

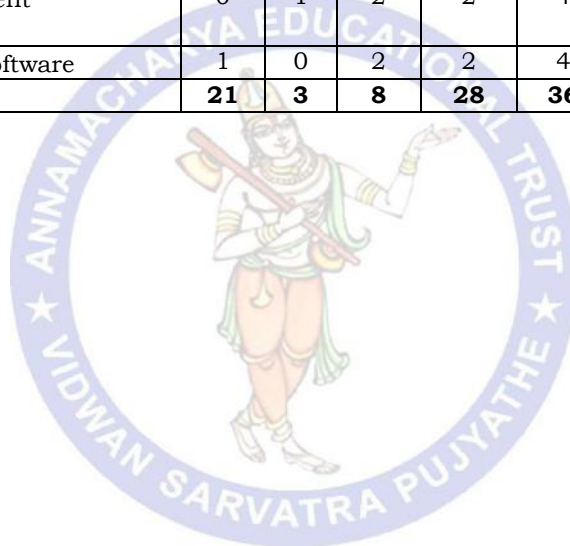
**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI
(AUTONOMOUS)**

Department of Master of Computer Applications

Effective for the batches admitted from 2022-23

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	HS	22MCA0109	Foundations of R Software	1	0	2	2	40	60	100
	Total			21	3	8	28	360	540	900



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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	PE	22MCA0204	Professional Elective - I (MOOC)*	3	0	0	3	_*	_*	100
5	OE	22MCA0205	Open Elective - I (MOOC)*	3	0	0	3	_*	_*	100
6	PC	22MCA0206	Mobile Application Development Laboratory	0	1	2	2	40	60	100
7	PC	22MCA0207	Machine Learning Lab	0	1	2	2	40	60	100
8	PC	22MCA0208	Object-oriented Programming through Java Laboratory	0	1	2	2	40	60	100
9	SC	22MCA0209	Skill Oriented Course - I Python Programming	1	0	2	2	40	60	100
10	HS	22MCA0210	Soft Skills	0	1	2	2	50	0	50
	Total			19	4	10	28	330	420	950

*Assessment done by Swayam Portal will be taken into consideration for MOOC Electives

Professional Elective - I *:

1. Artificial Intelligence: Search Methods for Problem solving
2. Introduction to Game Theory and Mechanism Design
3. Getting Started with Competitive Programming
4. Computer Architecture and Organization
5. Introduction to Industry 4.0 and Industrial Internet Of Things
6. Programming in Modern C++
7. Computational Complexity
8. Artificial Intelligence: Search Methods for Problem solving
9. Operating System Fundamentals
10. Design & Implementation of Human-Computer Interfaces

Open Elective - I *:

1. Operations and supply chain management
2. Organizational Behaviour
3. Entrepreneurship
4. Principles of Management
5. Mathematical Methods and its Applications
6. Introduction to Fuzzy Set Theory, Arithmetic and Logic
7. Regression Analysis
8. Introduction to Probability Theory and Stochastic Processes
9. Introduction to Probability Theory and Statistics
10. Management Information System
11. Data Analysis & Decision Making - III
12. Essential Mathematics for Machine Learning

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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	Dev Ops	4	0	0	4	40	60	100
4	PE		Professional Elective – II	3	0	0	3	40	60	100
		22MCA0304	Full Stack Development							
		22MCA0305	Big Data Technologies							
		22MCA0306	Deep Learning							
5	OE		Open Elective – II	3	0	0	3	40	60	100
		22MCA0307	Foundations of Blockchain Technology							
		22MCA0308	Theory of Computation							
		22MCA0309	Software Architecture and Design Patterns							
6	PC	22MCA0310	Computer Networks Laboratory	0	1	2	2	40	60	100
7	PC	22MCA0311	Cloud Computing Lab	0	1	2	2	40	60	100
8	PC	22MCA0312	Dev Ops Laboratory	0	1	2	2	40	60	100
9	PR	22MCA0313	Summer Internship / Industry Oriented Mini Project/ Skill Development Course (Minimum 6 weeks)	-	-	-	2	-	100	100
10	SC	22MCA0314	Skill oriented Course – II UI/UX Design	0	1	2	2	40	60	100
Total				18	4	8	28	360	640	1000

Semester 4

S. No.	CC	Course Code	Course Name	Hours/Week			C	CIE	SEE	TM
				L	T	P				
1	PE		Professional Elective – III	3	0	0	3	40	60	100
		22MCA0401	Data Science							
		22MCA0402	Social Media Analysis							
		22MCA0403	Edge Computing							
2	PE		Professional Elective – IV	3	0	0	3	40	60	100
		22MCA0404	Internet of Things							
		22MCA0405	Artificial Intelligence for Robotics							
		22MCA0406	Cyber Security							
3	PR	22MCA0407	Project Work	0	0	20	10	80	120	200
4	PR	22MCA0408	Comprehensive Viva Voce	-	-	-	2	-	50	50
Total				6	-	20	18	160	290	450

Total marks: 3300

Total Credits: 102

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 						

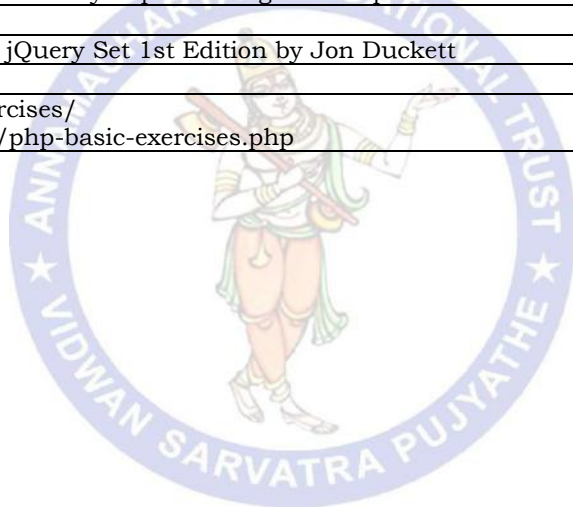
Course Code	SOFTWARE ENGINEERING		L	T	P	C
22MCA0102			4	0	0	4
Pre-Requisites	Maths	Semester	I			
Course Objectives:						
<ul style="list-style-type: none"> To learn the basic concepts of software engineering and life cycle models To explore the issues in software requirements specification and enable 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 Highlights some important facets of Software Design Testing Techniques and Quality Control Activities Discusses 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 						

Course Code	WEB PROGRAMMING			L	T	P	C
22MCA0103				4	0	0	4
				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 							

Course Code	C-PROGRAMMING & 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 						

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							

Course Code	WEB PROGRAMMING LABORATORY	L	T	P	C
22MCA0106		0	1	2	2
Pre-Requisites	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 					



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 Sahnii 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 						

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

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

4. TRIGGERS

- a. 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.
- b. Convert employee name into uppercase whenever an employee record is inserted or updated. Trigger to fire before the insert or update.
- c. 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

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

6. CURSORS

- a. Write a PL/SQL block that will display the name, dept no, salary of fist highest paid employees.
- b. 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.
- c. Write a PL/SQL block that will display the employee details along with salary using cursors.
- d. To write a Cursor to display the list of employees who are working as a Managers or Analyst.
- e. To write a Cursor to find employee with given job and dept no.
- f. 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) :

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

WEB REFERENCES :

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

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, ifelse, 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 							

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/ 						

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 and Multilayer Perceptrons 						
UNIT – I						Lecture Hrs: 12
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. 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						
UNIT – II						Lecture Hrs: 12
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. 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.						
UNIT – III						Lecture Hrs: 12
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 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.						
UNIT – IV						Lecture Hrs: 12
Clustering: Introduction, Mixture densities, K- Means clustering, Expectations- Maximization algorithm, Mixture of latent variable models, supervised learning after clustering, spectral clustering, Hierarchical clustering, Choosing the number of clusters. 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						
UNIT – V						Lecture Hrs: 12
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, Multilayer Perceptrons: Introduction, the perceptron, training a perceptron, learning Boolean functions, multilayer perceptrons, MLP as a universal approximator, Back propagation algorithm, Training procedures, Tuning the network size, Bayesian view of learning, dimensionality reduction, learning time, deep learning						
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 						

Course Code	OBJECT-ORIENTED PROGRAMMING THROUGH JAVA	L	T	P	C
22MCA0203			4	0	0
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/ 					

Course Code	MOBILE APPLICATION DEVELOPMENT LABORATORY		L	T	P	C
22MCA0206			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/ 						

Course Code	MACHINE LEARNING LABORATORY		L	T	P	C
22MCA0207			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 						

Course Code	OBJECT-ORIENTED PROGRAMMING THROUGH JAVA LABORATORY	L	T	P	C
22MCA0208		0	1	2	2
Pre-Requisites	Semester	2			
Course Objectives:					
<ul style="list-style-type: none"> Understand 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 					

Course Code	SKILL ORIENTED COURSE – I PYTHON PROGRAMMING	L	T	P	C
22MCA0209		1	0	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 :					

1. https://onlinecourses.nptel.ac.in/noc19_cs41/preview
2. <https://in.coursera.org/learn/python>



Course Code	SOFT SKILLS	L	T	P	C
22MCA0210		1	0	2	2
Pre-Requisites	Semester	2			
Course Objectives:					
<ul style="list-style-type: none"> 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					
<ol style="list-style-type: none"> 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. 					
<p>Week 1: Introduction to Soft Skills, Aspects of Soft Skills, Effective Communication Skills, Classification of Communication, Personality Development</p> <p>Week 2: Positive Thinking, Telephonic Communication Skills, Communicating without Words, Paralanguage</p> <p>Week 3: Proxemics, Haptics: The Language of Touch, Meta-communication, Listening Skills, Types of Listening</p> <p>Week 4: Negotiation Skills, Culture as Communication, Organizational Communication</p> <p>Week 5: Communication Breakdown, Advanced Writing Skills, Principles of Business Writing</p> <p>Week 6: Business Letters, Business Letters: Format and Style, Types of Business Letter</p> <p>Week 7: Writing Reports, Types of Report, Strategies for Report Writing, Evaluation and Organization of Data</p> <p>Week 8: Structure of Report, Report Style, Group Communication Skills</p> <p>Week 9: Leadership Skills, Group Discussion, Meeting Management, Adaptability & Work Ethics</p> <p>Week 10: Advanced Speaking Skills, Oral Presentation, Speeches & Debates, Combating Nervousness, Patterns & Methods of Presentation, Oral Presentation: Planning & Preparation</p> <p>Week 11: Making Effective Presentations, Speeches for Various Occasions, Interviews, Planning & Preparing: Effective Resume</p> <p>Week 12: Facing Job Interviews, Emotional Intelligence & Critical Thinking, Applied Grammar</p>					
TEXT BOOK(S) and REFERENCES:					
<ol style="list-style-type: none"> 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 :					
<ol style="list-style-type: none"> https://onlinecourses.nptel.ac.in/noc21_hs76/preview 					