Layouts and Controls, Event Handling, Displaying Messages Through Toast, Creating and Starting an Activity, Using the Edit Text Control, Choosing Options with Checkbox, Choosing Mutually Exclusive Items Using Radio Buttons.						
UNIT – III						Lecture Hrs: 12
Building Blocks for Android Application Design: Introduction to Layouts, Linear Layout, Relative Layout, Absolute Layout, Using Image View, Frame Layout, Table Layout, Grid Layout. Advanced User Interface And Data Persistence: Basic views, Picker views, List view, Image view, Menus with views, Web view, saving Creating and using databases.						
UNIT – IV						Lecture Hrs: 12
Using Selection widgets and Debugging: Using List View, Using the Spinner control, Using the GridView Control, Creating an Image Gallery Using the ViewPager Control, Using the Debugging Tool: Dalvik Debug Monitor Service(DDMS), Messaging, Location-Based Services and Networking SMS messaging, sending e-mail, displaying maps, getting location data, monitoring a location, Consuming web services using HTTP.						
UNIT – V						Lecture Hrs: 12
Android services, publishing android applications: Services, Communication between a service and an activity, Binding activities to services, Threading, Preparing for publishing, Deploying APK files. Building the app in android debugging an android app. iOS tools, iOS project, Debugging iOS apps						
TEXTBOOK(S) :						
<ol style="list-style-type: none"> Lauren Darcey and Shane Conder, “Android Wireless Application Development”, Pearson Education, 2nd ed. (2011) J. F. DiMarzio, Beginning Android Programming with Android Studio, Wiley India, 4 the Edition, 2017. Wei – Meng Lee, Beginning Android 4 Application Development, Wrox, 2017. Jeff McWherter and Scott Gowell, Professional Mobile Application Development, Wiley India, 1st Edition, 2012. 						
REFERENCES :						
<ol style="list-style-type: none"> Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt Ltd, 2010 Mark L Murphy, “Beginning Android”, Wiley India Pvt Ltd, 2009 Android Application Development All in one for Dummies by Barry Burd, 2nd ed, 2015 Neils Smyth, Android Studio Development Essentials, Creative Space Independent publishing platform, 7e, 2016. 						
Online Learning Resources:						
<ol style="list-style-type: none"> https://developer.android.com/training/basics/firstapp https://www.javatpoint.com/android-tutorial https://www.udemy.com/course/build-blockchain/ 						

Mapping of COs to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	2	1		1				1		2	3
CO2	3	1	1	1	1		1				1		2	3
CO3	2	2	2	1	2		2				1		2	3
CO4	2	2	2	1	2		2				1		2	3
CO5	2	2	2	1	2		2				1		2	3

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	MACHINE LEARNING			L	T	P	C
22MCA0202				4	0	0	4
Pre-Requisites	Maths, DBMS	Semester	II				
Course Objectives:							
<ul style="list-style-type: none"> To understand the basic theory underlying machine learning. To be able to formulate machine learning problems corresponding to different applications. To understand a range of machine learning algorithms along with their strengths and weaknesses. To be able to apply machine learning algorithms to solve problems of moderate complexity. 							
Course Outcomes (CO): Student will be able to							
<ol style="list-style-type: none"> Understand the basics of machine learning and decision tree learning Comprehend the working of ANN and hypothesis evaluation Illustrate Bayesian Learning and dimensionality reduction Estimate clustering models and non-parametric methods Perform Linear Discrimination 							
UNIT – I							Lecture Hrs: 12
<p>What is Machine Learning?, Examples of machine learning applications, supervised Learning: learning a class from examples, Vapnik- Chervonenkis dimension, probably approximately correct learning, noise, learning multiple classes, regression, model selection and generalization, dimensions of a supervised machine learning algorithm.</p> <p>Decision Tree Learning: Introduction, Decisions Tree representation, Appropriate problems for decision tree learning, the basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, issues in decision tree learning</p>							
UNIT – II							Lecture Hrs: 12
<p>Artificial Neural Networks: Introduction, Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithm, Remarks on the Backpropagation Algorithm, An illustrative Example: Face Recognition, Advanced Topics in Artificial Neural Networks.</p> <p>Evaluating Hypotheses: Motivation, Estimating hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, differences in error of two hypothesis, comparing learning algorithms.</p>							
UNIT – III							Lecture Hrs: 12
<p>Bayesian Learning: Introduction, Bayes Theorem, Bayes Theorem and Concept Learning, Maximum Likelihood and least squared error hypothesis, Maximum Likelihood hypothesis for predicting probabilities, Minimum Description Length Principle, Bayes Optimal Classifier, Gibbs Algorithm , Naive Bayes Classifier , Bayesian Belief Network, EM Algorithm</p> <p>Dimensionality Reduction: Introduction, Subset selection, principle component analysis, feature embedding, factor analysis, singular value decomposition and matrix factorization, multidimensional scaling, linear discriminant analysis, canonical correlation analysis, Isomap, Locally linear embedding, Laplacian Eigenmaps.</p>							
UNIT – IV							Lecture Hrs: 12
<p>Clustering: Introduction, Mixture densities, K- Means clustering, Expectation - Maximization algorithm, Mixture of latent variable models, supervised learning after clustering, spectral clustering, Hierarchical clustering, Choosing the number of clusters.</p> <p>Nonparametric Methods: Introduction, Non Parametric density estimation, generalization to multivariate data, nonparametric classification, condensed nearest neighbor, Distance based classification, outlier detection, Nonparametric regression: smoothing models, how to choose the smoothing parameter</p>							
UNIT – V							Lecture Hrs: 12
<p>Linear Discrimination: Introduction, Generalizing the linear model, geometry of the linear discrimination, pair wise separation, parametric discrimination revisited, gradient descent, logistic discrimination, discrimination by regression, learning to rank.</p>							
TEXTBOOK(S) :							
<ol style="list-style-type: none"> Machine Learning – Tom M. Mitchell - McGraw Hill Education, 2017 Introduction to Machine learning, Ethem Alpaydin, PHI, 3rd Edition, 2014. 							
REFERENCES :							
<ol style="list-style-type: none"> Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis Chapman and Hall/CRC; 2nd edition, 2014 Machine Learning For Beginners: A Comprehensive Guide To Understand Machine Learning. How It Works And How Is Correlated To Artificial Intelligence And Deep Learning, Chris Neil, Alicex Ltd, 2020 							
Online Learning Resources:							
<ol style="list-style-type: none"> https://www.youtube.com/watch?v=r4sgKrRL2Ys&list=PL1xHD4vteKYVpaliy295pg6_SY5qznc77 https://nptel.ac.in/courses/106106139 https://developers.google.com/machine-learning/crash-course 							

Mapping of COs to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	3	2		2				1		3	2
CO2	2	2	2	3	2		2				1		3	2
CO3	2	2	2	3	2		2				1		3	2
CO4	2	2	2	3	2		2				1		3	2
CO5	2	2	2	3	2		2				1		3	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	OBJECT-ORIENTED PROGRAMMING THROUGH JAVA	L	T	P	C
22MCA0203		4	0	0	4
Pre-Requisites	Semester	II			
Course Objectives:					
<ul style="list-style-type: none"> Demonstrate the use of good object-oriented programming principles 					
Course Outcomes (CO): Student will be able to					
<ol style="list-style-type: none"> Understand the basics of Java Programming Environment Code on Objects, classes, and Inheritance (Basic Principles of Object-oriented Programming) Relate with Interfaces, Multi threading and Exception handling Demonstrate Generic Programming and Collection Framework Create GUI Programming with Swing 					
UNIT – I		Lecture Hrs: 12			
An introduction to Java, Java Programming Environment, Fundamental Programming Structures - Simple Java Program, Data Types, Variables, Constants, Operators, Strings, Input and Output, Control flow, Big Numbers, Arrays					
UNIT – II		Lecture Hrs: 12			
Objects and classes – Introduction to OOP, Using pre-defined classes, Defining your own classes, static fields and methods, Method parameters, Object construction, Packages, jar files, Documentation comments Inheritance – Classes, super-classes and sub-classes, Object class, Generic Array Lists, Object Wrappers and Autoboxing, Methods with a variable number of parameters, Enumeration classes, Reflection					
UNIT – III		Lecture Hrs: 12			
Interfaces, Lambda Expressions, Inner classes, Service Loaders, Proxies Multithreading- Java Thread Model, The Main Thread, Thread Life Cycle, Creating Thread and Multiple Threads, isAlive() and join(), Thread Priorities, Synchronization, Inter thread Communication Exceptions, Assertions and Logging – Dealing with errors, catching exceptions, Using Assertions, Logging					
UNIT – IV		Lecture Hrs: 12			
Generic Programming – Need, Define a simple generic class, Generic methods, Bounds for Type variables, Generic code and the virtual machine, Restrictions and Limitations, Inheritance rules for generic types, Wildcard types, Reflection and Generics Collection Framework: Java Collections Framework, Interfaces, Concrete collections, Maps, Views and Wrappers, Legacy collections					
UNIT – V		Lecture Hrs: 12			
GUI Programming with Swing: A history of Java user Interface toolkit, Displaying Frames, Displaying information in a component, Event Handling. User Interface components with swing – Swing and the MVC design pattern, Introduction to Layout Management, Text input, choice components, Menus, Sophisticated Layout management, dialog boxes					
TEXTBOOK(S) :					
<ol style="list-style-type: none"> Cay S. Horstmann, Core Java Volume I – Fundamentals, Pearson Education Inc., Eleventh Edition, 2019 Herbert Schildt, Java: The Complete Reference, Eleventh Edition, Paperback – 19, March 2019 					
REFERENCES :					
<ol style="list-style-type: none"> R. Nageswara Rao, Core Java: An Integrated Approach, New: Includes All Versions upto Java 8, Paperback – 1, January 2016 DT Editorial Services. Julio Sanchez, Maria P. Canton, Java Programming for Engineers Hardcover, CRC Press, 26 July 2017 Anghel Leonard, Java Coding Problems: Improve your Java Programming skills by solving real-world coding challenges, Packt Publishing Limited, 20 September 2019 Herbert Schildt, Java A Beginner's Guide, Eighth Edition Create, Compile and Run Java Programs Today Paperback, McGraw Hill November 2020 					
Online Learning Resources:					
<ol style="list-style-type: none"> https://www.w3schools.com/java/ https://nptel.ac.in/courses/106105191 https://www.coursera.org/courses?query=java https://www.udemy.com/course/java-tutorial/ 					

Mapping of COs to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	1		1				1		3	2
CO2	1	1	3	1	1		1				1		3	2
CO3	2	2	1	1	2		2				1		3	2
CO4	2	2	1	1	2		2				1		3	2
CO5	2	2	1	1	2		2				1		3	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	MOBILE APPLICATION DEVELOPMENT LABORATORY		L	T	P	C
22MCA0204			0	1	2	2
Pre-Requisites	HTML	Semester	2			
Course Objectives:						
<ul style="list-style-type: none"> To write applications for Android devices. 						
Course Outcomes (CO): Student will be able to						
<ol style="list-style-type: none"> Create data sharing with different applications Develop applications using services Publishing android applications. 						
List of programs to be implemented:						
<ol style="list-style-type: none"> Setting Up the Development Environment <ol style="list-style-type: none"> Download/Install the SDK Download/Install the Eclipse Plugin Download/Install the SDK Platform Components Test the android development environment by performing the following operations. <ol style="list-style-type: none"> Add the sample application to a project in Android studio. Create an Android Virtual Device (AVD) for sample project. Create a launch configuration for sample project. Run a sample application in Android Emulator. Create "Hello World" Application Develop a program which will implement Sub menu in android application. Develop a program to implement Context menu (Floating List of Menu Items) in android application Create Application by Using Widgets <ol style="list-style-type: none"> Creating the Application by using the Activity class <ol style="list-style-type: none"> onCreate() (ii) onStart() (iii) onResume() (iv) onPause() (v) onStop() (vi) onDestroy() (vii) onRestart() Develop a program to implement a Custom Button and handle the displayed message on button click Creating the Application by using Text Edit control. Creating the Application Choosing Options (i) CheckBox (ii) RadioButton Design the Application by using <ol style="list-style-type: none"> Linear Layout (ii) Relative Layout (iii) Absolute Layout Develop a program to implement the List View in android application. Develop a program to show how to use Date picker control of ADK in android applications. Develop a program to insert, delete, display, and update the employee details in Android APP To develop an Android Application that makes use of Notification Manager. Develop an Android Application that uses GPS location information. Develop an Android Application that creates an alert upon receiving a message. Write a mobile application that makes use of RSS Feed Develop a mobile application to send an email. Develop an Android Application that creates Alarm Clock. Create an application using toggle button 						
REFERENCES :						
<ol style="list-style-type: none"> J. F. DiMarzio, Beginning Android Programming with Android Studio, Wiley India, 4thEdition, 2017. Wei – Meng Lee, Beginning Android 4 Application Development, Wrox, 2017. Paul Deital and Harvey Deital, Android How to Program, Detial Associates Publishers, 1stEdition, 2013. Neils Smyth, Android Stduio Development Essentials, Creative Space Independent publishing platform, 7thedition 2016. Jeff McWherter and Scott Gowell, Professional Mobile Application Development, Wiley 						
WEB REFERENCES :						
<ol style="list-style-type: none"> https://developer.android.com/docs https://www.tutlane.com/tutorial/android https://abhiandroid.com/ 						

Mapping of COs to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	3		3	2			3		2	3
CO2	3	3	3	1	3		3	2			3		2	3
CO3	3	3	3	1	3		3	2			3		2	3

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	MACHINE LEARNING LABORATORY		L	T	P	C
22MCA0205			0	1	2	2
Pre-Requisites	Basic Programming skills in R/Python	Semester	2			
Course Objectives:						
<ul style="list-style-type: none"> • Explore the data • Train the dataset • Test the dataset • Evaluate the model 						
Course Outcomes (CO): Student will be able to						
<ol style="list-style-type: none"> 1. Implement Supervised and Unsupervised Learning Algorithms 2. Check for the accuracy of the model 3. Interpret the results 4. Design a project 						
List of programs to be implemented in R/Python:						
<ol style="list-style-type: none"> 1. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample. 2. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets. 3. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets. 4. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Calculate the accuracy, precision, and recall for your data set. 5. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. 6. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. 7. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. 8. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs 9. Perform k-means clustering 10. Determine the working of Principal Component Analysis 11. Evaluate Model Performance by Cross-validation 12. Implement Dimensionality Reduction Technique 13. Interpret the results of Confusion Matrix, ROC curve, and AUC 14. Implement a Perceptron Learning Algorithm 15. Train a SVM model to classify the different flowers in Iris dataset 16. Design a Real-time Machine Learning Project 						
TEXTBOOK(S) :						
<ol style="list-style-type: none"> 1. Sebastian Raschka, Python Machine Learning, Packt Publishing, 2015 2. Andreas C. Muller and Sarah Guido, Introduction to Machine Learning with Python, O'Reilly, 2017 3. Brett Lantz, Machine Learning with R: Expert techniques for predictive modeling, Packt Publishing , 3rd Edition, 2015 4. Scott V. Burger, Introduction to Machine Learning with R, O'Reilly Media, 2018 						
WEB REFERENCES :						
<ol style="list-style-type: none"> 1. https://lgatto.github.io/IntroMachineLearningWithR/unsupervised-learning.html#model-selection 2. https://www.geeksforgeeks.org/introduction-to-machine-learning-in-r/ 3. https://www.datacamp.com/tutorial/machine-learning-in-r 4. https://www.javatpoint.com/machine-learning 						

Mapping of COs to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	3	3		2				3		3	2
CO2	2	2	2	3	3		2				3		3	2
CO3	2	2	2	3	3		2				3		3	2
CO4	2	2	2	3	3		2				3		3	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	OBJECT-ORIENTED PROGRAMMING THROUGH JAVA LABORATORY		L	T	P	C
22MCA0206			0	1	2	2
Pre-Requisites		Semester	2			
Course Objectives:						
<ul style="list-style-type: none"> Implement the concepts and features of object oriented programming 						
Course Outcomes (CO): Student will be able to						
<ol style="list-style-type: none"> Implement object oriented programming concepts using java Develop interactive programs using swings. 						
List of programs to be implemented:						
<ol style="list-style-type: none"> Use Java's basic data types in your programs Write Java programs using Conditional and iterative statements Handle arrays of fixed and variable size Create Classes and Objects using Java Implementing Constructors and Constructor Overloading Solving problems using Inheritance and Polymorphism Create your own package Create your own interface Handling exceptions arising in programs Use concept of multithreading in programs writing Handle Strings Use GUI components in your programs Use Layout Managers 						
TEXTBOOK(S) :						
<ol style="list-style-type: none"> M.T. Somashekara, D.S. Guru, K.S. Manjunatha, Object Oriented Programming with Java Paperback, PHI Learning, 2017 Karthik and Gajalakshmi Sagayaraj, Denis, JAVA PROGRAMMING Paperback – 1, The Orient Blackswan, 2018 Kathy Sierra, Bert Bates, Elisabeth Robson, OCA Java SE 8, Oracle Press, 2014 Joshua Bloch, Neal Gafter, Java Puzzlers: Traps, Pitfalls, and Corner Cases, Pearson, 2005 						
WEB REFERENCES :						
<ol style="list-style-type: none"> https://www.udemy.com/course/java-the-complete-java-developer-course/ https://www.coursera.org/specializations/object-oriented-programming https://onlinecourses.nptel.ac.in/noc22_cs47/preview 						

Mapping of COs to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	2		3				3		3	2
CO2	3	3	1	1	2		3				3		3	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	SKILL ORIENTED COURSE – I PYTHON PROGRAMMING	L	T	P	C
22MCA0207		0	1	2	2
Pre-Requisites	Semester	2			
Course Objectives:					
<ul style="list-style-type: none"> Learn the Basics of Python Programming 					
Course Outcomes (CO): Student will be able to					
<ol style="list-style-type: none"> Work with Strings, numbers, expressions, and conditional statements Implement files, lists, dictionaries and functions Implement graphics and gui-based programming Implement searching and sorting algorithms 					
List of programs to be implemented:					
<ol style="list-style-type: none"> Strings, Assignment, and Comments - Data Types, String Literals, Escape Sequences, String Concatenation, Variables and the Assignment Statement, Program Comments and Docstrings Numeric Data Types and Character Sets – Integers, Floating-Point Numbers, Character Sets Expressions - Arithmetic Expressions, Mixed-Mode Arithmetic and Type Conversions Using Functions and Modules - Calling Functions: Arguments and Return Values, The math Module, The Main Module, Program Format and Structure, Running a Script from a Terminal Command Prompt Definite Iteration: The for Loop - Executing a Statement a Given Number of Times, Count-Controlled Loops, Augmented Assignment. Loop Errors: Off-by-One Error. Traversing the Contents of a Data Sequence, Specifying the Steps in the Range, Loops That Count Down, Formatting Text for Output. Selection: if and if-else Statements - The Boolean Type, Comparisons, and Boolean Expressions , if-else, One-Way Selection Statements, Multi-Way if Statements, Logical Operators and Compound Boolean Expressions, Short-Circuit Evaluation, Testing Selection Statements Conditional Iteration: The while Loop - The Structure and Behavior of a while Loop, Count Control with a while Loop, The while True Loop and the break Statement, Random Numbers, Loop Logic, Errors, and Testing Accessing Characters and Substrings in Strings - The Structure of Strings, The Subscript Operator, Slicing for Substrings, Testing for a Substring with the in Operator, String methods Strings and Number System - The Positional System for Representing Numbers, Converting Binary to Decimal, Converting Decimal to Binary, Conversion Shortcuts, Octal and Hexadecimal Numbers Text Files - Text Files and Their Format, Writing Text to a File, Writing Numbers to a File, Reading Text from a File, Reading Numbers from a File, Accessing and Manipulating Files and Directories on Disk Lists - List Literals and Basic Operators, Replacing an Element in a List, List Methods for Inserting and Removing Elements, Searching a List, Sorting a List, Mutator Methods and the Value None, Aliasing and Side Effects, Equality: Object Identity and Structural Equivalence, Example: Using a List to Find the Median of a Set of Numbers, Tuples Defining Simple Functions - The Syntax of Simple Function Definitions, Parameters and Arguments, The return Statement, Boolean Functions, Defining a main Function Dictionaries - Dictionary Literals, Adding Keys and Replacing Values, Accessing Values, Removing Keys, Traversing a Dictionary, Example: Finding the Mode of a List of Values Design with Recursive Functions - Defining a Recursive Function, Tracing a Recursive Function, Using Recursive Definitions to Construct Recursive Functions, Recursion in Sentence Structure, Infinite Recursion, The Costs and Benefits of Recursion Higher-Order Functions - Functions as First-Class Data Objects, Mapping, Filtering, Reducing, Using lambda to Create Anonymous Functions, Creating Jump Tables Simple Graphics - Overview of Turtle Graphics, Turtle Operations, Setting Up a turtle.cfg File and Running IDLE, Object Instantiation and the turtle Module, Drawing Two-Dimensional Shapes, Examining an Object's Attributes, Manipulating a Turtle's Screen, Taking a Random Walk, Colors and the RGB System, Example: Filling Radial Patterns with Random Colors Coding Simple GUI-Based Programs - A Simple "Hello World" Program, A Template for All GUI Programs, The Syntax of Class and Method Definitions, Subclassing and Inheritance as Abstraction Mechanisms Windows and Window Components - Windows and Their Attributes, Window Layout Types of Window Components and Their Attributes, Displaying Images Command Buttons and Responding to Events Input and Output with Entry Fields - Text Fields, Integer and Float Fields for Numeric Data, Using Pop-Up Message Boxes Defining and Using Instance Variables. Other Useful GUI Resources - Using Nested Frames to Organize Components, Multi-Line Text Areas, File Dialogs, Obtaining Input with Prompter Boxes, Check Buttons, Radio Buttons, Keyboard Events, Working with Colors, Using a Color Chooser Search Algorithms – Linear and Binary Sorting Algorithms – Selection, Bubble, Insertion, Quick and Merge Packages 					
TEXTBOOK(S) :					
<ol style="list-style-type: none"> Kenneth A. Lambert, Fundamentals of Python: First Programs, Second Edition, Cengage, 2019 Eric Matthes, Python Crash Course, No Starch Press, 2nd edition, 2019 Lutz Mark, Python Pocket Reference, O'Reilly, 5th ed, 2014 					
WEB REFERENCES :					
<ol style="list-style-type: none"> https://onlinecourses.nptel.ac.in/noc19_cs41/preview https://in.coursera.org/learn/python 					

Mapping of COs to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	3		3				3		3	2
CO2	3	3	1	1	3		3				3		3	2
CO3	3	3	1	1	3		3				3		3	2
CO4	3	3	1	1	3		3				3		3	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	SOFT SKILLS				L	T	P	C
22MCA0208					0	1	2	2
Pre-Requisites	Semester				2			

Course Objectives:

- Addresses various challenges of communication as well as behavioural skills faced by individuals at workplace and organizations in bridging the gaps through effective skills of interviews, group discussions, meeting management, presentations and nuances of drafting various business documents for sustainability in today's global world.

Course Outcomes (CO): Student will be able to

- Effectively communicate through verbal/oral communication and improve the listening skills
- Write precise briefs or reports and technical documents
- Actively participate in group discussion / meetings / interviews and prepare & deliver presentations
- Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships and leadership quality.

Week 1: Introduction to Soft Skills, Aspects of Soft Skills, Effective Communication Skills, Classification of Communication, Personality Development
 Week 2: Positive Thinking, Telephonic Communication Skills, Communicating without Words, Paralanguage
 Week 3: Proxemics, Haptics: The Language of Touch, Meta-communication, Listening Skills, Types of Listening
 Week 4: Negotiation Skills, Culture as Communication, Organizational Communication
 Week 5: Communication Breakdown, Advanced Writing Skills, Principles of Business Writing
 Week 6: Business Letters, Business Letters: Format and Style, Types of Business Letter
 Week 7: Writing Reports, Types of Report, Strategies for Report Writing, Evaluation and Organization of Data
 Week 8: Structure of Report, Report Style, Group Communication Skills
 Week 9: Leadership Skills, Group Discussion, Meeting Management, Adaptability & Work Ethics
 Week 10: Advanced Speaking Skills, Oral Presentation, Speeches & Debates, Combating Nervousness, Patterns & Methods of Presentation, Oral Presentation: Planning & Preparation
 Week 11: Making Effective Presentations, Speeches for Various Occasions, Interviews, Planning & Preparing: Effective Resume
 Week 12: Facing Job Interviews, Emotional Intelligence & Critical Thinking, Applied Grammar

TEXT BOOK(S) and REFERENCES:

- Butterfield, Jeff. Soft Skills for Everyone. New Delhi: Cengage Learning. 2010.
- Chauhan, G.S. and Sangeeta Sharma. Soft Skills. New Delhi: Wiley. 2016.
- Goleman, Daniel. Working with Emotional Intelligence. London: Bantam Books. 1998.
- Hall, Calvin S. et al. Theories of Personality. New Delhi: Wiley. rpt. 2011.
- Holtz, Shel. Corporate Conversations. New Delhi: PHI. 2007.
- Kumar, Sanajy and Pushp Lata. Communication Skills. New Delhi: OUP. 2011.
- Lucas, Stephen E. The Art of Public Speaking. McGraw-Hill Book Co. International Edition, 11th Ed. 2014.
- Penrose, John M., et al. Business Communication for Managers. New Delhi: Thomson South Western. 2007.
- Sharma, R.C. and Krishna Mohan. Business Correspondence and Report Writing. New Delhi: TMH. 2016.
- Sharma, Sangeeta and Binod Mishra. Communication Skills for Engineers and Scientists. New Delhi: PHI Learning, 2009, 6th Reprint 2015.
- Thorpe, Edgar and Showick Thorpe. Winning at Interviews. Pearson Education. 2004.
- Turk, Christopher. Effective Speaking. South Asia Division: Taylor & Francis. 1985.

WEB REFERENCES :

- https://onlinecourses.nptel.ac.in/noc21_hs76/preview

Mapping of COs to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1									3				1	1
CO2									3				1	1
CO3									3		1		1	1
CO4									3				1	1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI
(AUTONOMOUS)
Department of Master of Computer Applications
AK22 - Course Structure and Syllabus

Semester 3

S. No.	CC	Course Code	Course Name	Hours/Week			C	CIE	SEE	TM
				L	T	P				
1	PC	22MCA0301	Computer Networks	4	0	0	4	40	60	100
2	PC	22MCA0302	Cloud Computing	4	0	0	4	40	60	100
3	PC	22MCA0303	Operating Systems	4	0	0	4	40	60	100
4	PE	Professional Elective - I		3	0	0	3	40	60	100
		22MCA0304	Artificial Intelligence							
		22MCA0305	UI/UX Design							
		22MCA0306	Design and Analysis of Algorithms							
5	OE	Open Elective - I		3	0	0	3	40	60	100
		22HBS0301	Numerical and Optimization Methods							
		22HBS0302	Probability and Statistics							
		22MBA0111	Accounting and Financial Management							
6	PC	22MCA0307	Computer Networks Lab	0	1	2	2	40	60	100
7	PC	22MCA0308	Cloud Computing Lab	0	1	2	2	40	60	100
8	PC	22MCA0309	Operating Systems Lab	0	1	2	2	40	60	100
9	PR	22MCA0310	Summer Internship / Industry Oriented Mini Project/ Skill Development Course (Minimum 6 weeks)	-	-	-	2	-	100	100
10	SC	22MCA0311	Skill oriented Course - II Informatica	0	1	2	2	40	60	100
Total				18	4	8	28	360	640	1000

Course Code	Computer Networks			L	T	P	C
22MCA0301				4	0	0	4
Pre-Requisites	high school level arithmetic	Semester	III				
Course Objectives:							
The students will be able to							
<ul style="list-style-type: none"> Run and manage the Internet, part of the Internet, or an organization's network that is connected to the Internet. understand the basics of data communications and networking know the protocols used in the Internet communication 							
Course Outcomes (CO): Student will be able to							
<ol style="list-style-type: none"> understand the basics of physical layer classify the functionalities of two sub layers of Data link Layer design Network Layer through algorithms and protocols distinguish the services provided by Transport Layer recognize the services offered by Application Layer to the user 							
UNIT – I							Lecture Hrs: 12
Introduction: Data Communications, Networks, Network Types, Internet History, Standards and Administration. Network Models: Protocol Layering, TCP/IP Protocol Suite, The OSI Model Introduction to Physical Layer: Data and Signals, Transmission Impairment, Data Rate Limits, Performance. Transmission Media: Introduction, Guided Media, Unguided Media, Switching: Introduction, Circuit Switched Networks, Packet Switching							
UNIT – II							Lecture Hrs: 14
The Data Link Layer: Introduction, Link layer addressing, Error detection and Correction: Cyclic codes, Checksum, Forward error correction, Data link control: DLC Services, Data link layer protocols, HDLC, Point to Point Protocol. Media Access control: Random Access, Controlled Access, Channelization, Connecting devices and Virtual LANs: Connecting Devices.							
UNIT – III							Lecture Hrs: 12
The Network Layer: Network layer design issues, Routing algorithms, Congestion control algorithms, Quality of service, Internetworking. The network layer in the Internet: IPV4 Addresses, IPV6, Internet Control protocol, OSPF, BGP, IP, ICMPv4, IGMP.							
UNIT – IV							Lecture Hrs: 12
The Transport Layer: The Transport Service, Elements of Transport Protocols, Congestion Control, The internet transport protocols: UDP, TCP, Performance problems in computer networks, Network performance measurement.							
UNIT – V							Lecture Hrs: 10
The Application Layer: Introduction, Client-Server Programming, WWW and HTTP, FTP, e-mail, TELNET, Secure Shell, Domain Name System, SNMP.							
TEXTBOOK(S) :							
<ol style="list-style-type: none"> Data communications and networking, Behrouz A. Forouzan, Mc Graw Hill Education, 5th edition, 2012. Computer Networks, Andrew S. Tanenbaum, David Wetherall, Pearson, 5th edition, 2010. 							
REFERENCES :							
<ol style="list-style-type: none"> Computer Networking, James F. Kurose, Pearson Education, 8e , 31 May 2022. Networking All-in-One For Dummies, Doug Lowe, Wiley, 7ed, January 2018 Introduction to Networks v6 Companion Guide, Cisco Networking Academy, Pearson Education, 1e, December 2019. Data Communication and Networks, Bhushan Trivedi, Oxford University Press, 2021 Computer Networks - A Systems Approach, Larry Peterson, Bruce Davie, Elsevier, 6e, January 2021 							
WEB REFERENCES :							
<ol style="list-style-type: none"> https://nptel.ac.in/courses/106105183 https://www.coursera.org/learn/tcpip https://www.coursera.org/learn/fundamentals-network-communications 							

Mapping of Cos to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3						1						2	
CO2	2	3					1						2	
CO3	2	2	3		1		1						2	
CO4	2	3	3		2		1						3	2
CO5	2	2					1						1	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	CLOUD COMPUTING			L	T	P	C
22MCA0302				4	0	0	4
Pre-Requisites	Fundamental computer terms	Semester	III				
Course Objectives:							
The students will be able to							
<ul style="list-style-type: none"> understand all aspects from basic data center facilities to the ways cloud-native software differs from traditional software interpret concepts that span many providers and services 							
Course Outcomes (CO): Student will be able to							
<ol style="list-style-type: none"> describe the motivation, advantages, and growth of cloud computing. explain cloud infrastructure and virtualization, including virtual computing, networking, and storage mechanisms. portray high level automation and orchestration systems that manage the virtualized infrastructure. interpret cloud software, including the programming paradigms used brief the concept of edge computing and its relationship to the Industrial Internet of Things, security problems that arise in a cloud environment, and approaches that help designers control the complexity of cloud deployments. 							
UNIT – I	The Era of Cloud Computing			Lecture Hrs: 8			
The motivations for cloud, Elastic computing and its advantages, Types of cloud and cloud providers							
UNIT – II	Cloud Infrastructure and Virtualization			Lecture Hrs: 16			
Data Center Infrastructure and Equipment, Virtual Machines, Containers, Virtual Networks, Virtual Storage							
UNIT – III	Automation and Orchestration			Lecture Hrs: 8			
Automation, Automated Replication and Parallelism							
UNIT – IV	Cloud Programming Paradigms			Lecture Hrs: 16			
The MapReduce Paradigm, Microservices, Controller-based Management software, Serverless Computing and Event Processing, DevOps							
UNIT – V	Other Aspects of Cloud			Lecture Hrs: 12			
Edge Computing and IIoT, Cloud Security and Privacy, Controlling the complexity of Cloud-Native Systems							
TEXTBOOK(S) :							
1. The Cloud Computing Book - The Future of Computing Explained, Douglas E. Comer, CRC Press, 1e, 2021							
REFERENCES :							
<ol style="list-style-type: none"> Cloud Computing for Dummies Judith Hurwitz and Daniel Kirsch, John Wiley & Sons, 2e, 2020 Insider's Guide to Cloud Computing, David Linthicum, Pearson Education, 1e, 23 May 2023 Transforming Your Business with AWS: Getting the Most Out of Using AWS to Modernize and Innovate Your Digital Services, Philippe Abdoulaye, Wiley; 1st edition, October 2021 Data Science on AWS, Chris Fregly, Antje Barth, O'Reilly Media, 23 April 2021 							
WEB REFERENCES :							
<ol style="list-style-type: none"> https://intellipaat.com/course-cat/cloud-computing-courses/ https://www.coursera.org/browse/information-technology/cloud-computing https://onlinecourses.nptel.ac.in/noc23_cs42/preview 							

Mapping of Cos to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	2								1	
CO2	3	2	1	1	2								2	1
CO3	2	3	2	1	2								2	
CO4	2	1	2	1	2								2	2
CO5	2	2	1	1	2								2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	OPERATING SYSTEMS			L	T	P	C
22MCA0303				4	0	0	4
Pre-Requisites	Data Structures, C/Java Programming	Semester	III				
Course Objectives:							
The students will be able to							
<ul style="list-style-type: none"> understand fundamental data structures that are prevalent in most operating systems. 							
Course Outcomes (CO): Student will be able to							
<ol style="list-style-type: none"> explain what operating systems are, what they do, and how they are designed and constructed. analyze methods for process scheduling, inter-process communication, threads, process synchronization and deadlock handling deal with the management of main memory during the execution of a process describe how mass storage, I/O and file systems are handled in a modern computer system brief about hardware assistance technologies 							
UNIT – I	INTRODUCTION			Lecture Hrs: 10			
Computer System - organization and architecture; Operating System Operations and Services - User and OS Interface - System Calls and Services - Linkers and Loaders - OS specific applications, Design, Implementation and Structure - OS Building, Booting and Debugging.							
UNIT – II	PROCESS MANAGEMENT			Lecture Hrs: 14			
Processes - Process Concept - Process Scheduling - Operations on Processes - Inter-process Communication; CPU Scheduling - Scheduling criteria - Scheduling algorithms: Threads - Multithreading Models – Threading issues; Process Synchronization - The Critical-Section problem - Synchronization hardware – Semaphores – Mutex Locks - Classical problems of synchronization - Semaphores - Monitors; Deadlock - Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.							
UNIT – III	MEMORY MANAGEMENT			Lecture Hrs: 10			
Main Memory - Contiguous Memory Allocation – Paging - Structure of the Page Table - Swapping; Virtual Memory - Demand Paging – Copy on Write - Page Replacement - Allocation of Frames –Thrashing.							
UNIT – IV	STORAGE MANAGEMENT			Lecture Hrs: 14			
Mass Storage Structure – HDD Scheduling - RAID Structure; File-System Interface - File concept - Access methods - Directory Structure - Protection - Memory - Mapped Files; File System Implementation - File System Structure and operations - Directory implementation - Allocation Methods - Free Space Management; I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem.							
UNIT – V	VIRTUAL MACHINES			Lecture Hrs: 12			
Virtual Machines – History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; DFS and Remote File Access; Case Study on LINUX OS;							
TEXTBOOK(S) :							
1. Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, John Wiley and Sons Inc., 10th Edition, 2018							
REFERENCES :							
<ol style="list-style-type: none"> Andrew S Tanenbaum, Modern Operating Systems, Pearson, 5e, 2022 New Delhi. William Stallings, Operating Systems, Pearson, 9e, 2018. G. Sreehitha Reddy, K. Reddy Pradeep, Operating Systems : Concepts, 1e, Notion Press, Nov 2019 							
WEB REFERENCES :							
<ol style="list-style-type: none"> https://www.coursera.org/specializations/codio-introduction-operating-systems https://www.udacity.com/course/introduction-to-operating-systems--ud923 https://nptel.ac.in/courses/106105214 							

Mapping of Cos to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	1								1	
CO2	2	1	1	1	1								1	
CO3	3	3	3	1	1								2	
CO4	1	1	2	2	1								2	
CO5	2	2	1	1	1								2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	ARTIFICIAL INTELLIGENCE			L	T	P	C
22MCA0304				3	0	0	3
Pre-Requisites	Mathematics	Semester	III				
Course Objectives:							
The students will be able to							
<ul style="list-style-type: none"> Define AI as the study of agents that receive percepts from the environment and perform actions Explain the role of learning as extending the reach of the designer into unknown environments 							
Course Outcomes (CO): Student will be able to							
<ol style="list-style-type: none"> Explain intelligent agent frameworks Apply problem solving techniques Apply game playing and CSP techniques Perform logical reasoning Understand NLP and Reinforcement Learning 							
UNIT – I	INTELLIGENT AGENTS			Lecture Hrs:			
Introduction to AI – Agents and Environments – concept of rationality – nature of environments – structure of agents. Problem solving agents – search solutions – uninformed search strategies.							
UNIT – II	PROBLEM SOLVING			Lecture Hrs:			
Heuristic search strategies – heuristic functions. Local search and optimization problems – local search in continuous space – search with non-deterministic actions – searching with partially observable environments – online search agents and unknown environments							
UNIT – III	GAME PLAYING AND CSP			Lecture Hrs:			
Game theory – optimal decisions in games – alpha-beta pruning – imperfect real-time decisions – stochastic games – partially observable games. Constraint satisfaction problems – constraint propagation – backtracking search for CSP – local search for CSP – structure of CSP.							
UNIT – IV	REASONING			Lecture Hrs:			
Knowledge-based agents – propositional logic – propositional theorem proving – propositional model checking – agents based on propositional logic. First-order logic – syntax and semantics – knowledge representation and engineering – inferences in first-order logic – forward chaining – backward chaining – resolution							
UNIT – V	NLP AND REINFORCEMENT LEARNING			Lecture Hrs:			
Language Models, Text Classification, Information Retrieval, Information Extraction; Passive Reinforcement Learning, Active Reinforcement Learning, Generalization, Policy, Applications							
TEXTBOOK(S) :							
1. Stuart Russell and Peter Norvig, Artificial Intelligence – A Modern Approach, Fourth Edition, Pearson Education, 2021.							
REFERENCES :							
<ol style="list-style-type: none"> Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2007 Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008 Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006 Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013. 							
WEB REFERENCES :							
<ol style="list-style-type: none"> https://nptel.ac.in/courses/106102220 https://www.coursera.org/learn/introduction-to-ai 							

Mapping of Cos to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	1								1	
CO2	3	1	1	2	1								1	
CO3	2	2	2	2	1								1	
CO4	1	1	1	1	1								1	
CO5	1	2	1	1	1								1	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	UI / UX DESIGN		L	T	P	C
22MCA0305			3	0	0	3
Pre-Requisites	Frontend Tools, Software Engineering, Multimedia	Semester	III			
Course Objectives:						
The students will be able to						
<ul style="list-style-type: none"> • Think like a UX Designer • Understand both design and coding parts of a product 						
Course Outcomes (CO): Student will be able to						
<ol style="list-style-type: none"> 1. Create a UX Strategy 2. Observe how users observe the products 3. Provide a proper visual Design 4. Explain the Process to hand product design to frontend team 5. Learn about those who will be using the product 						
UNIT – I	Introduction		Lecture Hrs: 9			
What is UX Design? UX Design vs UI Design, Importance, Full Stack Design. UX Design Process, Discovery and Planning, UX Strategy, UX research, UX Analysis, Design and Production						
UNIT – II	User Behavior		Lecture Hrs: 9			
User Behavior Basics, The Gestalt Theory, Psychology in UX, User Research, Market Research, Benefits Getting to know your users, How to conduct user interviews, User Personas, Four different Perspectives, Benefits						
UNIT – III	Designing Behavior		Lecture Hrs: 9			
Designing Behavior, Introducing visual design principles and processes, Basics of Visual Design, Design Principles, Visual Design Tools, Wireframes and Prototyping						
UNIT – IV	UI Design and Implementation		Lecture Hrs: 9			
UI Design and Implementation, UI Design, Frontend UI Implementation and Process, UI Design handover, Using a handover design tool, Frontend development/UI development						
UNIT – V	Post-launching UX Activities		Lecture Hrs: 9			
Post-launch UX activities, Collecting the correct user feedback, User accessibility testing (UI testing), A/B testing, Tracking and recording user UI sessions, Creating and analyzing conversion funnels, UX Design with big data, Data Visualization						
TEXTBOOK(S) :						
1. Hands-On UX Design for Developers - Design, Prototype, and Implement Compelling User Experiences from Scratch, Elvis Canziba, Packt Publishing, 2018						
REFERENCES :						
<ol style="list-style-type: none"> 1. Basics of UI/UX Design and Fundamentals, Robert Pattinson, Amazon Digital Services LLC - KDP, 2018 2. The New 2022 UI/UX For Beginners And Experts - UX/UI Design for Automatic Designers, Allen Veronica, Amazon Digital Services LLC - KDP, 2021 3. Modular Design Frameworks - A Projects-based Guide for UI/UX Designers, James Cabrera, Apress, 2017 4. The UX Book - Agile UX Design for a Quality User Experience, Rex Hartson, Pardha S. Pyla, Elsevier Science, 2018 5. UX For Dummies, Kevin P. Nichols, Donald Chesnut, Wiley, 2014 						
WEB REFERENCES :						
<ol style="list-style-type: none"> 1. https://www.coursera.org/specializations/ui-ux-design 2. https://onlinecourses.nptel.ac.in/noc21_ar05/preview 3. https://www.classcentral.com/course/swayam-user-interface-design-12889 						

Mapping of Cos to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	1									1
CO2	3	3	3	2	2									1
CO3	2	2	2	2	2									1
CO4	1	3	3	1	2									1
CO5	3	2	1	1	1								1	1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	DESIGN AND ANALYSIS OF ALGORITHMS		L	T	P	C
22MCA0306			3	0	0	3
Pre-Requisites	Basic Knowledge Of Programming And Mathematics	Semester	III			

Course Objectives:

The students will be able to

- know the importance of writing algorithms
- analyze the problem and provide solution
- deal with different design strategies

Course Outcomes (CO): Student will be able to

1. Analyze the complexity of the algorithms
2. Use techniques of greedy and dynamic programming to solve the problems.
3. Implement traversal, backtracking and searching techniques.
4. Choose the appropriate algorithm for solving minimization problem.
5. Able to prove that a certain problem is NP-Complete

UNIT – I

Lecture Hrs: 9

Introduction: What is an Algorithm, Algorithm specification, Performance analysis.

Divide and Conquer: General method, Binary Search, Finding the maximum and minimum, Master's Theorem, Strassen's matrix multiplication.

UNIT – II

Lecture Hrs: 9

Greedy Method: General method, Knapsack problem, Job Scheduling with Deadlines, Minimum cost Spanning Trees, Optimal storage on tapes, Single-source shortest paths; Dynamic programming: General Method, Multistage graphs, All-pairs shortest paths, Optimal binary search trees, 0/1 knapsack, The traveling sales person problem.

UNIT – III

Lecture Hrs: 9

Basic Traversal and Search Techniques: Techniques for binary trees, Techniques for Graphs, Connected components and Spanning trees, Bi-connected components and DFS; Backtracking: General Method, 8 – queens problem, Sum of subsets problem, Graph coloring and Hamiltonian cycles, Knapsack Problem.

UNIT – IV

Lecture Hrs: 9

Branch and Bound: The method, Travelling salesperson, 0/1 Knapsack problem, Efficiency Considerations.

Lower Bound Theory: Comparison trees, Lower bounds through reductions – Multiplying triangular matrices, inverting a lower triangular matrix, computing the transitive closure.

UNIT – V

Lecture Hrs: 9

NP – Hard and NP – Complete Problems: NP Hardness, NP Completeness, Consequences of being in P, Cook's Theorem, Reduction Source Problems, Reductions: Reductions for some known problems

TEXTBOOK(S) :

1. "Fundamentals of Computer Algorithms", Ellis Horowitz, S. Sartaj Sahani and Rajasekharan, 2nd edition, University Press, 2014.
2. "Design and Analysis of Algorithms", Parag Himanshu Dave, Himanshu Bhalchandra Dave, Pearson Education, Second Edition, 2009.

REFERENCES :

1. "Introduction to Algorithms", second edition, T.H.Cormen, C.E.Leiserson, R.L.Rivest and C.Stein, PHI Pvt. Ltd.
2. "Introduction to Design and Analysis of Algorithms A strategic approach", R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, Mc Graw Hill.
3. "Design and Analysis of algorithms", Aho, Ullman and Hopcroft, Pearson education.

WEB REFERENCES :

1. <https://nptel.ac.in/courses/106106131>
2. <https://www.coursera.org/learn/analysis-of-algorithms>

Mapping of Cos to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	1	1								3	
CO2	2	2	2	1	1								2	
CO3	2	2	2	2	1								2	
CO4	2	2	2	2	1								2	
CO5	2	1	2	1	1								2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	NUMERICAL AND OPTIMIZATION METHODS			L	T	P	C
22HBS0301				3	0	0	3
Pre-Requisites	Mathematics	Semester	III				
Course Outcomes (CO):							
1. Make use of the concepts of Errors, Relative and Percentage Errors. 2. Solve the concepts of Algebraic & Transcendental Equations to solve different Engineering problems. 3. Examine Interpolation concept in solving Numerical Methods. 4. Evaluate linear programming problems by various methods. 5. Determine an optimal solution in assignment jobs, give transportation of items from sources to destinations							
UNIT- I	Interpolation			Lecture Hrs: 9			
Forward, backward and central difference formulae, Newton's forward and backward interpolation – Lagrange's interpolation formulae, Gauss forward and backward formula, Sterling's formula, Bessel's formula							
UNIT- II	Solution of Algebraic and Transcendental Equations			Lecture Hrs: 9			
The Bisection Method – The Method of False Position – Newton-Raphson Method, Solution of linear simultaneous equation: Crout's triangularisation method, Gauss - Seidal iteration method.							
UNIT- III	Numerical integration and numerical solutions of differential equation			Lecture Hrs: 9			
Trapezoidal and Simpson's 1/3 and 3/8 th rules, Euler's method, Euler's modified method and Runge-Kutta method of 4 th order.							
UNIT- IV	Linear programming problems(LPP)			Lecture Hrs: 9			
Linear programming problems (LPP) - Graphical Method-Simplex method - Big M Method - Dual simplex method.							
UNIT- V	Transportation & Assignment Problem			Lecture Hrs: 9			
Formulation of transportation model, Basic feasible solution using different methods, Optimality Methods, Unbalanced transportation problem, Degeneracy in transportation problems, Applications of Transportation problems. Assignment Problem: Formulation, unbalanced assignment problem, Travelling salesman problem.							
TEXTBOOK(S) :							
1. B. S. Grewal, Higher Engineering Mathematics, 44 th Edition, Khanna publishers, 2017. 2. Erwin Kreyszig, Advanced Engineering Mathematics, 10 th Edition, John Wiley & Sons, 2011. 3. Operations research by S D Sarma							
Reference Books:							
1. Dr. T.K.V. Iyengar, Engineering Mathematics - I, S. Chand publishers 2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi publication, 2008 3. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education. 4. Operations research by J K Sarma							

Mapping of Cos to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3													
CO3	3													
CO4		3												
CO5		3												

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	PROBABILITY AND STATISTICS			L	T	P	C
22HBS0302				3	0	0	3
Pre-Requisites	Mathematics	Semester	III				
Course Outcomes (CO):							
1. Interpret the characteristics through correlation and regression tools. 2. Make use of the concepts of probability and their applications. 3. Apply discrete and continuous probability distributions. 4. Inference the components of a classical hypothesis test for large sample and 5. Inspect the components of a classical hypothesis test for small samples.							
UNIT- I	Descriptive statistics			Lecture Hrs: 9			
Data science, Statistics Introduction, Population vs Sample, Collection of data, primary and secondary data, Type of variable: dependent and independent Categorical and Continuous variables, Data visualization, Measures of Central tendency, Measures of Variability (spread or variance) Skewness Kurtosis, correlation, correlation coefficient, rank correlation, regression coefficients, principle of least squares, method of least squares, regression lines.							
UNIT- II	Probability			Lecture Hrs: 9			
Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.							
UNIT- III	Probability distributions			Lecture Hrs: 9			
Probability distribution - Binomial, Poisson approximation to the binomial distribution and normal distribution- their properties							
UNIT- IV	Estimation and Hypothesis Testing			Lecture Hrs: 9			
Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems. ANOVA : One - way and Two - way classification							
UNIT- V	Small sample tests			Lecture Hrs: 9			
Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), χ^2 - test for goodness of fit							
TEXTBOOK(S) :							
1. Miller and Friends, Probability and Statistics for Engineers, 7/e, Pearson, 2008. 2. S.C. Gupta and V.K. Kapoor, Fundamentals of Applied Statistics, 11/e, Sultan Chand & Sons Publications. 3. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications.							
REFERENCE BOOKS:							
1. S. Chand, Probability and Statistics, Dr.T.K.V. Iyengar, Dr. B.Krishna Gandhi, S. Ranganatham, Dr. M.V.S.S.N. Prasad 2. S. Ross, a First Course in Probability, Pearson Education India, 2002. 3. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.							

Mapping of COs to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2		3												
CO3		3												
CO4				3										
CO5				3										

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	ACCOUNTING & FINANCIAL MANAGEMENT			L	T	P	C
22MBA0111				3	0	0	3
Pre-Requisites	Maths	Semester		III			
Course Outcomes (CO):							
1: Understand the importance of accounting concepts and principles and able to prepare the financial statements (trading, profit & loss account and balance sheet).							
2: Able to analyze the performance of the business through financial analysis tools.							
3: Understand the importance of finance in business and able to determine the cost of Capital of the firm.							
4: Understand the capital budgeting methods and able to take investment decisions.							
5: Recognize the role of computerized accounting system in business organizations.							
UNIT – I	Introduction to Accounting			Lecture Hrs: 9			
Meaning, objectives, nature and scope, advantages and limitations. Accounting Principles: concepts and conventions. Systems of book keeping and Accounting. Double entry system of accounting, Classification of accounts and debit-credit rules. Journal and Subsidiary books, ledger and trial balance. Preparation of final accounts: Trading account, Profit and loss account and Balance sheet with simple adjustments.							
UNIT – II	Financial Statement Analysis and Interpretation			Lecture Hrs: 9			
Meaning, Significance, Limitations and Tools for financial statement analysis. Ratio Analysis – Classification of ratios – Short term solvency and Long term solvency – Profitability ratios – Analysis and interpretation of financial statements through ratios of liquidity, Solvency and Profitability (Simple problems)							
UNIT – III	Introduction to Financial Management			Lecture Hrs: 9			
Meaning, nature and scope, objectives of financial management. Capital Structure: Meaning, Factors, Types and Importance. Cost of capital: Cost of equity, Preference shares and Bonds – Weighted Average Cost of Capital (Simple problems)							
UNIT – IV	Capital Budgeting			Lecture Hrs: 9			
Meaning, Features, Methods of capital budgeting: Pay Back (PB), Accounting Rate of Return (ARR), Net Present Value (NPV) and Internal Rate of Return (IRR) (Simple problems)							
UNIT – V	Computerized Accounting System (Theory)			Lecture Hrs: 9			
Meaning, Components and Salient features of computerised accounting system, Differences between manual accounting system and computerised accounting, Advantages of the computerised financial accounting system. An overview of Accounting Information System and Management Information System							
TEXTBOOKS:							
1. Dr. S.N. Maheshwari and Dr.S.K. Maheshwari, Financial Accounting Vikas Publishing House Pvt. Ltd.,							
2. M E Thukaram Rao, Accounting and Financial Management, New Age International.							
3. I.M.Pandey, Financial Management, Vikas Publishing House Pvt., Ltd., 12th Edition.							
4. MY Khan and PK Jain, Financial Management-Text and Problems, Tata McGraw-Hill							
REFERENCE(S):							
1. P.C.Tulisan, Financial Accounting, S.Chand							
2. Asish K. Bhattacharyya, Financial Accounting for Business Managers, PHI							
3. V.K.Bhalla, Financial Management, S.Chand							
4. Prasanna Chandra, Financial Management, 9th edition, Tata McGraw Hill, 2012.							
5. Scott B Smart, S M Graham, Introduction to Financial Management, Cengage Learning							
6. Computerized Accounting System NCERT Text Book							

Mapping of Cos to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2													
CO2		2		1										
CO3								2						
CO4								2						
CO5	1						1							

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	COMPUTER NETWORKS LAB			L	T	P	C
22MCA0307				0	1	2	2
Pre-Requisites	C, Java	Semester	III				
Course Objectives:							
Student will be able to							
<ul style="list-style-type: none"> Implement Networks concepts in Programming Languages 							
Course Outcomes (CO): Student will be able to							
<ol style="list-style-type: none"> Implement Data Link Layer Protocol concepts Implement Network Layer Protocol concepts 							
List of programs to be implemented in C/Java/Python:							
<ol style="list-style-type: none"> Illustrate a basic one-way Client and Server setup where a Client connects, sends messages to the server and the server shows them using a socket connection. Implementation of the Inet Address class to illustrate the usage of its methods Implementation of the URL class to illustrate the usage of methods Implement Bit Stuffing error detection technique Implement Byte Stuffing Implement Character Stuffing and destuffing Implementation of Hamming Code Implement CRC for Error Detection Simulate the stop and wait protocol. Simulate Go Back N protocol Simulate Selective Repeat protocol Implement Dijkstra's algorithm Simulate Distance Vector Routing Algorithm Simulate Link State Vector Routing Algorithm Write a program for congestion control using leaky bucket algorithm Program to find Class, Broadcast and Network addresses Do the following using NS2 Simulator <ol style="list-style-type: none"> Simulate to Find the Number of Packets Dropped Simulate to Find the Number of Packets Dropped by TCP/UDP Simulate to Find the Number of Packets Dropped due to Congestion Simulate to Compare Data Rate & Throughput 							
REFERENCES :							
<ol style="list-style-type: none"> Computer Network Simulation Using NS2 by Ajit Kumar Nayak, Satyananda Champati Rai, Rajib Mall, CRC Press, 30 June 2020 Packet Tracer Network Simulator, Jesin A, Packt Publishing, 2014 Network with Practical ALL PACKET TRACER LABS, Mulayam Singh, BookRix, 2020 Learn Packet Tracer by Examples Technical Manual on Configuring Routers, Switches and Other Networking Devices, Blerton Abazi, Create Space, 2017 Introduction to Network Simulator NS2, Teerawat Issariyakul, Ekram Hossain, Springer, 2011 							
WEB REFERENCES :							
https://www.sanfoundry.com/ https://www.geeksforgeeks.org/ https://www.javatpoint.com/ https://www.javatpoint.com/							

Mapping of Cos to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	3						3		2	2
CO2	3	1	1	1	3						3		2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	CLOUD COMPUTING LAB			L	T	P	C
22MCA0308				0	1	2	2
Pre-Requisites	C, Java	Semester	III				
Course Objectives:							
Student will be able to							
<ul style="list-style-type: none"> Use infrastructure and applications via the internet, without installing and maintaining them on-premises. 							
Course Outcomes (CO): Student will be able to							
<ol style="list-style-type: none"> Configure various virtualization tools such as Virtual Box, VMware workstation Design and deploy a web application in a PaaS environment 							
List of programs to be implemented:							
<ol style="list-style-type: none"> Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs Install Google App Engine. Create hello world app and other simple web applications using python/java. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim. Find a procedure to transfer the files from one virtual machine to another virtual machine. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version) Install Hadoop single node cluster and run simple applications like wordcount. Working in Cloud9 to demonstrate different language. Manage Azure Storage Create an word document of your class time table and store locally and on the cloud with doc, and pdf format (use www.zoho.com and docs.google.com). Create a spread sheet which contains employee salary information and calculate gross and total sal using the formula DA=10% OF BASIC HRA=30% OF BASIC PF=10% OF BASIC IF BASIC<=3000 12% OF BASIC IF BASIC>3000 TAX=10% OF BASIC IF BASIC<=1500 =11% OF BASIC IF BASIC>1500 AND BASIC<=2500 =12% OF BASIC IF BASIC>2500 (use www.zoho.com and docs.google.com) NET_SALARY=BASIC_SALARY+DA+HRA-PF-TAX Prepare a ppt on cloud computing –introduction , models, services ,and architecture Ppt should contain explanations, images and at least 20 pages (use www.zoho.com and docs.google.com). Create your resume in a neat format using google and zoho cloud Write a Google app engine program to generate n even numbers and deploy it to google cloud. Google app engine program multiply two matrices. Write a Google app engine program to display nth largest no from the given list of numbers and deploy it into google cloud. 							
REFERENCES :							
<ol style="list-style-type: none"> Cloud Computing - A Practical Approach for Learning and Implementation, A. Suresh Srinivasan, Pearson Education India, 2014 Microsoft Azure Cloud - Complete Practical Guide for Ultimate Beginners Step by Step Azure Cloud Lab Manual Guide, ProTechGurus, 2018 Hands-On Azure for Developers: Implement rich Azure PaaS ecosystems using containers, serverless services, and storage solutions by Kamil Mrzyglód, Packt, 1st Edition, 2018 							
WEB REFERENCES :							
<ol style="list-style-type: none"> https://microsoftlearning.github.io/AZ-104-MicrosoftAzureAdministrator/Instructions/Labs/LAB_07-Manage_Azure_Storage.html https://k21academy.com/microsoft-azure/admin/azure-administrator-training-step-by-step-activity-guides-hands-on-lab-exercise/ 							

Mapping of Cos to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	2	2						3		1	3
CO2	1	2	2	2	2						3		1	3

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	OPERATING SYSTEMS LAB			L	T	P	C
22MCA0309				0	1	2	2
Pre-Requisites	C, Java	Semester	III				
Course Objectives:							
Student will be able to							
<ul style="list-style-type: none"> Implement Operating System concepts in Programming Languages 							
Course Outcomes (CO): Student will be able to							
<ol style="list-style-type: none"> Execute Basics of Linux Commands Simulate OS Concepts 							
List of programs to be implemented:							
<ol style="list-style-type: none"> Practicing of Basic UNIX Commands. Write programs using the following UNIX operating system calls Fork, exec, getpid, exit, wait, close, stat, opendir and readdir Simulate UNIX commands like cp, ls, grep, etc., Simulate the following CPU scheduling algorithms: a) Round Robin b) SJF c) FCFS d) Priority Simulate all file allocation strategies: a) Sequential b) Indexed c) Linked Simulate MVT and MFT Simulate all File Organization Techniques a) Single level directory b) Two level c) Hierarchical d) DAG Simulate Bankers Algorithm for Deadlock Avoidance Simulate Bankers Algorithm for Deadlock Prevention Simulate all page replacement algorithms a) FIFO b) LRU c) LFU Etc. ... Simulate Paging Technique of memory management Control the number of ports opened by the operating system with a) Semaphore b) monitors Simulate how parent and child processes use shared memory and address space Simulate sleeping barber problem Simulate dining philosopher's problem Simulate producer and consumer problem using threads (use java) Simulate little's formula to predict next burst time of a process for SJF scheduling algorithm. Develop a code to detect a cycle in wait-for graph 							
REFERENCES :							
<ol style="list-style-type: none"> "Operating Systems Concepts with Java" , Abraham Silberschatz , Wiley Plus Set, 2006 "Practical System Programming with C - Pragmatic Example Applications in Linux and Unix-Based Operating Systems", Sri Manikanta Palakollu, Apress publishers, 2020 "Introduction to Operating System Design and Implementation - The OSP 2 Approach", Michael Kifer, Scott Smolka, Springer London, 2007 "Principles of Modern Operating Systems", Jose M Garrido, Richard Schlesinger, Kenneth Hoganson, Jones & Bartlett Learning, 2011 "UNIX The Textbook", Syed Mansoor Sarwar, Robert M. Koretsky , CRC Press, Third Edition, 2016 "Beginning Linux Programming", Neil Matthew, Richard Stones , Wiley, 2008 "Linux System Programming Techniques - Become a Proficient Linux System Programmer Using Expert Recipes and Techniques", Jack-Benny Persson, Packt, 2021 							
WEB REFERENCES :							
<ol style="list-style-type: none"> https://www.sanfoundry.com/ https://www.geeksforgeeks.org/ https://www.javatpoint.com/ https://www.javatpoint.com/ https://www.cse.iitb.ac.in/~mythili/os/ 							

Mapping of Cos to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	1						3		3	
CO2	1	3	3	3	1						3		3	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	INFORMATICA			L	T	P	C
22MCA0311				0	1	2	3
Pre-Requisites	DBMS	Semester	III				
Course Objectives: Student will be able to							
<ul style="list-style-type: none"> execute any ETL tool 							
Course Outcomes (CO): Student will be able to							
<ol style="list-style-type: none"> connect & fetch data from different heterogeneous sources and processing of data. extract data, transform and load generate reports 							
List of Programs to be implemented:							
Week 1: Introduction to Informatica PowerCenter - (E)xtraction, (T)ransformation and (L)oding Process - PowerCenter Tools (Repository Manager, Designer, Workflow Manager, Workflow Monitor)							
Week 2: Source and Target Object Definitions - Transformation Concepts (Types, Classifications, Basic uses)- ODBC & Relational Connections							
Week 3: Working with Flat files - Working with XML Files - Transformations: Filter - Router - Sequence Generator - Rank - Sorter - Joiner - Union - Source Qualifier							
Week 4: Expression - Aggregator - Lookup (Connected/Unconnected) - Normalizer - Stored Procedure (Connected/Unconnected)							
Week 5: Update Strategy-Transaction Control-Java Transformation-SQL Transformation(Query/Script)							
Week 6: XML Parser-XML Generator							
Week 7: Different Load Types - Slowly Changing Dimensions - Indirect Method for Loading							
Week 8: Mapplets and Reusable Transformations - Parameters and Variables (Mapping and Workflow)							
Week 9: Different Types of Tasks - Session - Email - Command - Assignment							
Week 10: Control - Timer - Decision - Event Wait - Event Raise							
Week 11: Working with Links - Worklets - Scheduler - Parallel and Serial Batching							
Week 12: User Defined Functions - Incremental Aggregation - Constraint Based Loading - Target Load Plan - Performance Tuning - Pushdown Optimization - Wizards - Partitioning - Debugger							
TEXTBOOK(S) :							
1. Getting Started, Informatica PowerCenter 10.2, Informatica LLC, 2020							
References:							
1. Informatica: Mastering Information through the Ages, Alex Wright, Cornell University Press, 2023							
2. Learning Informatica PowerCenter 10.x - Second Edition: Enterprise data warehousing and intelligent data centers for efficient data management solutions, Rahul Malewar, Packt, 2e, 2017							
3. The Data Warehouse ETL Toolkit: Practical Techniques for Extracting, Cleaning, Conforming, and Delivering Data 1st Edition, Wiley, 2007.							
Web References:							
1. https://www.academia.edu/32634344/ETL_Informatica_Training_Online_pdf							
2. https://www.informatica.com/in/services-and-training/informatica-university.html							
3. https://www.udemy.com/course/informatica-tutorial-informatica-online-training-beginners-developer/							

Mapping of Cos to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2						3			3
CO2	1	3	3	3	2						3			3
CO3	1	1	1	1	2						3			3

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI
(AUTONOMOUS)
Department of Master of Computer Applications
AK22 - Course Structure and Syllabus

Semester 4

S. No.	CC	Course Code	Course Name	Hours/Week			C	CIE	SEE	TM
				L	T	P				
1	PE	Professional Elective - II		3	0	0	3	40	60	100
		22MCA0401	Cryptography							
		22MCA0402	Social Network Analysis							
		22MCA0403	Full Stack Development							
2	PE	Professional Elective - III		3	0	0	3	40	60	100
		22MCA0404	Web Application Security							
		22MCA0405	Deep Learning							
		22MCA0406	DevOps							
3	PE	Professional Elective - IV		3	0	0	3	40	60	100
		22MCA0407	Cyber Security							
		22MCA0408	Data Science							
		22MCA0409	Big Data Technologies							
4	PR	22MCA0410	Project Work	0	0	20	10	80	120	200
5	PR	22MCA0411	Comprehensive Viva Voce	-	-	-	2	-	50	50
6		22MCA0209	Evaluation of MOOC	-	-	-	3	*	*	100
Total				9	-	20	24	200	350	650

Course Code	CRYPTOGRAPHY		L	T	P	C
22MCA0401			3	0	0	3
Pre-Requisites	Discrete Mathematics, Computer Networks	Semester	IV			
Course Objectives: The students will be able to						
<ul style="list-style-type: none"> understand cryptographic algorithms and protocols that provide network security 						
Course Outcomes (CO): Student will be able to						
<ol style="list-style-type: none"> Understand the main concepts of symmetric cryptography. Understand the distinction between stream ciphers and block ciphers. Compare and contrast ECB, CBC, CFB, OFB, and counter modes of operation. Present an overview of the basic principles of public-key cryptosystems. Summarize the key functional components of the Internet mail and system architecture 						
UNIT - I						Lecture Hrs: 9
Introduction: Computer Security concepts, Security attacks and services; Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography,						
UNIT - II						Lecture Hrs: 9
Block Cipher Principles, DES, A DES Example, Block Cipher Design Principles, AES Structure, AES Round Functions, AES Key Expansion, AES Example, AES Implementation, Multiple Encryption and Triple DES						
UNIT - III						Lecture Hrs: 9
Electronic Codebook Mode, Cipher Block Chaining Mode, Cipher Feedback Mode, Output Feedback Mode, Counter Mode, Pseudorandom Number Generation using a Block Cipher, Stream Ciphers						
UNIT - IV						Lecture Hrs: 9
Public-key Cryptosystems, The RSA Algorithm, Diffie - Hellman Key Exchange, Secure Hash Algorithm, Message Authentication Functions, Digital Signatures, Key Management and Distribution						
UNIT - V						Lecture Hrs: 9
Electronic Mail Security - PGP, S/MIME, DKIM; System Security - Intruders, Malicious Software, Firewalls						
TEXTBOOK(S) :						
1. Cryptography And Network Security - Principles And Practice, William Stallings, Pearson, 7e, 2017						
REFERENCES :						
1. Understanding Cryptography: A Textbook for Students and Practitioners, Bart Preneel, Christof Paar, Jan Pelzl, Springer, 8 November 2014						
2. Real-World Cryptography, David Wong, Manning Publishers, 2021						
3. Cryptography and Network Security, Atul Kahate, McGraw Hill Education, 3e, July 2017						
4. A Classical Introduction to Cryptography, Serge Vaudenay, Springer, January 2008						
WEB REFERENCES :						
1. https://www.tutorialspoint.com/cryptography/index.htm						
2. https://onlinecourses.nptel.ac.in/noc22_cs90/preview						
3. https://www.udemy.com/topic/cryptography/						
4. https://www.udacity.com/course/applied-cryptography--cs387						

Mapping of Cos to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	1									1	
CO2	3	2	1	1									1	
CO3	2	3	1	1									1	
CO4	3	1	2	1									1	
CO5	3	1	1	3									1	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	SOCIAL NETWORK ANALYSIS		L	T	P	C
22MCA0402			3	0	0	3
Pre-Requisites	Basic Knowledge Of Graph Theory	Semester	IV			
Course Objectives: Student will be able to						
1. Gain knowledge on various aspects of different key concepts of social science data						
2. Generate data with respect to type of analysis can be done.						
Course Outcomes (CO): Student will be able						
1. To learn development of Social Network Analysis.						
2. To understand the basic mathematical concept of social networks.						
3. To impart knowledge, concerning the Ontological representation of social relationships.						
4. To learn building Semantic Web applications.						
5. To understand the Evaluation of web-based social network extraction						
UNIT – I	INTRODUCTION		Lecture Hrs: 9			
Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web-Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks - Applications of Social Network Analysis.						
UNIT – II	MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION		Lecture Hrs: 9			
Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modeling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations.						
UNIT – III	EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS		Lecture Hrs: 9			
Extracting evolution of Web Community from a Series of Web Archive - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks - Multi-Relational characterization of dynamic social network communities.						
UNIT – IV	PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES		Lecture Hrs: 9			
Understanding and predicting human behaviour for social communities - User data management - Inference and Distribution- Enabling new human experiences - Reality mining - Context - Awareness - Privacy in online social networks - Trust in online environment -- Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.						
UNIT – V	VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS		Lecture Hrs: 9			
Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Applications - Cover networks - Community welfare - Collaboration networks - Co-Citation networks.						
TEXT BOOKS:						
1. Social Networks and the Semantic Web, Peter Mika, First Edition, Springer 2007.						
2. Handbook of Social Network Technologies and Applications, Borko Furht, 1st Edition, Springer, 2010.						
REFERENCES :						
1. Guandong Xu ,Yanchun Zhang and Lin Li, – Web Mining and Social Networking – Techniques and applications, First Edition, Springer,2011.						
2. Dion Goh and Schubert Foo, – Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively, IGI Global Snippet, 2008.						
3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, –Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling, IGI Global Snippet, 2009.						

Mapping of Cos to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1										1
CO2	3	2	1	1										1
CO3	2	2	2	1										1
CO4	2	2	2	1										1
CO5	2	2	1	1										1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	FULL STACK DEVELOPMENT			L	T	P	C
22MCA0403				3	0	0	3
Pre-Requisites	Web Technologies, Software Engineering	Semester	IV				
Course Objectives: This course has the							
<ul style="list-style-type: none"> • Advantage of mastering a set of vital skills • Scope to be Part of Game-Changing Projects 							
Course Outcomes (CO): Student will be able to							
6. Understand web, plan work and get user experience							
7. Design Systems and Front-end with ethics							
8. Design Testing Strategies, Scripting and Accessibility with UI							
9. Work with APIs, Storage and Security							
10. Process the documents, model, and overall project made available for use							
UNIT – I							Lecture Hrs: 9
The Modern Web: Rise of the Web, Mobile Web, The State of HTML, Applications vs Web Sites, Keeping Up. Planning Your Work: Identifying Requirements, Defining the Work, Tracking the Work Continuous Improvement, Prioritization & Estimation, Managing Bugs, Continuous Delivery. User Experience: Information Architecture, Getting the User Experience Right, Polishing the User Experience, Implementing the User Experience.							
UNIT – II							Lecture Hrs: 9
Designing Systems: System Architectures, Identifying Concepts, Identifying User Interactions, Handling Commonalities, Working with Legacy and External Dependencies, Component Interactions, Applications vs. Modules, Cross-Functional Requirements, Caching, Designing for Failure, Designing Modules, Refactoring, Tools, Changing Your Architecture. Ethics: Privacy, Cognitive Load, Energy Usage, Trust; Front End: HTML, From Server to Browser, Styling, Components, Responsive Design, Progressive Enhancement to Progressively Enhance, or Not? Mobile First, Feature Detection, Progressive Enhancement of Style, When Not Using Progressive Enhancement, Search Engine Optimization, Build Tools.							
UNIT – III							Lecture Hrs: 9
Testing: Test-Driven Development, Test Pyramid, Behaviour - Driven Development, Three Amigos, Manual Testing, Visual Testing, Cross-Functional Testing. JavaScript: Communicating Between Components, Connecting Components Together, Testing, Build Tools. Accessibility: Accessible from the Start, Working with Assistive Technologies, Dealing with Interactive UI, Testing for Accessibility, Avoiding Common Mistakes							
UNIT – IV							Lecture Hrs: 9
APIs: API Responsibilities, designing a REST API, Securing Your API, Event-Based APIs, Discovering APIs, Using APIs Storing Data: Types of Databases, To SQL, or NoSQL?, Where to Store Your Data, Accessing Data from Your App, Managing Your Data, Protecting Your Data. Security: Trust, Responding to Incidents, The Golden Rule, Threats, Security Checklists, Passwords, Indirect Attacks.							
UNIT – V							Lecture Hrs: 9
Deployment: Twelve Factor Apps, Developer Machines, Production Environments, Moving Code into Production, Configuring Your Box, Infrastructure, Immutable Infrastructure, Continuous Delivery & Continuous Deployment. In Production: Fire Drills, Run Books, Monitoring, Responding to Incidents. Constant Learning: Collecting, Experiments, Analyzing Results, Hypothesis-Driven.							
TEXTBOOK(S) :							
1. The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer, Chris Northwood, Apress, Springer, 2018							
REFERENCES :							
1. Full-Stack React Projects, Shama Hoque, Packt, Second Edition, 2020							
2. Modern Full-Stack Development: Using TypeScript, React, Node.js, Webpack, and Docker - Frank Zammetti, Apress, 2022							
3. Full Stack Web Development For Beginners: Learn Ecommerce Web Development Using HTML5, CSS3, Bootstrap, JavaScript, MySQL, and PHP - Riaz Ahmed, 2021							
4. Full Stack Development with MongoDB: Covers Backend, Frontend, APIs, and Mobile App Development using PHP, NodeJS, ExpressJS, Python and React Native Paperback - Manu Sharma, bpb, 2022							
Online Learning Resources:							
1. https://link.springer.com/book/10.1007/978-1-4842-4152-3							
2. https://www.simplilearn.com/full-stack-web-developer-mean-stack-certification-training							

Mapping of Cos to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1										1
CO2	3	2	1	1										1
CO3	2	2	2	1										1
CO4	2	2	2	1										1
CO5	2	2	1	1										1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	WEB APPLICATION SECURITY			L	T	P	C
22MCA0404				3	0	0	3
Pre-Requisites	Web, Computer Networks	Semester	IV				
Course Objectives: Student will be able to							
<ol style="list-style-type: none"> 1. obtain knowledge on foundations to design a web application in a secure manner. 2. understand the vulnerabilities in web application design, handling the errors, auditing logs, alert and reacting to the attacks. 3. deal with authentication technologies and their flaws, the tools to capture the passwords and access control mechanisms, learn the basics related SQL injection attacks and how to prevent these kinds of attacks 							
Course Outcomes (CO): Student will be able to							
<ol style="list-style-type: none"> 1. Expertise in web application security core mechanisms. 2. Learn various web technologies and their security. 3. To provide awareness on web application mapping. 4. To provide practical and hands on experience on attacking authentication and data stores 5. Perception of securing devices and Internet security perimeter 							
UNIT – I	Web Application (In)security			Lecture Hrs: 9			
The Evolution of Web Applications, Common Web Application Functions, Benefits of Web Applications, Web Application Security. Core Defence Mechanisms: Handling User Access Authentication, Session Management, Access Control, Handling User Input, Varieties of Input Approaches to Input Handling, Boundary Validation. Multistep Validation and Canonicalization: Handling Attackers, Handling Errors, Maintaining Audit Logs, Alerting Administrators, Reacting to Attacks.							
UNIT – II	Attacking Authentication			Lecture Hrs: 9			
Authentication Technologies, Design Flaws in Authentication Mechanisms, Bad Passwords, Brute Force Login, Verbose Failure Messages, Vulnerable Transmission of Credentials, Password Change, Functionality, Forgotten Password Functionality, “Remember Me” Functionality, User Impersonation, Functionality Incomplete, Validation of Credentials, Non-unique Usernames, Predictable Usernames, Predictable Initial Passwords, Insecure Distribution of Credentials. Attacking Access Controls: Common Vulnerabilities, Completely Unprotected, Functionality Identifier-Based Functions, Multistage Functions, Static Files, Platform Misconfiguration, Insecure Access Control Methods							
UNIT – III	Attacking Data Stores			Lecture Hrs: 9			
Injecting into Interpreted Contexts, bypassing a Login, injecting into SQL, exploiting a Basic Vulnerability Injecting into Different Statement Types, Finding SQL Injection Bugs, Fingerprinting the Database, The UNION Operator, Extracting Useful Data, Extracting Data with UNION, Bypassing Filters, Second-Order SQL Injection, Advanced Exploitation Beyond SQL Injection: Escalating the Database Attack, Using SQL Exploitation Tools, SQL Syntax and Error Reference, Preventing SQL Injection							
UNIT – IV	Attacking Back-End Components			Lecture Hrs: 9			
Injecting OS Commands, Manipulating File Paths, Injecting into XML Interpreter, Injecting into Back-end HTTP Requests, Injecting into Mail Services							
UNIT – V	Attacking Users: Cross-Site Scripting			Lecture Hrs: 9			
Varieties of XSS, XSS Attacks in Action, Finding and Exploiting XSS Vulnerabilities, Preventing XSS Attacks							
TEXTBOOK(S) :							
1. The Web Application Hacker's Handbook: Finding and Exploiting Security, Defydd Stuttard, Marcus Pinto, Wiley Publishing, Second Edition,							
REFERENCES :							
1. Professional Pen Testing for Web application, Andres Andreu, Wrox Press							
2. “Web Application Security”, Carlos Serrao, Vicente Aguilera, Fabio Cerullo, Springer, 1st Edition							
WEB REFERENCES :							
1. https://www.comparitech.com/vpn/cybersecurity-cyber-crime-statistics-facts-trends/							

Mapping of Cos to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1									1	1
CO2	1	2	2	1									1	1
CO3	2	2	2	1									1	1
CO4	2	2	2	1									1	1
CO5	3	1	1	1									1	1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	DEEP LEARNING			L	T	P	C
22MCA0405				3	0	0	3
Pre-Requisites	Machine Learning	Semester	IV				
Course Objectives:							
<ul style="list-style-type: none"> Develop and Train Deep Neural Networks. 							
Course Outcomes (CO): Student will be able to							
<ol style="list-style-type: none"> Understand basics of Deep Learning Differentiate different architectures Build Deep Networks Tune Deep Networks Classify and extract features using Autoencoders 							
UNIT – I			Lecture Hrs: 9				
Historical Trends in Deep Learning, The Learning Machines, Defining Deep Learning, Common Architectural Principles of Deep Networks, Building Blocks of Deep Networks About Neural Network. Building Blocks of Neural Network. Optimizers. Activation Functions. Loss Functions. Data Pre-processing for neural networks, Feature Engineering. Overfitting and Underfitting. Hyperparameters.							
UNIT – II			Lecture Hrs: 9				
Convolutional Neural Networks: Biological Inspiration, CNN Architecture, Input layers, Convolutional layers, Pooling layers, Fully connected Layers, Applications Recurrent Neural Networks: Modeling the Time Dimension, 3D Volumetric Input Recursive Neural Networks: Architecture, Varieties, Applications							
UNIT – III			Lecture Hrs: 9				
Matching Deep Networks to the right problem, The DL4J Suite of Tools, Basic concepts of the DL4J API, Modeling CSV data with Multilayer Perceptron Networks, Modeling Hand Written Images using CNNs							
UNIT – IV			Lecture Hrs: 9				
Basic Concepts, Matching Input data and Network Architectures, Relating Model goal and Output layers. Working with layer count, parameter count and memory. Weight Initialization Strategies. Using Activation functions. Applying loss functions. Understanding Learning Rates. How to use Regularisation. Working with class imbalance.							
UNIT – V			Lecture Hrs: 9				
Undercomplete Autoencoders. Regularized Autoencoders. Representational Power, Layer Size and Depth. Stochastic Encoders and Decoders. Denoising Autoencoders. Learning Manifolds with Autoencoders. Contractive Autoencoders. Predictive Sparse Decomposition. Using Autoencoders for Anomaly Detection, Applications of Autoencoders							
TEXTBOOK(S) :							
<ol style="list-style-type: none"> Deep Learning A Practitioner’s Approach, Josh Patterson and Adam Gibson, O’Reilly Media, Inc., 2017 Deep Learning, Ian Goodfellow, Yoshua Bengio, Aaron Courville, MIT Press book, 2016 							
REFERENCES :							
<ol style="list-style-type: none"> Deep Learning, John D. Kelleher, MIT Press, 2019 Fundamentals of Deep Learning, Nithin Buduma, Nikhil Buduma, Joe Papa, O’Reilly 2e, May 2022 Deep Learning Projects Using TensorFlow 2, Vinita Silaparasetty, Apress, 2020 Deep Learning with Python, François Chollet, Manning Shelter Island, 2017 Pro Deep Learning with TensorFlow, Santanu Pattanayak, Apress, 2017 Learn Keras for Deep Neural Networks, Jojo Moolayil, Apress, 2018 Hands-On Machine Learning with R, Brad Boehmke, Brandon M. Greenwell, CRC Press, 2019 							
Online Learning Resources:							
<ol style="list-style-type: none"> https://nptel.ac.in/courses/106106184 https://www.coursera.org/specializations/deep-learning https://www.deeplearning.ai/courses/ 							

Mapping of Cos to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	1										1
CO2	1	2	2	1										1
CO3	1	2	2	1										1
CO4	1	2	2	1										1
CO5	1	2	2	1										1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	DEVOPS			L	T	P	C
22MCA0406				3	0	0	3
Pre-Requisites	JAVA, PYTHON	Semester	IV				
Course Objectives: Student will be able to							
1. Adapt the software Engineering practices that combine Software Development and IT 2. Understand operations for Quality Software Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service agility							
Course Outcomes (CO): Student will be able to							
1. Explain how DevOps will balance the needs throughout the SDLC 2. Demonstrate how DevOps improves the collaboration and productivity by automation 3. Adapt DevOps in real time projects. 4. Operation for quality software enumerate the principles of continues development 5. Illustrate the continuous integration tools and monitoring tools							
UNIT – I	DevOps Concepts			Lecture Hrs: 9			
Understanding DevOps movement, DevOps with changing time, the water fall model, Agile Model, Collaboration, Why DevOps, Benefits of DevOps, DevOps life cycle- all about continuous, Build Automation, Continuous Integration, Continuous Management, Continuous Delivery / Continuous Development, The agile wheel of wheels							
UNIT – II	DevOps Tools and Technologies			Lecture Hrs: 9			
Code Repositories : Git, Differences between SVN and Git, Build tools – Maven, Continuous integration tools – Jenkins, Container Technology – Docker, Monitoring Tools – Zenoss, Continuous integration with Jenkins 2, Creating built-in delivery pipelines, Creating Scripts, Creating a pipeline for compiling and executing test units, Using the Build Pipeline plugin, Integrating the deployment operation, Getting started with Chef, Overview of hosted Chef, Installing and configuring a Chef workstation.							
UNIT – III	Docker Containers			Lecture Hrs: 9			
Overview of Docker containers, Understanding the difference between virtual machines and containers, Installation and configuration of Docker on CentOS, creating your first Docker container, managing containers, creating a Docker image from Docker file, an overview of Docker's elements, creating a Docker file, writing a Docker file, Building and running a container on a local machine, testing a container locally, Pushing an image to Docker Hub							
UNIT – IV	Cloud Provisioning and Configuration Management with Chef			Lecture Hrs: 9			
Cloud Provisioning and Configuration Management with Chef, Managing Containers Effectively with Kubernetes Chef and cloud provisioning, installing knife plug-ins for Amazon EC2 and Microsoft Azure, Creating and configuring a virtual machine in Amazon Web Services, Creating and configuring a virtual machine in Microsoft Azure, Managing Docker containers with Chef, Prerequisite – deploying our application on a remote server, Deploying the application on AWS, Deploying the application on Microsoft Azure, Deploying the application in a Docker container							
UNIT – V	Testing the Code			Lecture Hrs: 9			
Manual testing, Unit testing, JUnit in general and JUnit in particular, A JUnit example, Automated integration testing, Docker in automated testing, Performance testing, Automated acceptance testing, Automated GUI testing, Integrating Selenium tests in Jenkins, JavaScript testing, Testing backend integration points, Test-driven development, A complete test automation scenario, Manually testing our web application, Security and Performance Tests: Applying web security and penetration testing with ZAP, Running performance tests with Postman							
TEXTBOOKS:							
1. DevOps for Web Development, Mitesh Soni, Packet Publishing, 2016. 2. Learning DevOps- The complete guide to accelerate collaboration with Jenkins, Kubernetes, Terraform and Azure DevOps, Mikael Krief, Packet Publishing, 2019.							
REFERENCES :							
1. Practical DevOps, Joakim Verona, Packet Publishing, 2016 2. DevOps for Developers, Michael Huttermann, Apress publishers,2012. 3. The DevOps Adoption Playbook, Sanjeev Sharma, John Wiley & Sons, Inc.2017. 4. DevOps for Dummies, Sanjeev Sharma & Bernie Coyne, John Wiley & Sons, Inc							
WEB REFERENCE(S):							
1. https://www.udemy.com/topic/devops/ 2. https://www.edureka.co/devops-certification-training 3. https://www.coursera.org/courses?query=devops							

Mapping of Cos to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	2	1									1
CO2	1	1	1	2	1									1
CO3	1	1	1	2	1									1
CO4	1	1	1	2	1									1
CO5	1	1	1	2	1									1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	CYBER SECURITY			L	T	P	C
22MCA0407				3	0	0	3
Pre-Requisites	Security Information And Event Management	Semester	IV				
Course Objectives: Student will be able to							
<ul style="list-style-type: none"> know the global perspective of Cybercrimes, Cyber stalking, key loggers, crimes. identify, classify, estimate the criminal plans of the attackers predict the web threats and security implications.. 							
Course Outcomes (CO): Student will be able to							
<ol style="list-style-type: none"> Introduce the fundamentals of various cyber threats and attacks. Acquaint with the knowledge about various security tools. Understand IT security processes and technologies. Awareness on cyber security industry standards. Perception of securing devices and Internet security perimeter 							
UNIT – I	Introduction to Cyber security			Lecture Hrs: 9			
Cyber security Definition, Key Terms, Security Threats, Vulnerability Assessments, Roles in Security, Cyber security Today, Critical Thinking in Cyber security Overview of actors and their motives: Hacking organizations, Major types of cyber-attacks, Network Security Model, Security services, Security Mechanisms, Threat Examples, Malware and Ransomware, Threat Protection, Internet Security Threats, Security Threat, The Cyber Kill Chain, Social Engineering, Cyber warfare							
UNIT – II	Overview of key security concepts			Lecture Hrs: 9			
CIA Triad, Non - Repudiation - How does it apply to CIA? Access Management, Key Concepts – Incident Response, Incident Response Process, Introduction to Frameworks and Best Practices, IT Governance Process, Cyber security Compliance and Audit Overview. Overview of key security tools: Introduction to Firewalls, Firewalls - Packet Filtering, Firewalls – Application Gateway, Firewalls - XML Gateway, Firewalls - Stateless and Stateful, Antivirus/Antimalware							
UNIT – III	Overview of People, Process and Technologies			Lecture Hrs: 9			
What is IT Security? Frameworks and their purpose, Roles in Security, Introduction to Process, Overview Business Process Management. Overview of Information Technology Infrastructure Library (ITIL), Key ITIL Processes, identification and AAA, Access Control Methods, Access Control - Physical and Logical, Open Web Application Security Project (OWASP).							
UNIT – IV	Compliance Frameworks and Industry Standards			Lecture Hrs: 9			
What Cyber security Challenges do Organizations Face? Compliance Basics, Overview of US Cyber security Federal Law, National Institute of Standards and Technology (NIST) Overview, General Data Protection Regulation (GDPR) Overview, International Organization for Standardization (ISO) 2700x, SOC Reports, SOC Reports - Auditor Process Overview, Health Insurance Portability and Accountability Act (HIPAA), Payment Card Industry Data Security Standard (PCI DSS), Center for Internet Security (CIS) Critical Security Controls. Client System Administration, Endpoint Protection, Endpoint Detection and Response, Unified Endpoint Management, Overview of Patching, Windows Patching							
UNIT – V	Securing the perimeter			Lecture Hrs: 9			
Perimeter Security in the Real World, Security Challenges, The Basics of Internet Security, Understanding the Environment, Hiding the Private Network, Understanding Private Networks, Protecting the Perimeter, Understanding the Perimeter, Network Appliances, Proxy Servers, Demilitarized Zones (DMZs), Honeypots, Extranets.							
TEXTBOOK(S) :							
1.Charles J. Brooks, Christopher Grow, Philip Craig, Donald Short, Cyber Security Essentials 1/e, Sybex Wiley, 2019							
REFERENCES :							
<ol style="list-style-type: none"> James Graham, Richard Howard and Ryan Otson, Cyber Security Essentials, 1/e, CRC Press, 2011. Chwan-Hwa(John) Wu, J. David Irwin, Introduction to Cyber Security, 1/e, CRC Press T&F Group, 2013 Nina Godbole and SuNone Belapure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, 1/e, Wiley INDIA. 							

Mapping of Cos to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1									1	1
CO2	2	2	2	2									1	1
CO3	2	2	2	1									1	1
CO4	2	1	2	1									1	1
CO5	2	1	2	2									1	1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	DATA SCIENCE			L	T	P	C
22MCA0408				3	0	0	3
Pre-Requisites	SQL, ML, Python, R	Semester	IV				
Course Objectives: Student will be able to							
1.To understand the data science fundamentals and process. 2.To learn to describe the data for the data science process. 3.To learn to describe the relationship between data. 4.To utilize the Python libraries for Data Wrangling. 5.To present and interpret data using visualization libraries in Python.							
Course Outcomes (CO): Student will be able to							
1: Define the data science process 2: Understand different types of data description for data science process 3: Gain knowledge on relationships between data 4: Use the Python Libraries for Data Wrangling 5: Apply visualization Libraries in Python to interpret and explore data							
UNIT – I	INTRODUCTION			Lecture Hrs: 9			
Data Science: Benefits and uses – facets of data - Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation - Exploratory Data analysis – build the model-presenting findings and building applications - Data Mining - Data Warehousing – Basic Statistical descriptions of Data							
UNIT – II	DESCRIBING DATA			Lecture Hrs: 9			
Types of Data - Types of Variables -Describing Data with Tables and Graphs – Describing Data with Averages - Describing Variability - Normal Distributions and Standard (z) Scores							
UNIT – III	DESCRIBING RELATIONSHIPS			Lecture Hrs: 9			
Correlation – Scatter plots – correlation coefficient for quantitative data – computational formula for correlation coefficient – Regression – regression line – least squares regression line – Standard error of estimate – interpretation of r ² –multiple regression equations – regression towards the mean							
UNIT – IV	PYTHON LIBRARIES FOR DATA WRANGLING			Lecture Hrs: 9			
Basics of Numpy arrays –aggregations –computations on arrays – comparisons, masks, Boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – Hierarchical indexing – combining datasets – aggregation and grouping – pivot tables							
UNIT – V	DATA VISUALIZATION			Lecture Hrs: 9			
Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn.							
TEXTBOOK(S) :							
1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, “Introducing Data Science”, Manning Publications, 2016. (Unit I) 2. Robert S. Witte and John S. Witte, “Statistics”, Eleventh Edition, Wiley Publications, 2017. (Units II and III) 3. Jake VanderPlas, “Python Data Science Handbook”, O’Reilly, 2016. (Units IV and V)							
REFERENCES :							
1. Allen B. Downey, “Think Stats: Exploratory Data Analysis in Python”, Green Tea Press,2014.							

Mapping of Cos to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	2									2	
CO2	1	2	2	2									2	
CO3	1	2	2	2									2	
CO4	1				3								3	
CO5	1				3								3	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	BIG DATA TECHNOLOGIES			L	T	P	C
22MCA0409				3	0	0	3
Pre-Requisites	DBMS	Semester		IV			
Course Objectives:							
The course is designed to							
<ul style="list-style-type: none"> Understand the basic concepts and importance of Big Data Get insights of the technologies to improve business operations 							
Course Outcomes (CO): Student will be able to							
<ol style="list-style-type: none"> Understand the basic concepts of Big Data Set up an Hadoop Environment Deduce how MapReduce works Understand basic concepts of Pig and NoSql Know Hive, Spark and HBase Technologies 							
UNIT – I	Introduction to Big Data			Lecture Hrs: 8			
What is Big Data? Why Big Data is Important? Meet Hadoop - Data, Data Storage and Analysis, Comparison with other systems, History of Apache Hadoop, Hadoop Ecosystem, VMWare Installation of Hadoop, Analyzing the Data with Hadoop, Scaling Out							
UNIT – II	HDFS			Lecture Hrs: 10			
The Design of HDFS, HDFS Concepts, The Command-Line Interface, Hadoop File systems, The Java Interface, Data flow. Running Locally on Test Data, Running on a Cluster. Setting up a Hadoop Cluster - Cluster specification, Cluster Setup and Installation, Hadoop Configuration, Security.							
UNIT – III	How MapReduce Works			Lecture Hrs: 9			
MapReduce: Developing a MapReduce application - The Configuration API, Setting up the Development Environment, Anatomy of a MapReduce Job Run, Failures, Shuffle and Sort, Task Execution. MapReduce Types and Formats: MapReduce Types, Input formats, output formats							
UNIT – IV	NoSql and Pig			Lecture Hrs: 9			
Pig: Installing and Running Pig, an Example, Comparison with Databases, Pig Latin, User-Defined Functions, Data Processing Operators. NoSql: Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases. Replication and sharding							
UNIT – V	Hive, Spark and HBase			Lecture Hrs: 9			
Installing Hive, Running Hive, Comparison with traditional Databases, HiveQL, Tables, Querying Data. Spark: Installing Spark, Resilient Distributed Datasets, Shared Variables, Anatomy of a Spark Job Run. HBase: HBasics, Installation, clients, Building an Online Query Application							
TEXTBOOK(S):							
<ol style="list-style-type: none"> Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013. P. J. Sadalage, M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2014. Tom White, "Hadoop: The Definitive Guide", 4e, O'Reilly, 2015 							
REFERENCES:							
<ol style="list-style-type: none"> Big Data Fundamentals - Concepts, Drivers & Techniques, Thomas Erl, Wajid Khattak, and Paul Buhler, Prentice Hall, 2016 Big Data For Dummies, Judith S. Hurwitz, Alan Nugent, Fern Halper, Marcia Kaufman, Wiley 2013 Simplify Big Data Analytics with Amazon EMR - A Beginner's Guide to Learning and Implementing Amazon EMR for Building Data Analytics Solutions, Sakti Mishra, Packt, 2022 							

Mapping of Cos to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1		1										2
CO2		1	2		3									2
CO3	1				2									2
CO4			3		3									3
CO5		1	1		2									3

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)