Master of Computer Applications (MCA)

FIRST YEAR SCHEME & SYLLABUS

(I and II Semester)

2024

ST JOSEPH ENGINEERING COLLEGE

AN AUTONOMOUS INSTITUTION

Vamanjoor, Mangaluru - 575028

MOTTO

Service and Excellence

VISION

To be a global premier Institution of professional education and research

MISSION

- Provide opportunities to deserving students of all communities, the Christian students in particular, for quality professional education
- Design and deliver curricula to meet the national and global changing needs through student-centric learning methodologies
- Attract, nurture and retain the best faculty and technical manpower
- Consolidate the state-of-art infrastructure and equipment for teaching and research activities
- Promote all-round personality development of the students through interaction with alumni, academia and industry
- Strengthen the Educational Social Responsibilities (ESR) of the Institution

ST JOSEPH ENGINEERING COLLEGE

An Autonomous Institution
Vamanjoor, Mangaluru - 575028

Affiliated to VTU – Belagavi & Recognized by AICTE New Delhi
NBA – Accredited: B.E.(CSE, ECE, EEE, ME and CIV) & PG (MBA and MCA)
NAAC – Accredited with A+

MCA SCHEME & SYLLABUS 2024
(With effect from 2024-25)

Master of Computer Applications

FIRST YEAR

(I and II Semester)

AUTONOMY AND ACCREDITATION

St Joseph Engineering College (SJEC) is an Autonomous Institute under Visvesvaraya Technological University (VTU), Belagavi, Karnataka State, and is recognized by the All-India Council for Technical Education (AICTE), New Delhi. SJEC is registered under the trust "Diocese of Mangalore, Social Action Department".

The SJEC has been conferred Fresh Autonomous Status from the Academic Year 2021-22. The college was granted autonomy by the University Grants Commission (UGC) under the UGC Scheme for Autonomous Colleges 2018 and conferred by VTU. The UGC Expert Team had visited the college on 28-29 November 2021 and rigorously assessed the college on multiple parameters. The fact that only a handful of engineering colleges in the state have attained Autonomous Status adds to the college's credibility that has been on a constant upswing. Autonomy will make it convenient for the college to design curricula by recognizing the needs of the industry, offering elective courses of choice and conducting the continuous assessment of its students.

At SJEC, the Outcome-Based Education (OBE) system has been implemented since 2011. Owing to OBE practised at the college, SJEC has already been accredited by the National Board of Accreditation (NBA). Five of the UG programs, namely Computer Science & Engineering, Mechanical Engineering, Electronics and Communication Engineering, Electrical & Electronics Engineering and Civil Engineering and two of the PG programs, namely, MBA and MCA programs, have accreditation from the NBA.

Also, SJEC has been awarded the prestigious A+ grade by the National Assessment and Accreditation Council (NAAC) for five years. With a Cumulative Grade Point Average (CGPA) of 3.39 on a 4-point scale, SJEC has joined the elite list of colleges accredited with an A+ grade by NAAC in its first cycle. The fact that only a small percentage of the Higher Education Institutions in India have bagged A+ or higher grades by NAAC adds to the college's credibility that has been on a constant upswing.

The college is committed to offering quality education to all its students, and the accreditation by NAAC and NBA reassures this fact. True to its motto of "Service and Excellence", the college's hard work has resulted in getting this recognition, which has endorsed the academic framework and policies that the college has been practicing since its inception. The college has been leveraging a flexible choice-based academic model that gives students the freedom to undergo learning in respective disciplines and a transparent and continuous evaluation process that helps in their holistic development.

CONTENTS

ABOUT THE DEPARTMENT

The Master of Computer Applications (MCA) program, established in 2008 with an intake of 60 students, offers a two-year course approved by the All India Council for Technical Education (AICTE) and is an Autonomous Institution affiliated to Visvesvaraya Technological University (VTU), Belgaum, Karnataka. The MCA program is accredited by National Board of Accreditation (NBA) in the year 2024.

The Computer Applications department at St. Joseph Engineering College, Vamanjoor, Mangaluru emphasizes core courses that delve into design and analysis techniques for the software development across diverse application domains. Additionally, students gain insights into the workings of computers and networks. The program also offers elective courses from emerging fields technologies, such as Artificial Intelligence, Cloud Technologies, Cyber Security, Big Data Analytics, Internet of Things, and Drone Technologies etc, allowing students to explore their individual interests. Greater emphasis will be given on application development to better prepare the students for the industry. Currently the department works with an intake of 120 students.

DEPARTMENT VISION

To be recognized as a department with research environment empowering computer professionals with a strong sense of service and human values at the core.

DEPARTMENT MISSION

- Inculcate professional behavior with strong ethical values and innovative research capabilities among faculty and students.
- To meet the global needs and challenges through training of professionals who can work with interest to support the society.
- Encourage faculty to have continuous progress in their teaching skills and self-development.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates will be able to:

- Have appreciation for, Professional and Ethical responsibilities through strong commitment to values.
- Acquire essential fundamentals and adopt techniques and skills to critically identify, formulate and solve computational problems
- Effectively design, develop and manage computer applications, using modern tools and techniques.
- Develop confidence for self-education and innovative entrepreneurship.

PROGRAM OUTCOMES (POs)

PO1 Foundation Knowledge: Apply knowledge of mathematics, programming logic and coding fundamentals for solution architecture and problem solving.

PO2 Problem Analysis: Identify, review, formulate and analyse problems for primarily focussing on customer requirements using critical thinking frameworks.

PO3 Development of Solutions: Design, develop and investigate problems with as an innovative approach for solutions incorporating ESG/SDG goals.

PO4 Modern Tool Usage: Select, adapt and apply modern computational tools such as development of algorithms with an understanding of the limitations including human biases.

PO5 Individual and Teamwork: Function and communicate effectively as an individual or a team leader in diverse and multidisciplinary groups. Use methodologies such as agile.

PO6 Project Management and Finance: Use the principles of project management such as scheduling, work breakdown structure and be conversant with the principles of Finance for profitable project management.

PO7 Ethics: Commit to professional ethics in managing software projects with financial aspects. Learn to use new technologies for cyber security and insulate customers from malware.

PO8 Life-long learning: Change management skills and the ability to learn, keep up with contemporary technologies and ways of working.

I Semester MCA – Scheme of Teaching and Examination

Sl. No	Course and Course Code		Course Title	Teaching Department	Paper Setting Board	Teaching Hours/Week			Examination				Credits
						Theory Lecture	Tutorial	Practical	Duration in hours	CIE Marks	SEE Marks	Total Marks	
						L	T	P					
1	PCC	24MCA101	Computer Fundamentals and Operating System	MCA	MCA	03	-	-	03	50	50	100	**03**
2	PCC	24MCA102	Data Structures with Algorithms	MCA	MCA	03	-	-	03	50	50	100	**03**
3	IPCC	24MCA103	Introduction to Web Technologies	MCA	MCA	02	-	02	03	50	50	100	**03**
4	PCC	24MCA104	Database Management Systems	MCA	MCA	03	-	-	03	50	50	100	**03**
5	BSC	24MCA105	Discrete Mathematics and Statistics	MATHS	MCA	02	02	-	03	50	50	100	**03**
6	PCC	24MCL106	Data Structures with Algorithms Laboratory	MCA	MCA	01	-	02	03	50	50	100	**02**
7	PCC	24MCL107	Database Management Systems Laboratory	MCA	MCA	01	-	02	03	50	50	100	**02**
8	SDC	24ITM108	Industry-Oriented Training- I (Mathematical Skills)	MATHS	-	-	02	-	02	50	-	50	**-**
9	NCMC	24AEC109	Research Methodology & IPR (Online)	MCA	-	-	01		-	50	-	50	**-**
					Total	**15**	**05**	**06**	**23**	**450**	**350**	**800**	**19**

* Bridge Courses for students with Non-Computer Science and Non-Mathematics background shall be conducted with 2 hours per week culminating with a structured assessment process.

Note: PCC: Professional Core Course, IPCC: Integrated Professional Core Course, PEC: Professional Elective Course; BSC: Basic Science Course, SDC: Skill Development Course; INT =Internship, NCMC: Non Credit Mandatory Course, AEC: Ability Enhancement Course

Definition of Credit:	One-hour Lecture (L) per week per semester = 1 Credit; Two-hour Tutorial (T) per week per semester = 1 Credit Two-hour Practical/Laboratory (P) per week per semester = 1 Credit.

II Semester MCA - Scheme of Teaching and Examination													
SI. No	**Course and Course Code**		**Course Title**	**Teaching Department**	**Paper Setting Board**	**Teaching Hours/Week**			**Examination**				**Credits**
						Theory Lecture	**Tutorial**	**Practical**	**Duration in hours**	**CIE Marks**	**SEE Marks**	**Total Marks**	
						L	**T**	**P**					
1	PCC	24MCA201	Software Engineering and Testing	MCA	MCA	03	-	-	03	50	50	100	**03**
	IPCC	24MCA202	Computer Networks	MCA	MCA	02		02	03	50	50	100	**03**
2	PCC	24MCA203	Data Analytics using Python	MCA	MCA	03	-	-	03	50	50	100	**03**
3	PCC	24MCA204	Enterprise Java	MCA	MCA	03	-	-	03	50	50	100	**03**
4	PEC	24MC205X	Specializations 1	MCA	MCA	03	-	-	03	50	50	100	**03**
5	PEC	24MC206X	Specializations II	MCA	MCA	03	-	-	03	50	50	100	**03**
6	PCC	24MCL207	Data Analytics using Python Laboratory	MCA	MCA	01	-	02	03	50	50	100	**02**
7	PCC	24MCL208	Enterprise Java Laboratory	MCA	MCA	01	-	02	03	50	50	100	**02**
8	SDC	24AEC209	Ability Enhancement Course with Seminar -1	MCA	MCA	-	-	02	03	50	50	100	**01**
9	SDC	24ITP210	Industry Oriented Training II (Problem Solving Skills)	COM	-	-	02	-	02	50	-	50	-
					Total	**19**	**02**	**08**	**29**	**450**	**400**	**850**	**23**

Specializations 1: Networks and Security		**Specializations II: Software and Applications**	
24MC205A	Ethical Hacking	24MC206A	Devops
24MC205B	Cyber Security	24MC206B	Software Architecture
24MC205C	Cryptography and Network Security	24MC206C	Enterprise Resource Planning
24MC205D	Network and Linux Administration	24MC206D	Mobile Application Development
24MC205E	Blockchain Technology	24MC206E	Parallel Computing
24MC205F	Mobile and Wireless Security	24MC206F	Salesforce Administrator

III Semester MCA - Scheme of Teaching and Examination													
SI. No.	**Course and Course Code**		**Course Title**	**Teaching Department**	**Paper Setting Board**	**Teaching Hours/Week**			**Examination**				**Credits**
						Theory Lecture	**Tutorial**	**Practical**	**Duration in hours**	**CIE Marks**	**SEE Marks**	**Total Marks**	
						L	**T**	**P**					
1	IPCC	24MCA301	Advances in Web Technologies	MCA	MCA	02	-	02	03	50	50	100	**03**
2	PCC	24MCA302	Programming using C#.NET	MCA	MCA	03	-	-	03	50	50	100	**03**
3	PEC	24MC303X	Specializations III	MCA	MCA	03	-	-	03	50	50	100	**03**
4	PCC	24MCL304	Programming using C#.NET Laboratory	MCA	MCA	01	-	02	03	50	50	100	**02**
5	SDC	24MCP305	Project Work	MCA	MCA	-	-	22	03	50	50	100	**11**
Total						**09**	**-**	**26**	**15**	**250**	**250**	**500**	**22**

Specializations III: Advanced Technologies and Intelligence	
24MC303A	Machine Learning
24MC303B	Introduction to Generative AI
24MC303C	Deep Learning Fundamentals
24MC303D	Introduction to Drone Technologies
24MC303E	Artificial Intelligence of Things
24MC303F	Big Data Analytics

IV Semester MCA - Scheme of Teaching and Examination													
SI. No.	**Course and Course Code**		**Course Title**	**Teaching Department**	**Paper Setting Board**	**Teaching Hours/Week**			**Examination**				**Credits**
						Theory Lecture	**Tutorial**	**Practical**	**Duration in hours**	**CIE Marks**	**SEE Marks**	**Total Marks**	
						L	**T**	**P**					
1	SDC	24AEC401	MOOCs (Online Courses 16 Weeks duration)	MCA	Any MOOC topic (Choices are given by the Department) with minimum 16 weeks to be completed between I Sem to IV Sem)						-	100	**04**
2	SDC	24MCS402	Technical Seminar	MCA	-	-	-	02	02	100	-	100	**02**
3	INT	24INT403	Research Internship/Industry Internship/ Startup Internship	-	-	-	-	-	03	50	50	100	**10**
Total						**-**	**-**	**02**	**05**	**150**	**50**	**300**	**16**

		Semester-wise credit distribution			
Sl. No.	**Course Area**	**I**	**II**	**III**	**IV**
1.	BSC	03	-	-	-
2.	PCC	13	13	5	-
3.	IPCC	03	03	3	-
4.	PEC	-	06	3	-
5.	SDC	-	01	11	6
6.	INT	-	-	-	10
Total		**19**	**23**	**22**	**16**

FIRST SEMESTER

COMPUTER FUNDAMENTALS AND OPERATING SYSTEM			
Course Code	**24MCA101**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. To realize the concepts of computer system organization.
2. To get the basic insights of operating systems.
3. To analyze process management in the operating system.
4. To summarize process synchronization techniques.
5. To describe detection and prevention deadlock techniques.
6. To describe memory management techniques in operating system

Module-1 **8Hrs**

Binary Systems and Combinational Logic Digital Computers and Digital Systems, Binary Numbers, Number Base Conversion, Octal and Hexadecimal Numbers, subtraction using r's and r-1 complements, Binary Storage and Registers, Binary Logic, Digital Logic Gates, Basic structure of computers.

Module-2 **8Hrs**

Introduction to Operating Systems, What operating systems do, Operating System Structure, Operating System Operations, Operating System Services, System Calls, Types of System Calls, System Programs, Process Management: Process concept, process state, process control block, Process Scheduling.

Module-3 **8Hrs**

Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, - FCFS, SJF, Priority Scheduling, Round Robin Scheduling. Synchronization Background, The Critical Section Problem, Semaphores, Classic Problems of Synchronization: Readers-Writers Problem, Dining Philosophers Problem using Semaphores.

Module-4 **8Hrs**

Deadlocks: System model, Deadlock Characterization, Methods for handling deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock.

Module-5 **8Hrs**

Memory Management Strategies: Basic Hardware, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Virtual Memory Management: Background, Demand Paging, Page Replacement algorithms: FIFO, LRU, Optimal Page Replacement Algorithm.

Course Outcomes: At the end of the course the student will be able to:	
24MCA101.1	Realize the concepts of computer system organization.
24MCA101.2	Get the basic insights of operating systems.
24MCA101.3	Analyze process management in the operating system.
24MCA101.4	Summarize process synchronization techniques.
24MCA101.5	Design solutions to prevent or recover from deadlocks using appropriate strategies.
24MCA101.6	Describe memory management techniques in the operating system.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1.	Operating System Concepts	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne	Wiley – India	8th Edition, 2017
2.	Digital Logic and Computer Design.	M.Morris Mano	Pearson education	3rd Edition, 2023
3.	Computer Organization	Carl Hamacher, Zvonko Vranesic Safwat Zaky	Tata McGraw-Hill	5th Edition, 2011
Reference Books				
1.	Operating Systems – A Concept Based Approach	D M Dhamdhere	Tata McGraw – Hill	2nd Edition, 2002

Web links/Video Lectures/MOOCs

1. https://www.coursera.org/learn/os-power-user: Introductions to Operating Systems
2. https://onlinecourses.nptel.ac.in/noc21_cs88/preview : Operating system Fundamentals

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
24MCA101.1	3							2
24MCA101.2	3	2						
24MCA101.3		3	-	3				2
24MCA101.4		3	2	2			-	
24MCA101.5		2	3		3	3		2
24MCA101.6		**2**	3	2		2		3

1: Low 2: Medium 3: High

DATA STRUCTURES WITH ALGORITHMS			
Course Code	**24MCA102**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	03	Exam Hours	03

Course Learning Objectives:

1. To use the concepts of Stack
2. To use the concepts Queue, Lists, Trees and Hashing
3. To describe concepts and algorithms for searching and sorting.
4. To appraise efficiency of algorithms in terms of asymptotic notations for the given problem.
5. Apply decrease and conquer and greedy algorithms in problem solving.
6. Build solutions for real world problems using concepts of data structures

Module-1	**8 Hrs**
Classification of Data Structures: Primitive and Non- Primitive, Linear and Nonlinear; Data structure Operations, Stack: Definition, Representation, Operations and Applications: Polish and reverse polish expressions, Infix to postfix conversion, evaluation of postfix expression, infix to prefix, postfix to infix conversion.	
Module-2	**8 Hrs**
Recursion - Factorial, GCD, Fibonacci Sequence, Tower of Hanoi. Queue: Definition, Representation, Queue Variants: Circular Queue, Priority Queue, Double Ended Queue; Applications of Queues. Programming Examples**.**	
Module-3	**8 Hrs**
Linked List: Limitations of array implementation, Memory Management: Static (Stack) and Dynamic (Heap) Memory Allocation, Memory management functions. Definition, Representation, Types of linked list. Singly Linked List : Operations- Linked list as a data Structure, Inserting and removing nodes from a list, Linked implementations of stacks, Header nodes. Trees: Binary tree Traversals and related properties.	
Module-4	**8 Hrs**
Introduction, Fundamentals of the Analysis of Algorithm Efficiency, Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Important Problem Types, Analysis Framework, Asymptotic Notations and Basic efficiency classes, Mathematical analysis of Recursive algorithms. Brute Force: Selection Sort and Bubble Sort, Sequential Search.	
Module-5	**8 Hrs**
Divide-and-Conquer: Mergesort, Quicksort, Binary Search Decrease-and-Conquer : Insertion Sort, Depth First and Breadth First Search, Topological sorting. Greedy Technique : Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm	

Course Outcomes: At the end of the course the student will be able to:	
24MCA102.1	Apply the concepts of Stack and explore its applications
24MCA102.2	Apply the concepts of Queue and Lists
24MCA102.3	Describe concepts and algorithms for searching and sorting.
24MCA102.4	Interpret the efficiency of algorithms in terms of asymptotic notations for the given problem.
24MCA102.5	Apply decrease and conquer and greedy algorithms in problem solving.
24MCA102.6	Build solutions for real world problems using concepts of data structures.

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Introduction to the Design and Analysis of Algorithms	Anany Levitin	Pearson Education	3rd Edition, 2023
2	Programming in ANSI C	Balaguruswamy	McGraw Hill Education	8th Edition, 2022
3	Data Structures Using C and C++	Yedidyah Langsam and Moshe J. Augenstein and Aaron M Tenanbanum	Pearson Education Asia	2nd Edition, 2007
Reference Books				
1	Data Structures	Seymour Lipschutz	McGraw Hill	Revised 1st Edition, 2016
2	Fundamentals of Data Structures in C	Ellis Horowitz and SartajSahni	Universities Press	2nd Edition, 2022

Web links/Video Lectures/MOOCs:

1. Introduction to Data Structures: https://nptel.ac.in/courses/106/102/106102064/
2. Data Structures and Algorithms: https://www.coursera.org/specializations/data-structures-algorithms

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)							
	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8
24MCA102.1	3	2						
24MCA102.2	3	2						
24MCA102.3	2	2						
24MCA102.4	2	3						
24MCA102.5	2	2	2					
24MCA102.6			2					2

1: Low 2: Medium 3: High

INTRODUCTION TO WEB TECHNOLOGIES			
Course Code	24MCA103	CIE Marks	50
Teaching Hours/Week (L:T:P)	(2:0:2)	SEE Marks	50
Credits	03	Exam Hours	03

Course Learning Objectives:

1. To describe the basics of Web Technologies.
2. To understand the basics of JavaScript.
3. To implement interactive event driven documents using dynamic JavaScript.
4. To demonstrate the applications of Javascript.
5. To apply Database concepts to the Web Page using PHP and MySQL.
6. To apply the Javascript, PHP and MySQL concepts for real world applications.

Module-1 **8Hrs**

Web Programming Basics

Web browsers, web servers, MIME, URL, HTTP Introduction to HTML tags, Basic syntax and structure, text markups, images, lists, tables and forms. Introduction to HTML5. Difference between HTML and XHTML. Working of World Wide Web: URL, URI, DNS and Web protocols.

Basics of Cascading Style Sheets

Introduction to CSS, Levels of CSS, Selectors, Font, color and Text Properties, BOX Model, Span and Div tags. Responsive Design.

Module-2 **8Hrs**

Overview of JavaScript

Data Types Object orientation and JavaScript, general Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts.

The JavaScript Execution Environment

The Document Object Model, Elements Access in JavaScript, Events and Event Handling , Handling Events from Body Elements, Handling Events from Text Box and password Elements, The DOM2 Model, The navigator Object.

Module-3 **8Hrs**

Dynamic Documents with JavaScript

Introduction, Positioning Elements, Moving Elements , Element Visibility, Changing Colors and Fonts, Dynamic Content, Stacking Elements, Locating the Mouse Cursor, Reacting to a Mouse Click, Slow Movement of Elements, Dragging and Dropping Elements.

Module-4 **8Hrs**

Advanced Javascript

Prototypes and Inheritance, Classes, Error handling, Promises, async/await, Generators, advanced iteration, Modules.

Module-5 **8Hrs**

Introduction to PHP

Essentials of PHP- Installation of Web Server, XAMPP Configurations PHP Forms- GET and POST method. Regular Expressions-Cookies- Sessions- Usage of Include and require statements- File:read and write from the file- PHP Filters-PHP. Introduction to Parsing PHP-Mysql. Introduction to different PHP Frameworks.

LIST OF LABORATORY PROGRAMS
Part A 1. Create a Web Page for the admission department of your college using XHTML and HTML5 tags. Design all the necessary input fields to collect the information of the student. Apply different levels of style sheets for the Web Page.
2. Develop and demonstrate, using JavaScript script, a XHTML document that contains three short paragraphs of text, stacked on top of each other, with only enough of each showing so that the mouse cursor can be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top to become completely visible. Modify the above document so that when a text is moved from the top stacking position, it returns to its original position rather than to the bottom.
3. Develop and demonstrate using push/pop and shift/unshift operations in jquery
4. Demonstrate applications of recursion in JavaScript.
5. Demonstrate stack applications using JavaScript.
6. Develop multiple webpages with CSS for the student placement application, with a navigation bar in a separate php file and include it in all pages to navigate between them. Keep the navigation icon active based on the page being viewed.
7. Write a PHP program to insert name and age information entered by the user into a table created using MySQL, and to display the current contents of this table.
8. Create a XHTML form with Name, Address Line 1, Address Line 2, and E-mail text fields. On submitting, store the values in MySQL table using PHP. Provide buttons to update and delete data for the same.
PART-B 1. Develop a web application (mini-project) using the languages and concepts learnt in the theory and exercises listed in part A with a good look and feel effects. Database connection needs to be implemented.
Note: A team of two students must develop the mini project which will be evaluated for other assessments.

Course Outcomes: At the end of the course the student will be able to:	
24MCA103.1	To describe the basics of Web Technologies.
24MCA103.2	To understand the basics of JavaScript.
24MCA103.3	To implement interactive event driven documents using dynamic JavaScript.
24MCA103.4	To demonstrate the applications of Javascript.
24MCA103.5	To apply Database concepts to the Web Page using PHP and MySQL.
24MCA103.6	To apply the Javascript, PHP and MySQL concepts for real world applications.

Sl.No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition And year
Textbooks				
1	Programming the World Wide Web	Robert W.Sebesta	Pearson education	4th Edition, 2012

2	HTML5 Black Book	DT Editorial Ssevices	Dreamtech Press India	2nd Edition, 2016
3	Eloquent JavaScript	Marijn Haverbeke	No Starch Press,US.	3rd Edition 2018
4	The HTML and CSS Workshop	Lewis Coulson	Packt Publishing, India	2019
Reference Books				
1.	Web Technologies	Uttam K Roy	Oxford University Press	2010
2.	Web Programming, building internet applications	Chris Bates	Wiley	2nd Edition, 2002
3.	Bootstrap: Responsive Web Development	Jake Spurlock	O'Reilly Media	2014

Web links/Video Lectures/MOOCs

Reference Tutorial Link for Module 2, 3 and 4:

1. https://javascript.info
2. https://www.youtube.com/watch?v=cM_AeQHzlGg
3. https://forum.freecodecamp.org/t/askjs-best-books-to-learn-advanced-javascript/563936
4. https://www.coursera.org/projects/dynamic-web-app-php-mysql
5. https://www.coursera.org/specializations/web-applications
6. https://www.coursera.org/specializations/full-stack-react

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)							
	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8
24MCA103.1	-	2	-	-	-	-	-	-
24MCA103.2	2	2	-	-	-	-	-	-
24MCA103.3	2	2	-	-	-	-	-	-
24MCA103.4	2	-	-	-	-	-	-	-
24MCA103.5	-	2	2	2	-	2	-	2
24MCA103.6	2	2	3	2	2	2	2	2

1: Low: 2: Medium 3: High

DATABASE MANAGEMENT SYSTEMS			
Course Code	**24MCA104**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. To explain basic database concepts, applications, data models, schemas and instances.
2. To demonstrate the use of constraints and relational algebra operations.
3. To implement a database schema for a given problem domain.
4. To describe the basics of SQL and construct queries using SQL.
5. To emphasize the importance of normalization in databases.
6. To distinguish database storage structures and access techniques.

Module-1 **8Hrs**

Characteristics of Database approach, Actors on the Scene, Workers behind the scene, Advantages of using DBMS approach, A Brief History of Database Applications, Data models, schemas and instances, Three-schema architecture and data independence, Database languages and interfaces, the database system environment, Centralized and client-server architectures, Classification of Database Management systems.

Module-2 **8Hrs**

Structure of Relational Databases, Database Schema, Keys, Relational Query Languages, Relational Operations.

Entity-Relationship Model: Conceptual Database using high level conceptual data models for Database Design, A Sample Database Application, Entity types, Entity sets Attributes and Keys Relationship types, Relationship Sets Functional Dependencies, Normal Forms- 1NF, 2NF, 3NF.

Module-3 **8Hrs**

SQL data definition and data types, specifying constraints in SQL, basic retrieval queries in SQL, Insert, update and delete statements in SQL, aggregate functions in SQL, group by and having clauses.

Module-4 **8Hrs**

Introduction to triggers in SQL, views in SQL, schema change statements in SQL, stored procedures and functions.

Module-5 **8Hrs**

Introduction to transaction processing, transaction and system concepts, desirable properties of transactions, transaction support in SQL. Concurrency control techniques: two-phase locking techniques, concurrency control based on timestamp ordering, multi version concurrency control techniques, validation concurrency control techniques. Recovery techniques: recovery concepts, recovery in multi database systems, database backup and recovery from catastrophic failures.

Course Outcomes: At the end of the course the student will be able to:	
24MCA104.1	Apply the basic concepts of database management in designing the database for the given problem.
24MCA104.2	Design entity-relationship diagrams to the given problem to develop database application with appropriate fields and validations.
24MCA104.3	Implement a database schema for a given problem domain.
24MCA104.4	Formulate SQL queries in Oracle to the given problem.

24MCA104.5	Apply normalization techniques to improve the database design to the given problem.
24MCA104.6	Distinguish database storage structures and access techniques.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Fundamentals of Database Systems	Elmasri and Navathe	Pearson	7th Edition, 2017
2	Database System Concepts	Silberschatz, Korth and Sudharshan	Tata McGraw Hill	7th Edition, 2019
Reference Books				
1	An Introduction to Database Systems	C.J. Date, A. Kannan, S. Swamynatham	Pearson Education	8th Edition 2013
2	Database Management Systems	Majmudar Arun K, Bhattacharyya pritimoy	McGraw Hill	1st Edition 2010

Web links/Video Lectures/MOOCs

1. https://coursera.org/learn/database-management : Introduction to database Management System
2. https://onlinecourses.nptel.ac.in/noc22_cs91/preview: Database Management System :By Prof. Partha Pratim Das, Prof. Samiran Chattopadhyay | IIT Kharagpur

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
24MCA104.1	3	2						
24MCA104.2		2	3					
24MCA104.3			2	2				
24MCA104.4			2	2				
24MCA104.5			3	2				
24MCA104.6				2				2

1: Low 2: Medium 3: High

DISCRETE MATHEMATICS AND STATISTICS					
Course :	24MCA105		**CIE Marks**	**:**	**50**
Credits: L:T:P	2:2:0		**SEE Marks**	**:**	**50**
Total Hours:	40		**SEE Duration**	**:**	**3 Hrs**

Course Learning Objectives:

1. Use propositional logic in knowledge representation
2. Apply set theory in computer applications
3. Find relation between different sets
4. Fit a curve for given data points
5. Apply probability distributions in real life problems
6. Identify different graphs and use it to generate prefix codes

Module-I	**08 Hrs**

Fundamentals of Logic:

Basic Connectives and Truth Tables, Logical Equivalence: The laws of logic, Duality, Logical NAND and NOR , Logical Implications, Rules of inference. Open Statement, Quantifiers.

Module-II	**08 Hrs**

Set Theory and Relations

Sets, Operations on sets , Laws of set theory, inclusion-exclusion principle, Soft Set Theory, Properties of relations, Functions, Composition and Inverse Functions Digraph and Matrix of relation, Equivalence Relations.

Module– III	**08 Hrs**

Statistical methods and Curve Fitting

Correlation, coefficient of correlations, rank correlation lines of regression-principle of least square. Curve Fitting, Principle of least square- to fit a straight line and parabola.

Module –IV	**08 Hrs**

Random variable and probability distribution

Probability of an event, Conditional probability, Concept of random variable, discrete probability distributions, continuous probability distributions, Mean, variance and Standard deviations of random variables. Binomial and Poisson distribution, normal distribution.

Module-V	**08 Hrs**

Graph Theory

Graphs and sub graphs, Graph Isomorphism, Vertex degree, Euler Graphs, Planar Graphs, Graph Coloring, Trees and Sorting, and Prefix Codes.

Course Outcomes: At the end of the course the student will be able to:	
24MCA105.1	Apply knowledge of propositional logic in truth verification
24MCA105.2	Demonstrate the application of discrete structures in different fields of computer applications
24MCA105.3	Recognize relations in real life applications
24MCA105.4	Correlate data points and fit curves for different data points
24MCA105.5	Relate discrete and continuous probability distributions in real life problems
24MCA105.6	Find applications of graph theory in real life

Sl. No.	Title of the Book/ Research Papers	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Discrete and Combinatorial Mathematics- An Applied Introduction	Ralph P. Grimaldi and B V Ramana	Pearson Education	5th Edition, 2017
2	Fundamentals of Statistics	S.C. Gupta	Himalaya Publishing	6th Edition, 2018
3	Soft Set Theory-Research Paper	P K Maji, R Biswas and A R Roy	Elsvier	2003
Reference Books				
1	Discrete Mathematical Structures with Applications to Computer Science	J.P. Tremblay and R. Manohar	McGraw Hill	Ist Edition, 2017
2	Discrete Mathematics and its Applications	Kenneth H. Rosen	Tata – McGraw Hill	7th Edition, 2017
3	First Look at Graph Theory	John Clark and Darek Allan Holtan	World Scientific Publishers	1st Edition 1993

Additional Resources: Weblinks/MOOCs
Correlation and Regression -https://www.youtube.com/watch?v=fNLeogEjMmM Probability Distributions- https://www.youtube.com/watch?v=6x1pL9Yov1k Mathematical Logic- https://nptel.ac.in/courses/128106032 Graph theory-https://archive.nptel.ac.in/courses/111/106/111106102/

Course Articulation Matrix

Course Outcomes	Program Outcomes (POs)							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
24MCA105.1	2	1	-	-	-	-	-	1
24MCA105.2	1	1	-	-	-	-	-	1
24MCA105.3	2	1	-	-	-	-	-	1
24MCA105.4	2	1	-	-	-	-	-	1
24MCA105.5	2	1	-	-	-	-	-	1
24MCA105.6	2	1	-	-	-	-	-	1

1: Low 2: Medium 3: High

DATA STRUCTURES WITH ALGORITHMS LAB

Course Code	**24MCL106**	CIE Marks	50
Teaching Hours/Week (L:T:P)	**(1:0:2)**	SEE Marks	50
Credits	**02**	Exam Hours	03

Course Learning Objectives:

1. Familiarize the knowledge of various types of data structures, operations and algorithms.
2. Implement and analyze the performance of Stack and its applications.
3. Implement and analyze Queue, Lists operations.
4. Implement and analyze Trees and graphs.
5. Implement the sorting algorithm.
6. Suggest and apply appropriate data structures for solving computing problems.

PART - A

1. Write a C program to Implement the following searching techniques a. Linear Search Binary Search.

2. Write a C program to implement the following sorting algorithms using user defined functions:
   a. Bubble sort (Ascending order)
   b. Selection sort (Descending order).

3.Write a C Program implement STACK with the following operations
   a. Push an Element on to Stack
   b. Pop an Element from Stack

4. Implement a Program in C for converting an Infix Expression to Postfix Expression.

5. Implement a Program in C for evaluating a Postfix Expression.

6. Write a C Program implement QUEUE with the following operations:
   a. enqueue
   b. dequeue

7. Write a C program to simulate the working of a singly linked list providing the following operations:
   a. Insert at begin
   b. Delete from the end
   c. Delete a given element
   d. Display

PART - B

1. Obtain the Topological ordering of vertices in a given graph with the help of a C program

2. Check whether a given graph is connected or not using the DFS method using C programming

3. From a given vertex in a weighted connected graph, find shortest paths to other vertices Using Dijkstra's algorithm (C programming)

4. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm (C programming)

5. Implement a merge sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.

Course Outcomes: At the end of the course the student will be able to:	
24MCL106.1	Implement searching and sorting techniques.
24MCL106.2	Implement Stack in various applications.
24MCL106.3	Implement Queue and List operations.
24MCL106.4	Implement decrease and conquer algorithms.
24MCL106.5	Implement and analyze the sorting algorithms.
24MCL106.6	Apply appropriate data structures for solving computing problems.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Introduction to the Design and Analysis of Algorithms	Anany Levitin	Pearson Education,	3rd Edition, 2023
2	Programming in ANSI C	Balaguruswamy	McGraw Hill Education	8th Edition, 2022
3	Data Structures Using C and C++	Yedidyah Langsam and Moshe J. Augenstein and Aaron M Tenanbanum,	Pearson Education Asia	2nd Edition, 2007
Reference Books				
1	Data Structures	Seymour Lipschutz, Schaum's Outlines	McGraw Hill	Revised 1st Edition, 2015
2	Fundamentals of Data Structures in C	Ellis Horowitz and SartajSahni,	Universities Press	2nd Edition, 2022

Course Articulation Matrix

Course Outcomes	**Program Outcomes (POs)**							
(COs)	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8
24MCL106.1	3	2						
24MCL106.2	3	2						
24MCL106.3	3	2						
24MCL106.4	2	2						
24MCL106.5	2	2						
24MCL106.6	3	2						2

1: Low 2: Medium 3: High

DATABASE MANAGEMENT SYSTEMS LABORATORY			
Course Code	**24MCL107**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**(1:0:2)**	**SEE Marks**	**50**
Credits	**02**	**Exam Hours**	**03**

Course Learning Objectives:

1. To familiarize the participant with the nuances of database environments towards an information-oriented data-processing oriented framework
2. Design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data
3. To facilitate a good formal foundation on the relational model of data
4. To implement a database schema for a given problem domain
5. To demonstrate SQL and procedural interfaces to SQL comprehensively
6. To introduce systematic database design approaches covering conceptual design, logical design and an overview of physical design .

Instructions for the Exercises:

1. Draw an ER diagram based on a given scenario with various Constraints
2. Create Relational Database Schema based on the scenario using Mapping Rules
3. Perform the given queries using any RDBMS Environment
4. Suitable tuples have to be entered so that queries are executed correctly
5. The results of the queries may be displayed directly

1)Create the following tables by specifying Primary keys, Foreign keys and solve the following queries.

BRANCH (Branchid, Branchname, HOD)
STUDENT (USN, Name, Address, Branchid, sem)
BOOK (Bookid, Bookname, Authorid, Publisher, Branchid)
AUTHOR (Authorid, Authorname, Country, age)
BORROW (USN, Bookid, Borrowed_Date)

Execute the following Queries:

i. List the details of Students who are all studying in 2nd sem MCA.
ii. List the students who are not borrowed any books.
iii. Display the USN, Student name, Branch_name, Book_name, Author_name, Books_Borrowed_Date of 2nd sem MCA Students who borrowed books.
iv. Display the number of books written by each Author.
v. Display the Book names in descending order of their names.

2) Consider the following schema:

STUDENT (USN, name, date_of_birth, branch, mark1, mark2, mark3, total, GPA)

Execute the following queries:

i. Update the column total by adding the columns mark1, mark2, mark3.
ii. Find the GPA score of all the students.
iii. Find the students who were born on a particular year of birth from the date_of_birth column.
iv. List the students who are studying in a particular branch of study.
v. Find the maximum GPA score of the student branch-wise.
vi. Find the students whose name starts with the alphabet

3)Design an ER-diagram for the following scenario, Convert the same into a relational model and then execute the following queries.

Consider a Cricket Tournament "SJEC Premier League" organized by SJEC. In the tournament there are many teams contesting each having a Teamid, Team_Name, City, a coach. Each team is uniquely identified by using Teamid. A team can have many Players and a captain. Each player is

uniquely identified by Playerid, having a Name, and multiple phone numbers, age. A player represents only one team. There are many Stadiums to conduct matches. Each stadium is identified using Stadiumid, having a stadium_name, Address (involves city, area_name, pincode). A team can play many matches. Each match is played between the two teams in the scheduled date and time in the predefined Stadium. Each match is identified uniquely by using Matchid. Each match won by any of the one team that also wants to record in the database. For each match man_of_the match award given to a player.

Execute the following Queries:

i. Display the youngest player (in terms of age) Name, Team name, age in which he belongs of the tournament.

ii. List the details of the stadium where the maximum number of matches were played.

iii. List the details of the player who is not a captain but got the man_of _match award at least in two matches.

iv. Display the team details of who won the maximum matches.

4) A country wants to conduct an election for the parliament. A country has many constituencies. Each constituency is identified uniquely by Constituency_id, having the Name, belongs to a state,Number_of_voters. A constituency can have many voters. Each voter is uniquely identified by using Voter_id, having the Name, age, address (involves Houseno,city,state,pincode). Each voter belongs to only one constituency. There are many candidates contesting in the election. Each candidates are uniquely identified by using candidate_id, having Name, phone_no, age, state. A candidate belongs to only one party. There are many parties. Each party is uniquely identified by using Party_id, having Party_Name,Party_symbol. A candidate can contest from many constituencies under a same party. A party can have many candidates contesting from different constituencies. No constituency having the candidates from the same party. A constituency can have many contesting candidates belongs to different parties. Each voter votes only one candidate of his/her constituency.

Execute the following queries:

i. List the details of the candidates who are contesting from more than one constituency which are belongs to different states.

ii. Display the state name having maximum number of constituencies.

iii. Create a stored procedure to insert the tuple into the voter table by checking the voter age. If voter's age

Is at least 18 years old, insert the tuple into the voter else display "Not an eligible voter"

iv. Create a stored procedure to display the number_of_voters in the specified constituency. Where the constituency name is passed as an argument to the stored procedure.

v. Create a TRIGGER to UPDATE the count 'Number of voters' of the respective constituency in 'CONSTITUENCY' table, after inserting tuple into the 'VOTERS' table.

5) Design an ER diagram for the following scenario, Convert the same into a relational model, normalize Relations into a suitable Normal form and then execute the following queries.

A country can have many Tourist places . Each Tourist place is identified by using tourist_place_id, having a name, belongs to a state, Number of kilometers away from capital city of that state, history. There are many tourists who visit tourist places every year. Each tourist is identified uniquely by using Tourist_id, having a Name, age, Country and multiple email id. A tourist visits many Tourist places, it is also required to record the visted_date in the database. A tourist can visit a Tourist place many times at different dates. A Tourist place can be visited by many tourists either in the same date or at different dates.

Execute the following queries:

i. List the state name which is having maximum number of tourist places

ii. List details of Tourist place where maximum number of tourists visited
iii. List the details of tourists visited all tourist places of the state
iv. Display the details of the tourists visited at least one tourist place of the state but visited all states tourist places
v. Display the details of the tourist place visited by the tourists of all country.

Course Outcomes: At the end of the course the student will be able to	
24MCL107.1	Design entity-relationship diagrams to solve simple database applications
24MCL107.2	Implement a database schema for a given problem domain.
24MCL107.3	Convert entity relationship diagrams into RDBMS.
24MCL107.4	Formulate SQL queries in Oracle.
24MCL107.5	Apply normalization techniques to improve the database design.
24MCL107.6	Build database for any given problem.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Fundamentals of Database Systems	Elmasri and Navathe	Pearson	7th Edition, 2017
2	Database System Concepts	Silberschatz, Korth and Sudharshan	Tata McGraw Hill	7th Edition, 2019
Reference Books				
1	An Introduction to Database Systems	C.J. Date, A. Kannan, S. Swamynatham:	Pearson education,	8th Edition 2013
2	Database Management Systems	Majmudar Arun K, Bhattacharyya pritimoy	McGraw-Hill	3rd Edition 2010

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
24MCL107.1		2	3					
24MCL107.2		3	2					
24MCL107.3			2	2				
24MCL107.4			2	2				2
24MCL107.5			2	2				
24MCL107.6			2					3

1: Low 2: Medium 3: High

INDUSTRY ORIENTED TRAINING – I (MATHEMATICAL SKILLS)			
Course Code	**24ITM108**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:2:0)	SEE Marks	-
Credits	-	Exam Hours	2

Course Learning Objectives:

1. To equip the students with basic concepts and tools of Mathematics to solve placement aptitude papers.
2. To enhance the problem solving skills and improve the basic mathematical skills to help students prepare for competitive examinations.

Module-1	**4 Hours**
Number System: Various types of Numbers; Tests of Divisibility; HCF and LCM; Roots and Squares. **Algebra:** Identities; BODMAS Rule; Logarithms; Indices; Number Series; Simple Interest and Compound Interest.	
Module-2	**4 Hours**
Time and Work: Facts and Formulae; Group work; Pipes and Cisterns. **Time and Distance:** Basics of Time, Speed and Distance; Average journey speed; Relative Speeds; Boats and Streams.	
Module-3	**4 Hours**
Average, Percentage, Age problems: Average; Concept of percentage, Results on Population and Depreciation; Problems on ages. **Profit and Loss:** Profit and Loss formulae; Percentage of profit and loss, Discount.	
Module-4	**4 Hours**
Permutations, Combinations, Probability: Factorial Notation; Permutations; Combinations; Random Experiment; Probability of Occurrence of events. **Ratio, Proportion, Partnership:** Ratio; Ratio in terms of Percentage, Proportion, Mean Proportion; Variation; Partnership.	
Module-5	**4 Hours**
Geometry: Pythagoras theorem - Heights and Distances; Area; Volume; Surface Area. **Clock and Calendar:** Problems related to clocks; Calendars; odd days; leap year; Day of the week related to Odd days.	

Course Outcomes: At the end of the course the student will be able to:	
24ITM108.1	Apply the basic concepts of quantitative abilities related to the Number system.
24ITM108.2	Evaluate time related problems by knowing the relationship between time/speed/distance or time/work.
24ITM108.3	Apply the concepts of average, percentage, appreciation and depreciation in real life problems
24ITM108.4	Solve application problems involving permutations and combinations.
24ITM108.5	Apply Ratio and Proportion concepts to solve the partnership problems where people share the ownership.
24ITM108.6	Apply the geometrical concepts in real- world applications.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Quantitative Aptitude for Competitive Examinations	Dr R S Aggarwal	S. Chand & Company LTD	44th Edition, 2018
2	Quantitative Aptitude for Competitive Examination	R.K Tyagi	MTG Learning Media	First Edition, 2018

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
24ITM108.1				2			1	
24ITM108.2		3						
24ITM108.3				2			1	
24ITM108.4		3						2
24ITM108.5				2			1	
24ITM108.6		3						3

1: Low 2: Medium 3: High

RESEARCH METHODOLOGY AND IPR

Course Code	**24AEC109**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:1:0)	SEE Marks	-
Credits	-	Exam Hours	-

Course Learning Objectives:

1. Identify suitable research methods and articulate research steps for any given problem
2. Define the problem statement, perform a literature survey and suggest appropriate solutions
3. Test the problem and perform experimental design with the samplings
4. Schedule data collection from various sources to segregate primary and secondary data.
5. Analyze the results obtained and build on the discussions.
6. Apply CopyRight Act/Patent Act/Cyber Law/Trademark concepts and develop conclusions.

Module-1 **5Hrs**

Research Methodology: Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by Researchers in India.

Module-2 **5Hrs**

Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration.

Reviewing the literature: Place of the literature review in research, Bringing clarity and focus to your research problem, Improving research methodology, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed.

Module-3 **5Hrs**

Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs.

Design of Sample Surveys: Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs

Module-4 **5Hrs**

Data Collection: Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method.

Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout.

Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports.

Module-5 **5Hrs**

Intellectual Property Law Basics, Types of Intellectual Property, Agencies Responsible for Intellectual Property Registration, International Organizations, Agencies, and Treaties, The Increasing Importance of Intellectual Property Rights.

Course Outcomes: At the end of the course the student will be able to:	
24AEC109.1	Identify the suitable research methods and articulate the research steps in a proper sequence for the given problem.

24AEC109.2	Carry out literature surveys, define the problem statement and suggest suitable solutions for the given problem.
24AEC109.3	Analyze the problem and conduct experimental design with the samplings.
24AEC109.4	Perform the data collection from various sources, segregate the primary and secondary data.
24AEC109.5	Analyze the results obtained and build on the discussions.
24AEC109.6	Apply some concepts/sections of CopyRight Act /Patent Act /Cyber Law/ Trademark to the given case and develop – conclusions.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Research Methodology: Methods and Techniques	C.R. Kothari, Gaurav Garg	New Age International	4th Edition, 2022
2	Research Methodology, a Step-by-Step Guide for Beginners	Ranjit Kumar	SAGE Publications Ltd	4th Edition, 2014
3	Intellectual Property, The Law of Trademarks, Copyrights, Patents, and Trade Secrets	Deborah E. Bouchoux	Cengage learning	4th Edition, 2018
Reference Books				
1	Research Methods: The Concise Knowledge Base	William Trochim	Atomic Dog Publishing	2nd Edition 2006
2	Intellectual Property Rights	Radhakrishnan R	New Delhi , Excel Books(P) Ltd	2017

Web links/Video Lectures/MOOCs

1. Research Methodology: https://onlinecourses.nptel.ac.in/noc23_ge36/preview
2. Intellectual Property Law Specialization: https://www.coursera.org/specializations/introduction-intellectual-property

Course Articulation Matrix

Course Outcomes	Program Outcomes (POs)							
(COs)	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
24AEC109.1		**2**		**2**				
24AEC109.2		**2**						
24AEC109.3		**2**						
24AEC109.4			**2**					
24AEC109.5								**2**
24AEC109.6							**2**	

1: Low 2: Medium 3: High

MATHEMATICS (BRIDGE COURSE)			
Course Code	**24MCA110**	CIE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	-
Credits		Exam Hours	-

Course Learning Objectives:

Course objectives: The mandatory learning course viz., Mathematics Bridge Course for MCA aims to provide basic concepts of Sets, Relations, Logic, Matrices & Determinants, Sequences & Series and Probability Theory.

Module-1	**8Hrs**
Introduction. Representation of sets, Types of Sets, Finite set, Infinite set, equivalent set, disjoint set, Subset, Power set. Venn diagram. Set operations: Union, Intersection, Complement of a set, Difference, Symmetric Difference. Laws of set theory. Cartesian product of sets, Relations, and properties.	
Module-2	**8Hrs**
Logic Statement, Propositions, Connectives, Basic Logic Operations: Conjunction, Disjunction, Negation, Implication and Double Implication. Truth table, Logical Equivalence/Equivalent Statements, Tautologies and Contradictions.	
Module-3	**8Hrs**
Matrix Introduction, Types of matrices, Scalar multiplication, Addition of matrices, Product of matrices. Transpose of a matrix, Symmetric and Skew Symmetric matrix, Rank of a matrix, Determinant of a matrix. Singular matrix.	
Module-4	**8Hrs**
Introduction, Sequences, Series, Arithmetic Progression, Sum of Finite number of terms in A.P, Arithmetic Means, Geometric Progression, sum to n terms of G.P, Geometric Mean, relation between A.M and G.M.	
Module-5	**8Hrs**
Probability: Introduction, random experiments, sample space, events and algebra of events. Definitions of Probability – classical, and axiomatic. Conditional Probability, laws of addition and multiplication, independent events, theorem of total probability, Bayes' theorem and its applications.	

Course Outcomes: At the end of the course the student will be able to:	
24MCA110.1	Widen the knowledge of Basic concepts in Set Theory and Apply the fundamentals of set theory and Relations to the given problem
24MCA110.2	Understand mathematical reasoning to read, comprehend and construct mathematical arguments
24MCA110.3	Understand the Basic Concepts in Matrices and Formulate the problems in Matrix expression
24MCA110.4	Determine the sum of the first n terms of an arithmetic and Geometric series
24MCA110.5	Get the basic concepts of probability and find the probability of simple and compound events
24MCA110.6	Develop basic mathematics challenge using a programming language

Web Link

•http://.ac.in/courses.php?disciplineID=111
•http://www.class-central.com/subject/math(MOOCs)
•http://academicearth.org/
• VTU EDUSAT PROGRAMME-20

FUNDAMENTALS OF PROGRAMMING (BRIDGE COURSE)			
Course Code	**24MCA111**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:2:0)	SEE Marks	-
Credits	0	Exam Hours	-

Course Learning Objectives:

1.To understand the structure, memory organization, design of the various functional units and components of computers.
2. To gain the knowledge about the basics of programming structure and module.
3. To study the concept of decision-making statements, loop controlling structures and arrays.
4. To learn the concept of structure and execute programs on structures.
5. To gain knowledge about pointers and execute the programs using pointers.
6. To learn the concept of logic gates and its applications in solving some societal/industrial problems

Module-1 **4 Hrs**

Basic Structure of Computer Hardware and Software, Computer Types, Functional Units, Basic Operational Concepts, Bus structure, Software, Performance, Multiprocessing and Multi computers, Machine Instruction: Memory Locations and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Interrupts.

Module-2 **4 Hrs**

C Programming: decision making, control structures and arrays

Decision making with if statement, simple if statement, the if..else statement, nesting of if..else statements, the else..if ladder, the switch statement, the ?: operator, the goto statement, the break statement, programming examples. The while statement, the do...while statement, the for statement, nested loops, jumps in loops, the continue statement, programming examples. one dimensional and two dimensional arrays, declaration and initialization of arrays, reading , writing and manipulation of above types of arrays.

Module-3 **4 Hrs**

Structures

Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, operations on individual members, array of structures, structures within structures, structures and functions, Unions, size of structures.

Module-4 **4 Hrs**

Pointers

Pointers in C, Declaring and accessing pointers in C, pointers in C++, Pointer as function arguments, Dynamic Allocation Operators new and delete, Initializing Allocated Memory,Allocating Arrays, Allocating Objects. Overloading, overloading operators.

Module-5 **4 Hrs**

Binary Systems and Combinational Logic, Digital Computers and Digital Systems, Binary Numbers, Number Base Conversion, Octal and Hexadecimal Numbers, subtraction using r's and r-1 complements, Binary Code, Binary Storage and Registers, Binary Logic, Integrated Circuits, Digital Logic Gates.

Course Outcomes: At the end of the course the student will be able to:	
24MCA111.1	Describe the structure, memory organization, design of the various functional units and components of computers.
24MCA111.2	Explain the basics of programming structure and module.
24MCA111.3	Demonstrate the concept of decision making statements, loop controlling structures. Execute simple programs, programs using arrays and structures.
24MCA111.4	Explain the concepts of functions and subroutine, execute the programs.
24MCA111.5	Explain the pointer concepts and execute the programs using pointers.
24MCA111.6	Explain the applications of logic gates in solving some societal/industrial problems.

Sl. No.	**Title of the Book**	**Name of the Author**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Programming in ANSI C	Balaguruswamy	Tata McGraw Hill	6th Edition, 2012
2	Let us C	Yashwant Kanetkar	BPB Publications	18th Edition, 2022
3	Computer Organization	Carl Hamacher, Zvonko Vranesic, Safwat Zaky	Tata McGraw-Hill	5th Edition, 2022
Reference Books				
1	C : The Complete Reference	Herbert Schildt	McGraw Hill Education	4th Edition, 2017
2	Digital Logic and Computer Design	M.Morris Mano	Pearson	2023

Web links/Video Lectures/MOOCs

1. Introduction: to Programming: https://www.coursera.org/learn/programming-introduction
2. Computer Organization: https://nptel.ac.in/courses/106103068

Course Articulation Matrix

Course Outcomes	**Program Outcomes (POs)**							
(COs)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
24MCA111.1	2				2			
24MCA111.2	2	2						
24MCA111.3	2	2						
24MCA111.4	2	2						
24MCA111.5	2	2						
24MCA111.6	2							2

1: Low 2: Medium 3: High

Second Semester

SOFTWARE ENGINEERING AND TESTING			
Course Code	**24MCA201**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. To get insight on IEEE/ACM code of software engineering ethics.
2. To describe requirement engineering.
3. To analyze different requirements using UML tools.
4. To discuss UML based object and class concepts.
5. To apply Software Testing concepts.
6. Apply correct process models for software development.

Module-1 **8Hrs**

Introduction: Professional Software Development Attributes of good software, software engineering diversity, IEEE/ACM code of software engineering ethics, case studies. Software Process and Agile Software Development Software Process models: waterfall, incremental development, reuses oriented, Process activities; coping with change, The Rational Unified Process. Agile Methods, Plan-Driven and Agile Development.

Module-2 **8Hrs**

Requirement Engineering: Functional and non-functional requirements, The Software requirements document, Requirements specification, Requirements engineering processes, Requirement elicitation and analysis, Requirement validation, Requirement management.

Module-3 **8rs**

Object orientation and OO development. OO features, OO themes. Modeling as design Technique: Modeling: The three models. Object and class concepts, Link and associations concepts, Generalization and inheritance, A sample class model. Navigation of class models.
Advanced objects and class concepts; Associations ends; N-array association; Aggregation, composition, Abstract class, Multiple inheritance, metadata, constraints, derived data, packages.

Module-4 **8Hrs**

State modeling: Events, States, Transitions and Conditions. State Diagram: State diagram behavior,
Advanced State Modeling: Nested state diagram, Nested states, signal generalization, concurrency, A sample state model.
Interaction modeling: Use Case models, Sequence models, Activity models.

Module-5 **8Hrs**

Introduction to Testing, The Six Essentials of Software Testing, Software Testing Fundamentals, Black-Box and White-Box Testing, Basic path Testing, Control Structure testing.
Testing Strategies : Strategic Approach to Software testing- VV Model, Organizing for Software testing, A software testing Strategy for conventional architectures, A software testing Strategy for Object Oriented architectures, Criteria for completion of testing

Course Outcomes: At the end of the course the student will be able to:	
24MCA201.1	Get insight on IEEE/ACM code of software engineering ethics.
24MCA201.2	Describe requirement engineering.
24MCA201.3	Analyze different requirements using UML tools.
24MCA201.4	Discuss UML based object and class concepts.
24MCA201.5	Apply Software Testing concepts.
24MCA201.6	Apply correct process models for software development.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Software Engineering	Ian Sommerville	Pearson Education Ltd	9th Edition 2011
2	Software Engineering	PankajJalote	Wiley India Pvt Ltd	2nd Edition 2010
3	Object Oriented Modeling and Design with UML	Michel Blaha, James Rumbaugh	Pearson	2nd Edition 2007
4	Software Engineering- A Practitioner's Approach	Roger S Pressman	Mc Graw Hill	7th Edition 2006
Reference Books				
1	Object oriented software engineering	Stephan R. Schach	Tata McGraw Hill	2nd Edition 2007
2	Applying UML and Patterns	Craig Larman	Pearson Education	3rd Edition 2005

Remote Laboratory Link

1. http://vlabs.iitkgp.ernet.in/se/

Web links/Video Lectures/MOOCs

1. https://nptel.ac.in/courses/106/105/106105182/ Software Engineering
2. https://www.coursera.org/learn/os-power-user : **Software Testing and Automation Specialization**

Course Articulation Matrix

(COs)	**Program Outcomes**							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
24MCA201.1							**2**	**2**
24MCA201.2						**2**	**2**	
24MCA201.3				**2**	**2**			
24MCA201.4				**2**	**2**			
24MCA201.5		**2**					**2**	
24MCA201.6					**2**	**2**	**2**	

1: Low 2: Medium 3: High

COMPUTER NETWORKS			
Course Code	24MCA202	CIE Marks	50
Teaching Hours/Week(L:T:P)	(2:0:2)	SEE Marks	50
Credits	03	Exam Hours	03

Course Learning Objectives:

1. To provide an introduction to the OSI and TCP/IP layers.
2. To gain an understanding of the roles of data link control protocols.
3. To develop the ability to explain the network layers working principles.
4. To provide a comprehensive introduction to analyze the transport layer functionalities.
5. To familiarize various network security and applications.
6. To Analyze the basic error detection techniques and reliable transmission.

Module-1	**6 Hrs**
Applications, Requirements, Network Architecture, Performance.	
Module-2	**6 Hrs**
Encoding (NRZ, NRZI, Manchester, 4B/5B), Framing-PPP, HDLC, SONET, Error Detection, Reliable Transmission.	
Module-3	**6 Hrs**
Internetworking and Advanced Internetworking Switching and Bridging- Datagrams, Virtual Circuit Switching, Basic Internetworking (IP), Routing – Network as a graph, Distance Vector.	
Module-4	**6 Hrs**
End-to-End Protocols and Congestion Control Simple Demultiplexer (UDP), Reliable Byte Stream (TCP), Queuing Disciplines, TCP Congestion Control.	
Module-5	**6 Hrs**
Network Security Cryptographic Building Blocks – Principles of cipher, Symmetric Key Cipher, Public Key cipher, Firewalls.	

LIST OF LABORATORY PROGRAMS

PART-A

Implement the following Computer Networks concepts using C/C++

1. Write a program for a distance vector algorithm to find a suitable path for transmission.
2. Using TCP/IP sockets, write a client-server program to make the client send the file name and to make the server send back the contents of the requested file if present.
3. Write a program for Hamming code generation for error detection and correction.
4. Write a program for congestion control using leaky bucket algorithm.

PART-B

(Simulate the following Computer Networks concepts using any network simulators)

1. Simulate a three nodes point to point network with duplex links between them. Set the queue size and vary the bandwidth and find the number of packets dropped.
2. Simulate the network with five nodes n0, n1, n2, n3, n4, forming a star topology. The node n4 is at the center. Node n0 is a TCP source, which transmits packets to node n3 (a TCP sink) through the node n4. Node n1 is another traffic source, and sends UDP packets to node n2

through n4. The duration of the simulation time is 10 seconds.

3. Simulate to study transmission of packets over Ethernet LAN and determine the number of packets drop destination.

Course Outcomes: At the end of the course the student will be able to:	
24MCA202 .1	Apply the basic concepts of networking and to analyze different parameters such as bandwidth, delay, throughput of the networks for the given problem.
24MCA202.2	Apply different techniques to ensure the reliable and secured communication in wired and wireless communication.
24MCA202.3	Analyze the networking concepts of TCP/IP for wired and wireless components.
24MCA202.4	Identify the issues of Transport layer to analyze the congestion control mechanism.
24MCA202.5	Design network topology with different protocols and analyze the performance.
24MCA202.6	Analyze the basic error detection techniques and reliable transmission.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Computer Networks A Systems Approach	Larry L Peterson and Bruce S Davie	Morgan Kaufmann Publishers	5th Edition, 2012
Reference Books				
1	Computer Networking – A Top-Down Approach Featuring the Internet	James F. Kurose, Keith W. Ross	Pearson Education	Fifth Edition, 2009
2	Computer and Communication Networks	Nader. F. Mir	Pearson Prentice Hall Publishers	Second Edition, 2010
3	Computer Networks: An Open Source Approach	Ying-Dar Lin, Ren-Hung Hwang, Fred Baker	McGraw Hill Publisher	2012
4	Data Communication and Networking	Behrouz A. Forouzan	Tata McGraw – Hill	Fourth Edition, 2011

Web links/Video Lectures/MOOCs/papers

1. https://www.coursera.org/learn/computer-networking
2. https://www.coursera.org/specializations/computer communication

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)							
	PO 1	**PO 2**	**PO 3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO 8**
24MCA202 .1	2				2			
24MCA202 .2		2					2	
24MCA202 .3			2			2		
24MCA202 .4		2			2			
24MCA202 .5	2				2			
24MCA202 .6		2					2	

1: Low 2: Medium 3: High

DATA ANALYTICS USING PYTHON			
Course Code	**24MCA203**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. To apply fundamental Python programming concepts.
2. To implement Python collection objects and functions.
3. To apply object-oriented programming concepts in Python.
4. To apply numpy array functions and pandas data structures for data analysis.
5. To implement data loading and wrangling in Python.
6. To implement the data visualization tools matplotlib and seaborn.

Module-1 **08Hrs**

Python Basic Concepts and Programming: Interpreter – Program Execution – Statements – Expressions – Flow Controls – Functions - Numeric Types – Sequences - Strings, Parts of Python Programming Language, Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, The type( ) Function and Is Operator, Control Flow Statements, The if Decision Control Flow Statement, The if…else Decision Control Flow Statement, The if…elif…else Decision Control Statement, Nested if Statement, The while Loop, The for Loop, The continue and break Statements, Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.

Module-2 **08Hrs**

Python Collection Objects, Classes: Strings- Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings, Lists-Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods. Sets, Tuples and Dictionaries. Files: reading and writing files. Class Definition – Constructors – Inheritance – Overloading

Module-3 **08Hrs**

Introduction to Numpy and Pandas :Numpy: Understanding data types in python, basics of Numpy arrays, computation on NumPy arrays: universal function. (refer chapter 2 from python data science handbook)

Pandas: Introducing to pandas data structure, essential functionally, summarizing and computing descriptive statistics, handling missing data.(refer chapter 5 from python for data Analytics).

Module-4 **08Hrs**

Data Loading and Data Wrangling: Reading and writing data in text format, interacting with databases, combining and merging data sets, reshaping and pivoting, data transformation(refer chapter 6 and 7 from python for data Analytics.)

Module-5 **08Hrs**

Visualization with Matplotlib, and Seaborn: General Matplotlib tips, simple line plots, simple scatter plots, visualizing errors, density and contour plots, histograms, binning and density, customizing plot legends and colorbars, customizing matplotlib, visualization with seaborn. (refer chapter 4 from python data science handbook)

Course Outcomes: At the end of the course the student will be able to:	
24MCA203.1	Apply fundamental Python programming concepts.
24MCA203.2	Implement Python collection objects and functions.
24MCA203.3	Apply object oriented programming concepts in Python.
24MCA203.4	Apply numpy array functions and pandas data structures for data analysis.
24MCA203.5	Implement data loading and wrangling in Python.
24MCA203.6	Implement the data visualization tools matplotlib and seaborn.

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Think Python: How to Think Like a Computer Scientist	Allen B. Downey	Shroff/O'Reilly	2nd Edition, Updated for Python 3,2016
2	An Introduction to Python	Guido van Rossum, Fred L. Drake Jr	Network Theory Ltd	Revised Edition for Python 3.2 2011
3	Python Data Science Handbook: Essential tools for working with data	Jake VanderPlas	O'Reilly Media, Inc.	1st Edition 2016
4	PYTHON Programming: using problem solving approach	Reema Thareja	Oxford Uni-Press	1st Edition 2018
Reference Books				
1	Programming Python	Mark Lutz	O'Reilly Media	4th Edition 2010
2	Python 3 for Absolute Beginners	Tim Hall and J-P Stacey	Apress	1st Edition 2009
3	Beginning Python: From Novice to Professional	Magnus Lie Hetland	Apress	2nd Edition 2005
4	Beginning Python Visualization Crafting Visual Transformation Scripts	ShaiVaingast	Apress	2nd Edition 2014

Web links/Video Lectures/MOOCs

1. **Python for Applied Data Science:** https://www.coursera.org/learn/python-python-for-applied-data science-ai
2. **Python for Data Visualization:** https://www.coursera.org/learn/python-for-data-visualization

Course Articulation Matrix

Course Outcomes	Program Outcomes (POs)							
(COs)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
24MCA203.1	3	2						
24MCA203.2	2	2						
24MCA203.3	2	2						
24MCA203.4	2	2						
24MCA203.5			2					2
24MCA203.6				3				2

1: Low 2: Medium 3: High

ENTERPRISE JAVA			
Course Code	**24MCA204**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1.To apply the concepts of class and inheritance for a problem and interfaces.
2.To create and analyze the application using Packages, Exceptions and Multithreading.
3.Describe the concepts Event handling and Java network classes.
4.Create Database connection for the Java applications and the implementation of servlets.
5.Use JSP tags in creating web applications.
6.Develop enterprise applications using Java Beans concepts for the given problem.

Module-1 **8Hrs**

Introduction to JAVA: Introducing classes: Class fundamentals; Declaring objects; Assigning object reference variables; Introducing methods; Constructors; The this keyword, Method Overloading, Overloading Constructors, Understanding Static, Introducing Nested and Inner Classes.

Inheritance: Inheritance Basics, Member Access, and Inheritance, Constructors and Inheritance, Using Super to Call Superclass constructors, using Super to Access Superclass Members, creating a Multilevel Hierarchy, Order of execution of constructors in Inheritance, Method Overriding, Using Abstract Classes, Using final.

Interfaces: Interface Fundamentals, Creating an Interface, Implementing an Interface, Using Interface References, Implementing Multiple Interfaces, Interfaces can be extended.

Module-2 **8Hrs**

Packages: Package Fundamentals, Packages and Member Access, Importing Packages, Static import.

Exception Handling: The Exception Hierarchy, Exception Handling Fundamentals, The Consequences of an Uncaught Exception, Multiple catch clauses, catching subclass Exceptions, nested try block, throwing an Exception, using finally, using throws.

Multithreaded programming: Java Thread model; Main thread; Creating a thread; Creating multiple threads; Using is Alive() and join(); Synchronization; Interthread communication.

Module-3 **8Hrs**

Event Handling: Two Event Handling Mechanisms, The Delegation Event Model, Events Event Sources, Event Listeners, Event Classes- The MouseEventClass, Event Listener Interfaces-The Mouse Listener Interface, the MouseMotionListener Interface, Delegation Event Model Handling Mouse Events.

Networking: Networking basics: Java and the net; InetAddress; TCP/IP client sockets; URL: URLConnection; TCP/IP server sockets; Datagrams.

Module-4 **8Hrs**

JDBC: JDBC objects: Concept of JDBC; JDBC driver types; JDBC packages; Brief overview of the JDBC process; Database connection; Statement objects - prepared Statement, ResultSet.

Servlets: Background; Life cycle of a Servlet; Simple Servlet; Servlet API; javax.servlet package; Reading Servlet parameter; javax.servlet.http package; Handling HTTP requests and responses; Using Cookies, session tracking.

Module-5	**8Hrs**
Java Server Pages (JSP): Introduction to JSP: Overview of JSP: JSP Technology, Need of JSP, Benefits of JSP, Advantages of JSP, Basic Syntax, Invoking Java code with JSP Scripting Elements, The JSP Page directive, Including Files and Applets in JSP Pages using JavaBeans components in JSP documents. **Enterprise Java Beans:** Introduction to Java Beans**;** Advantages of Java Beans;Enterprise Java Beans; Session Java Bean; Entity Java Bean; Message-Driven Bean.	

Course Outcomes: At the end of the course the student will be able to:	
24MCA204.1	Demonstrate a comprehensive understanding of object-oriented programming principles using Java, including classes, objects, and inheritance.
24MCA204.2	Illustrate the usage of Packages, Implement Exceptions, and multithreading in building efficient applications.
24MCA204.3	Implement the event-driven and java networking concepts.
24MCA204.4	Build the Database connection for the Java applications and the implementation of servlets.
24MCA204.5	Demonstrate the use of JSP tags in the web application.
24MCA204.6	Develop enterprise applications using Java Beans concepts for the given problem.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1.	Java Fundamentals, A Comprehensive Introduction	Herbert Schildt, Dale Skrien	Tata Mc Graw Hill	First Edition, 2013
2.	JAVA the Complete Reference	Herbert Schildt	Tata McGraw Hill	2019
3.	Java Server Programming Java EE 7 (J2EE 1.7), Black Book	DT EDITORIAL SERVICES	Dreamtech Press	2014
4.	Core Servlets and Java Server Pages	Marty Hall,Larry Brown Core	Pearson Education	2nd Edition, 2006
Reference Books				
1.	EJB 3 Developer Guide, A Practical Guide For Developers And Architects to the Enterprise Java Beans	Michel Sikora	PACKT Publishing	I st Edition, 2008.
2.	The Java Complete Reference, Comprehensive coverage of the Java Language	Herbert Schildt	Tata McGraw Hill	8 th Edition, 2011

3.	Java Programming	Hari Mohan Pandey	Pearson Education	First Edition 2012
4.	Java 6 Programming, Black Book	KoGenT	Dreamtech Press	2012
5.	Java 2 Essentials	Cay Horstmann	Wiley	Second Edition, 1999

Web links/Video Lectures/MOOCs

1. https://www.udemy.com/course/jsp-servletfree
2. https://www.coursera.org/projects/introduction-to-javaprogramming-java-fundamental concepts
3. https://nptel.ac.in/courses/106/105/106105191/
4. https://www.coursera.org/projects/learn-programming-java

Course Articulation Matrix

Course Outcomes	Program Outcomes (POs)							
(COs)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
24MCA204.1	3	2						
24MCA204.2	3	2						
24MCA204.3	2	2						
24MCA204.4			2	2				
24MCA204.5	3		2	2				2
24MCA204.6				3				2

1: Low 2: Medium 3: High

ETHICAL HACKING			
Course Code	**24MC205A**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	03	Exam Hours	03

Course Learning Objectives:

1. Understand and apply the principles of information security
2. Secure and manage system permissions
3. Assess and mitigate risks associated with remote access systems
4. Understand and apply security techniques
5. Implement secure web applications and countermeasures
6. Conduct wireless network security assessments

Module-1 **10 Hrs**

Casing the Establishment: What is foot printing, Internet Foot printing, Scanning, Enumeration, basic banner grabbing, Enumerating Common Network services.

Module-2 **10 Hrs**

Securing permission: Securing file and folder permission, Using the encrypting file, system, Securing registry permissions. Securing service: Managing service permission, Unix: The Quest for Root, Remote Access vs Local access, Remote access, Local access, After hacking root.

Module-3 **10 Hrs**

Dial-up, PBX, Voicemail and VPN hacking, Preparing to dial up, War-Dialing, Brute Force Scripting PBX hacking, Voice mail hacking, VPN hacking, Network Devices: Discovery Autonomous System Lookup, Public Newsgroups, Service Detection, Network Vulnerability, Detecting Layer 2 Media.

Module-4 **10 Hrs**

Wireless Hacking: Wireless Foot printing, Wireless Scanning and Enumeration, Gaining Access, Tools that exploiting WEP Weakness, Denial of Services Attacks, Firewalls: Firewalls landscape, Firewall Identification-Scanning Through firewalls, packet Filtering, Application Proxy Vulnerabilities, Denial of Service Attacks, Motivation of Dos Attackers, Types of DoS attacks, Generic Dos Attacks, UNIX and Windows DoS.

Module-5 **10 Hrs**

Remote Control Insecurities, Discovering Remote Control Software, Connection, Weakness.VNC, Advanced Techniques Session Hijacking, Back Doors, Trojans, Cryptography, Subverting the systems Environment, Social Engineering, Web Hacking, Web server hacking web application hacking, Hacking the internet Use, Malicious Mobile code, SSL fraud, E-mail Hacking, IRC hacking, Global countermeasures to Internet User Hacking.

Course Outcomes: At the end of the course the student will be able to:

24MC205A.1	Demonstrate knowledge of network scanning, enumeration, and basic banner grabbing to identify vulnerabilities.
24MC205A.2	Secure system files, folders, and registry permissions, and manage service access on Windows and Unix systems.
24MC205A.3	Identify and mitigate security risks in dial-up, PBX, voicemail, and VPN systems using ethical hacking techniques.
24MC205A.4	Perform wireless network security analysis and mitigate security risks such as weak encryption and denial of service attacks.

24MC205A.5	Analyze and counteract remote control insecurities, backdoors, and malicious software in remote desktop and network environments.
24MC205A.6	Secure web applications, email systems, and SSL communications by understanding common attack vectors and applying effective countermeasures.

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Hacking Exposed 7: Network Security Secrets & Solutions	Stuart McClure, Joel Scambray and Goerge Kurtz	Tata Mc Graw Hill Publishers	3rd Edition, 2010
2	Microsoft Windows Security Resource Kit	Bensmith, and Brian Komer	Prentice Hall of India	2nd Edition, 2010
Reference Books				
1	A Beginners Guide to Ethical Hacking	Rafay Baloch	CRC Press	1st Edition, 2015
2	Gray Hat Hacking The Ethical Hackers Handbook	Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle	McGraw-Hill Osborne Media paperback	3rd Edition, 2011

Web links/Video Lectures/MOOCs

1. Complete Ethical Hacking Bootcamp - https://www.udemy.com/share/103JJy/
2. Ethical Hacking Essentials (EHE) - https://www.coursera.org/learn/ethical-hacking-essentials-ehe
3. Ethical Hacking - https://onlinecourses.nptel.ac.in/noc22_cs13/preview

Course Articulation Matrix

Course Outcomes	Program Outcomes (POs)							
(COs)	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8
24MC205A.1	2	2			2			
24MC205A.2	2		2		2			
24MC205A.3	2	2			2	2		
24MC205A.4	2							2
24MC205A.5	2							2
24MC205A.6	2	2			2	2		

1: Low 2: Medium 3: High

CYBER SECURITY			
Course Code	**24MC205B**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	03	Exam Hours	03

Course Learning Objectives:

1. Define the area of cybercrime and forensics.
2. Analyze the working of cyber security principles in designing the system.
3. Analyze the given problem (cybercrime, vulnerability, threat), develop a strategy (physical, logical or administrative controls) to mitigate the problem and articulate consequences on Society and National Economy.
4. Analyze the cybercrimes in mobile and wireless devices.
5. Investigate the influence of Block chain technology for the cyber security problem and evaluate its role.
6. Illustrate tools used in cyber forensic.

Module-1 **8Hrs**

Introduction to Cybercrime and Laws

Introduction, Cybercrime: Definition and Origins of the word, Cybercrime and information Security, Cyber criminals, Classifications of Cyber Crimes. How Criminals Plan Them – Introduction, How Criminals Plan the Attacks, Cybercafé and Cybercrimes, Botnets, Attack Vector, Cloud Computing.

Module-2 **8Hrs**

Tools and Methods used in Cybercrime Introduction, Proxy Server and Anonymizers, Password Cracking, Keyloggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow.

Module-3 **8Hrs**

Phishing and Identity Theft Introduction, Phishing – Methods of Phishing, Phishing Techniques, Phishing Toolkits and Spy Phishing. Identity Theft – PII, Types of Identity Theft, Techniques of ID Theft. Digital Forensics Science, Need for Computer Cyber forensics and Digital Evidence, Digital Forensics Life Cycle.

Module-4 **8Hrs**

Mobile and Wireless Devices - Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

Module-5 **8Hrs**

Network Defense tools and block chain technology

Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, How a Firewall Protects a Network, Packet Characteristic to Filter, Stateless Vs Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding, the basic of Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Intrusion Detection System, introduction to block chain technology (definition, tools used for implementation) and its applications.

Course Outcomes: At the end of the course the student will be able to:	
24MC205B.1	Comprehend the Cybercrime and its origin
24MC205B.2	Analyze the working of cyber security principles in designing the system.
24MC205B.3	Analyze the given problem (cybercrime, vulnerability, threat), develop a strategy (physical, logical or administrative controls) to mitigate the problem and articulate consequences on Society and National Economy
24MC205B.4	Analyze the cybercrimes in mobile and wireless devices.
24MC205B.5	Investigate the influence of Block chain technology for the cyber security problem and evaluate its role.
24MC205B.6	Comprehend Digital Forensics.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Anti-Hacker Tool Kit (Indian Edition)	Mike Shema	Publication McGraw Hill.	4th Edition, 2014
2	Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives	Nina Godbole and Sunit Belapure	Wiley	First Edition, 2023
Reference Books				
1	Computer Forensics and Cyber Crime: An Introduction	Marjie T. Britz	Pearson	Third Edition, 2013
2	Introduction to Computer Networks and Cyber Security	Chwan-Hwa (John) Wu,J. David Irwin	CRC Press	First Edition, 2014
3	Guide to Computer Forensics and Investigations -Cengage Learning	Bill Nelson, Amelia Phillips, Christopher Steuart	Course Technology Inc	Fourth Edition, 2014
4	Cybersecurity: Managing Systems, Conducting Testing, and Investigating Intrusions	Thomas J. Mowbray	John Wiley & Sons, Inc	First Edition, 2014

Web links/Video Lectures/MOOCs

1. https://www.coursera.org/specializations/cyber-security
2. https://www.edx.org/course/introduction-to-cybersecurity
3. Introduction to Information Security I - https://nptel.ac.in/courses/106106129
4. https://www.youtube.com/@VTUeShikshanaProgramme/search?query=cyber%20security
5. Block chain technology - https://www.simplilearn.com/blockchain-certification-training-course

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)							
	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8
24MC205B.1		2	2					
24MC205B.2		2	2	2				
24MC205B.3		2	2	2				
24MC205B.4		2	2	2			2	
24MC205B.5	2	2	2	2				
24MC205B.6		2	2	2				2

1: Low 2: Medium 3: High

CRYPTOGRAPHY AND NETWORK SECURITY			
Course Code	**24MC205C**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. Implement encryption techniques for the given problem and analyze the results
2. Design the cipher technique and analyze the functioning of cipher for any given problem
3. Execute the public and private key-based cryptography algorithms and investigate the results of the algorithm based on the output
4. Construct the cryptographic algorithms using programming languages for any given problem
5. Develop security planning for the given case study with data classification, access control and propose a technical solution

Module-1 **8Hrs**

Introduction: OSI Security Architecture, Security Attacks, Security Services, Security Mechanism, model for Network Security.
Classical Encryption Technique: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques.

Module-2 **8Hrs**

Data Encryption and advanced encryption techniques:
Block Ciphers, Data Encryption Standard and Advanced Encryption Standard Block Cipher Principles, The Data Encryption Standard, Block Cipher Design Principles and Modes of operation, Evaluation Criteria for AES, AES Cipher-Encryption and Decryption, Data Structure, Encryption Round.
Public Key Cryptography and Key Management:
Principles of Public Key Crypto system, RSA algorithm, Key management, Diffie Hellman Key exchange.

Module-3 **8Hrs**

Message Authentication and Hash Function: Authentication Requirement, Authentication Functions, Message Authentication Code, Hash Functions, Digital Signatures, Digital Signature Standard.
Authentication Applications: Kerberos, X.509 Authentication Service

Module-4 **8Hrs**

Electronic Mail Security: Pretty Good Privacy (PGP), S/MIME
IP Security: IP Security Overview; IP Security Architecture; Authentication Header; Encapsulating Security Payload; Combining Security Associations; Key Management.

Module-5 **8Hrs**

Web Security: Web security Considerations; Secure Socket layer (SSL) and Transport layer Security (TLS); Secure Electronic Transaction (SET).
System Security: Intruders, Intrusion Detection, Firewall Design Principles- Characteristics, Types of Firewall and Firewall Configuration.

Course Outcomes: At the end of the course the student will be able to:	
24MC205C.1	Apply encryption techniques for the given problem and analyze the results.
24MC205C.2	Design the Cipher technique and analyze the functioning of Cipher for the given problem.
24MC205C.3	Implement the Public and Private key based cryptography algorithms and investigate the results of algorithms based on output.
24MC205C.4	Design and implement the cryptographic algorithms using programming languages/tools for the given problem/context.
24MC205C.5	Design the security planning for the given case study for data classification, access control and propose technical solutions, and submit the detailed report with plagiarism check.
24MC205C.6	Describe how to maintain the Confidentiality, Integrity and Availability of data.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Cryptography and Network Security – Principles and Practices	William Stallings	Pearson Education	4th Edition 2009
Reference Books				
1	Cryptography and Network Security	Behrouz A. Forouzan and Debdeep Mukhopadhyay	Tata McGraw-Hill	2nd Edition, 2010
2	Cryptography and Network Security	Atul Kahate	Tata McGraw-Hill	Third Edition, 2007

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
24MC205C.1	3	2						
24MC205C.2		3	2	2				
24MC205C.3			2	2				
24MC205C.4			2	2				
24MC205C.5					2	2	2	
23MC205C.6							2	2

1: Low 2: Medium 3: High

NETWORK AND LINUX ADMINISTRATION			
Course Code	**24MC205D**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. Explain the evolution and architecture of UNIX/Linux systems
2. To Identify and modify file and directory attributes and permissions to ensure a secure UNIX/Linux environment.
3. Utilize core UNIX commands to perform system navigation, user management, and file operations.
4. To Manipulate text and file contents effectively using advanced commands.
5. Demonstrate proficiency in UNIX networking by configuring interfaces and performing basic network troubleshooting
6. To implement basic Unix commands.

Module-1 **8Hrs**

Introduction, overview of LINUX and UNIX: history, features, components, Architecture, Open Source Software, Distributions: UBUNTU, FEDORA, SOLARIS, AIX

Module-2 **8Hrs**

File Systems, System Directories, Listing File Attributes, Listing Directory Attributes, File Management, File Permissions, Absolute Paths, Relative Paths, The Security Implications, Changing File Permissions, Directory Permissions, Changing File Ownership.

Module-3 **8Hrs**

General features of Unix commands/ command structure. Command arguments and options. Basic Unix commands such as echo, printf, ls, who, date,passwd, cal, Combining commands. Meaning of Internal and external commands. The type command: knowing the type of a command and locating it. The root login. Becoming the super user: su command.

Module-4 **8Hrs**

Advanced UNIX commands: Text manipulation: awk,grep,sed,tr ;File operations: basename, ln, find, rsync ;System status and monitoring: last,w,uname; Process management: ptree, kill, nice;
File system management: mount and unmount;File transfer: curl

Module-5 **8Hrs**

Introduction to UNIX networking, Overview of networking in UNIX, importance of networking in UNIX systems, understanding network interfaces: Ethernet, wifi, loopback, basic networking commands: PING, trace route, netstat, ss, if config, IP

Course Outcomes: At the end of the course the student will be able to:	
24MC205D.1	Understand the basics of Linux and UNIX
24MC205D.2	Explore about file system
24MC205D.3	Analyze basic and advanced commands
24MC205D.4	Apply text manipulation and file operations commands

24MC205D.5	Evaluate system performance and network commands.
24MC205D.6	Implement basic UNIX/Linux commands and networking configurations for practical problem-solving.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	UNIX and Shell Programming	Behrouz A. Forouzan, Richard F. Gilberg	Thomson Learning	1st Edition 2003
2	The Linux Administration: A Beginner's Guide	Wale Soyinka	McGraw Hill Education	6th Edition, 2012
Reference Books				
1	UNIX Concepts and Applications	Das, Sumitabha.	Tata McGraw Hill	4th Edition, 2006

Web links/Video Lectures/MOOCs

1. https://nptel.ac.in/courses/117106113
2. https://www.emblogic.com/41/linux-network-administration
3. https://www.geeksforgeeks.org/introduction-to-unix-system/

Course Articulation Matrix

Course Outcomes	Program Outcomes (POs)							
(COs)	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8
24MC205D.1	2							
24MC205D.2	2	2						
24MC205D.3			2					
24MC205D.4				2				
24MC205D.5				2				
24MC205D.6	2		2					

1: Low 2: Medium 3: High

BLOCKCHAIN TECHNOLOGY			
Course Code	**24MC205E**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. To demonstrate the basics of Blockchain concepts using modern tools/technologies.
2. To analyze the role of Blockchain applications in different domains including cybersecurity.
3. To evaluate the usage of Blockchain implementation/features for the given problem.
4. To exemplify the usage of bitcoins and its impact on the economy.
5. To analyze the application of specific block chain architecture for a given problem.
6. To demonstrate the working principles of bitcoin.

Module-1	**8Hrs**
Introduction to Blockchain, How Blockchain works, Blockchain vsBitcoin, Practical applications, public and private key basics, pros and cons of Blockchain, Myths about Bitcoin	
Module-2	**8Hrs**
Blockchain :Architecture , versions ,variants , use cases, Life use cases of blockchain, Blockchain shared Database, Introduction to crypto currencies, Types, Applications.	
Module-3	**8Hrs**
Concept of Double Spending, Hashing, Mining, Proof of work. Introduction to Merkel tree, Privacy , payment verification , Resolving Conflicts , Creation of Blocks	
Module-4	**8Hrs**
Introduction to Bitcoin, key concepts of Bitcoin, Merits and De Merits Fork and Segwits, Sending and Receiving bitcoins, choosing bitcoin wallet, Converting Bitcoins to Fiat Currency.	
Module-5	**8Hrs**
Introduction to Ethereum, Advantages and Disadvantages, Ethereumvs Bitcoin, Introduction to Smart contracts, usage, application, working principle, Law and Regulations. Case Study.	

Course Outcomes: At the end of the course the student will be able to:	
24MC205E.1	Demonstrate the basics of Block chain concepts using modern tools/technologies.
24MC205E.2	Analyze the role of block chain applications in different domains including cyber security.
24MC205E.3	Evaluate the usage of Block chain implementation/features for the given problem
24MC205E.4	Demonstrate the usage of bitcoins and its impact on the economy.
24MC205E.5	Analyze the application of specific block chain architecture for a given problem
24MC205E.6	Demonstrate the working principles of bitcoin

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Beginning Blockchain: A Beginner's Guide to Building Blockchain Solutions	Arshdeep Bikramaditya Signal, Gautam Dhameja Priyansu Sekhar Panda	APress	1st Edition 2018
2	Blockchain Applications: A Hands-On Approach	Bahga, Vijay Madisetti	Published By Arshadeep Bahga & Vijay Madisetti	1st Edition 2017
3	Blockchain	Melanie Swan	OReilly	1st Edition, 2015
Reference Books				
1	Bitcoin and Cryptocurrency Technologies	Aravind Narayan. Joseph Bonneau, Princeton	O'Reilly	4th Edition, 2016
2	Bitcoin and Blockchain Basics: A non-technical introduction for beginners	Arthu.T Brooks	Arthu.T Brooks	1st Edition 2019

Web links/Video Lectures/MOOCs

1. https://www.coursera.org/specializations/blockchain
2. https://www.coursera.org/specializations/uci-blockchain

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
24MC205E.1	2			2				
24MC205E.2		2					2	
24MC205E.3		2	2	2				
24MC205E.4		2						2
24MC205E.5	2	2						
24MC205E.6							2	2

1: Low 2: Medium 3: High

MOBILE AND WIRELESS SECURITY			
Course Code	**24MC205F**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	03	Exam Hours	03

Course Learning Objectives:

1. Familiarize with the issues and technologies involved in designing a wireless and mobile system that is robust against various attacks.
2. Gain knowledge and understanding of the various ways in which wireless networks can be attacked and tradeoffs in protecting networks.
3. Have a broad knowledge of the state-of-the-art and open problems in wireless and mobile security, thus enhancing their potential to do research or pursue a career in this rapidly developing area.
4. Learn various security issues involved in cloud computing.
5. Learn various security issues related to GPRS and 3G.

Module-1 **8 Hrs**

Security Issues in Mobile Communication: Mobile Communication History, Security – Wired Vs Wireless, Security Issues in Wireless and Mobile Communications, Security Requirements in Wireless and Mobile Communications.

Module-2 **8 Hrs**

Security for Mobile Applications, Advantages and Disadvantages of Application – level Security. Security of Device, Network, and Server Levels: Mobile Devices Security Requirements, Mobile Wireless network level Security, Server Level Security. Application Level Security in Wireless Networks: Application of WLANs, Wireless Threats.

Module-3 **8 Hrs**

Some Vulnerabilities and Attach Methods over WLANs, Security for 1G Wi-Fi Applications, Security for 2G Wi-Fi Applications, Recent Security Schemes for Wi-Fi Applications Application Level Security in Cellular Networks: Generations of Cellular Networks, Security Issues and attacks in cellular networks.

Module-4 **8 Hrs**

GSM Security for applications, GPRS Security for applications, UMTS security for applications, 3G security for applications, Some of Security and authentication Solutions. Application Level Security in MANETs: MANETs, Some applications of MANETs, MANET Features

Module-5 **8 Hrs**

Security Challenges in MANETs, Security Attacks on MANETs, External Threats for MANET applications, Internal threats for MANET Applications, Some of the Security Solutions. Ubiquitous Computing, Need for Novel Security Schemes for UC, Security Challenges for UC, and Security Attacks on UC networks, Some of the security solutions for UC.

Course Outcomes: At the end of the course the student will be able to:	
24MC205F.1	Understand and explain the fundamental differences between wired and wireless communication systems and the security requirements for wireless and mobile communications.
24MC205F.2	Identify and describe the security challenges at device, network, and server levels, and analyze application-level security mechanisms for wireless networks.

24MC205F.3	Examine vulnerabilities and attacks in WLANs and cellular networks, and evaluate recent security schemes for Wi-Fi and cellular applications.
24MC205F.4	Design and recommend security strategies for GSM, GPRS, UMTS, and 3G applications by analyzing their unique security requirements and challenges.
24MC205F.5	Assess the security challenges, threats, and attacks in MANETs and propose robust security solutions for mobile ad hoc networks and ubiquitous computing systems.
24MC205F.6	Evaluate emerging security solutions and their effectiveness in addressing novel threats to wireless systems and ubiquitous computing environments.

SL No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Wireless and Mobile Network Security	Pallapa Venkataram, Satish Babu	Tata Mc Graw Hill Publishers	1st Edition, 2010
2	Fundamentals of Mobile and Pervasive Computing	Frank Adelstein, K.S.Gupta	Tata Mc Graw Hill Publishers	1st Edition, 2005
Reference Books				
1	Wireless Security Models, Threats and Solutions	Randall k. Nichols, Panos C. Lekkas	Tata Mc Graw Hill Publishers	1st Edition, 2006
2	802.11 Security	Bruce Potter and Bob Fleck	O'Reilly Media, Inc.	1st Edition, 2005
3	Wireless Internet Security – Architecture and Protocols	James Kempf	Cambridge University Press	1st Edition, 2008

Web links/Video Lectures/MOOCs

1. Wireless and Mobile Security - https://www.coursera.org/learn/wireless-mobile-security
2. Mobile Security Essentials - https://www.udemy.com/course/mobile-security-essentials
3. Certified Wireless Security Professional (CWSP) - https://www.cwnp.com/cwsp
4. Securing Wireless and Mobile - CompTIA Security+ - https://www.youtube.com/watch?v=iAR6SgvtezY
5. Wireless Security: Lecture 1 Part 1 - https://www.youtube.com/watch?v=omvcdpH-zx8
6. SANS SEC617: Wireless Penetration Testing and Ethical Hacking - https://www.sans.org/cyber-security-courses/wireless-penetration-testing-ethical-hacking
7. Fundamentals of Mobile Computing and Security - https://www.edx.org/course/fundamentals-of-mobile-computing-and-security
8. Cybersecurity and Mobile Networking - https://www.futurelearn.com/courses/cybersecurity-and-mobile-networking

Course Articulation Matrix

Course Outcomes	Program Outcomes (POs)							
(COs)	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8
24MC205F.1	2	2			2			
24MC205F.2	2		2					
24MC205F.3	2	2			2	2		
24MC205F.4	2							
24MC205F.5	2							2
24MC205F.6	2	2			2	2		

1: Low 2: Medium 3: High

DEVOPS			
Course Code	**24MC206A**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. Understand overall structure of Devops with its Lifecycle.
2. Understand the different application managed service options in the cloud using LINUX.
3. Demonstrate DevOps workflow with GitLab learning Shell Script.
4. Discover practical skills of Continuous Integration to improve the speed, stability, Availability and security for software delivery capability.
5. Apply practical skills needed for integrating container.
6. Demonstrate a DevOps-based tool and explain its functionality, use cases, and how it integrates into the DevOps lifecycle.

Module-1 **8Hrs**

Introduction to Devops- What Is Devops, History of Devops, Devops, definition, DevOps Main Objectives, DevOps and Software Development, Life Cycle- Waterfall Model and Agile Model, Continuous Integration & Deployment- Jenkins, Containers and Virtual
Development- Docker and Vagrant, Configuration Management Tools-Ansible, Puppet and Chef.

Module-2 **8Hrs**

Cloud Computing- What is Cloud? Evolution of Cloud Computing, IAAS (Infrastructure as a Service), SAAS (Software as a Service), PAAS (Platform as a Service), Private, Public and Hybrid Cloud, Public Clouds- Amazon Web Services, Microsoft Azure and Google Cloud Services.
Architectures for parallel and distributed computing - Parallel Vs Distributed computing, Elements of distributed computing, Technologies for distributed computing.

Module-3 **8Hrs**

LINUX Basic and Admin- Linux OS Introduction, Importance of Linux in DevOps, Linux Basic Command Utilities, Linux Administration and Environment Variables.
Shell Scripting - Introduction, Variables, Flow Controls, Loops, Functions, Lists, Manipulating Strings, Reading and Writing Files and Positional Parameters. Version Control- Overview of SVN, GIT Features, 3-Tree Architecture, GIT – Clone /Commit / Push, GIT Hub Projects, GIT Hub Management, GIT Rebase & Merge, Reset, Checkout ,GIT Clone, Fetch and Pull.

Module-4 **8Hrs**

Continuous Integration – Jenkins- Introduction to Jenkins , Continuous Integration with Jenkins ,Configure Jenkins, Jenkins Management, Scheduling build Jobs - POLL SCM and Build Periodically ANSIBLE - Introduction to Ansible, Infrastructure Management, SSH Connection in Ansible Master.

Module-5 **8Hrs**

Playbooks- Variables, Conditionals, Loops, Blocks, Handlers and Templates Docker- How to get Docker Image? , What is Docker Image, Working with Docker Containers- What is Container, Docker Engine, Creating Containers, with an Image, Working with Images and Docker Command Line Interphase.

Course Outcomes: At the end of the course the student will be able to:	
24MC206A.1	Get insight on the overall structure of Devops with its Lifecycle.
24MC206A.2	Describe different application managed service options in the cloud using LINUX.
24MC206A.3	Analyze DevOps workflow with GitLab learning Shell Script.
24MC206A.4	Discuss practical skills of Continuous Integration to improve the speed, stability, Availability and security for software delivery capability.
24MC206A.5	Apply design and planning concepts.
24MC206A.6	Apply correct process models for software development.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Linux® Command Line and Shell Scripting Bible	Richard Blum Christine Bresnahan	John Wiley & Sons, Inc.	3th Edition
2	Practical DevOps – Joakim Verona, PACKT Publisher	PankajJalote	Wiley India Pvt Ltd	2nd Edition 2010
3	DevOps for Developers – Michael Huttermann, APress	Michel Blaha, James Rumbaugh	Pearon	2nd Edition 2007
4	Cloud Computing: Concepts, Technology & Architecture	Thomas Erl, Zaigham Mahmood, and Ricardo Puttini	PRENTICE HALL	2013
Reference Books				
5	Pro Git	Scott Chacon and Ben Straub	Apress	2nd Edition 2014

Web links/Video Lectures/MOOCs
1. DevOps Beginners to Advanced with Projects - 2023
https://www.udemy.com/course/decodingdevops/
2. Introduction to DevOps : https://www.coursera.org/learn/intro-to-devops

Course Articulation Matrix

Course Outcomes	**Program Outcomes (POs)**							
(COs)	PO1	PO2	PO3	PO4	PO5	PO 6	PO7	PO8
24MC206A.1	3	2			1			
24MC206A.2	2	2			3	1		
24MC206A.3		2	2		2			
24MC206A.4		2	2	2	1			
24MC206A.5	2	2	2		2	1		
24MC206A.6	2	2	3					1

1: Low 2: Medium 3: High

SOFTWARE ARCHITECTURE			
Course Code	24MC206B	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. Understand design patterns and object-oriented development.
2. Analyze system requirements for effective design.
3. Apply structural design patterns to solve software problems.
4. Design interactive systems using the MVC architecture.
5. Develop distributed systems using client-server models.
6. Evaluate scalable and maintainable design solutions.

Module-1	**8Hrs**

Introduction:
what is a design pattern? describing design patterns, the catalog of design pattern, organizing the catalog, how design patterns solve design problems, how to select a design pattern, how to use a design pattern. What is object-oriented development? , key concepts of object oriented design.

Module-2	**8Hrs**

Analysis a System:
overview of the analysis phase, stage 1: gathering the requirements functional requirements specification, defining conceptual classes and relationships, using the knowledge of the domain. Design and Implementation.

Module-3	**8Hrs**

Design Pattern Catalog:
Structural patterns, Adapter, bridge, composite, decorator, facade, flyweight, proxy.

Module-4	**8Hrs**

Interactive systems and the MVC architecture:
Introduction , The MVC architectural pattern, analyzing a simple drawing program , designing the system, designing of the subsystems, getting into implementation , implementing undo operation , drawing incomplete items, adding a new feature , pattern based solutions.

Module-5	**8Hrs**

Designing with Distributed Objects:
Client server system, java remote method invocation, implementing an object oriented system on the web (discussions and further reading) a note on input and output, selection statements, loops arrays.

Course Outcomes: At the end of the course the student will be able to:	
24MC206B.1	Understand the fundamentals of design patterns and object-oriented development.
24MC206B.2	Analyze system requirements and conceptualize class relationships for design and implementation.
24MC206B.3	Apply structural design patterns to solve real-world problems effectively.
24MC206B.4	Implement interactive systems using the MVC architecture for dynamic applications.

24MC206B.5	Design distributed object-oriented systems using client-server models and Java RMI.
24MC206B.6	Evaluate design patterns and architectures for scalable and maintainable solutions.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition And year**
Textbooks				
1.	Software Architecture in Practice	Bass, Len;Others	Pearson Education Pvt. Ltd.	4th Edition, 2021
2.	Pattern Oriented Software Architecture	Buschmann, Frank;Others	John Wiley & Sons Inc	1st Edition 1996

Reference books				
1.	Pattern Oriented Software Architecture	Frank Bachmann, ReginеMeunier, Hans Rohnert	Universities press,	Volume 1, 1996
2.	Anti-Patterns: Refactoring Software, Architectures and Projects in Crisis	William J Brown et al.	John Wiley	1998

Web links/Video Lectures/MOOCs

1. https://onlinecourses.nptel.ac.in/noc22_cs39/preview
2. https://www.youtube.com/watch?v=k3hKLd7vYZ8

Course Articulation Matrix

Course Outcomes	**Program Outcomes (POs)**							
(COs)	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8
24MC206B.1	2							
24MC206B.2	2	2						
24MC206B.3			2					
24MC206B.4				2				
24MC206B.5				2				
24MC206B.6	2		2					

1: Low 2: Medium 3: High

ENTERPRISE RESOURCE PLANNING			
Course Code	**24MC206C**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. Examine the pros and cons of ERP, data warehousing/mining and OLAP
2. Test the implementation of ERP in the context of business
3. Implement ERP for different manufacturing prospective
4. Explain ERP marketing
5. Examine the design ERP with future e-commerce and internet
6. Examine how to modernize and integrate business processes and systems

Module-1	**8Hrs**
Introduction to ERP Overview, Benefits of ERP, ERP and Related Technologies, Business Process Reengineering, Data Warehousing, Data Mining, On–line Analytical Processing, Supply Chain Management.	
Module-2	**8Hrs**
ERP Implementation: Implementation of Life Cycle, Implementation Methodology, Hidden Costs, Organizing Implementation, Vendors, Consultants and Users, Contracts, Project Management and Monitoring	
Module-3	**8Hrs**
ERP Manufacturing Prospective: MRP - Material Requirement Planning, BOM - Bill Of Material, MRP - Manufacturing Resource Planning, DRP - Distributed Requirement Planning, PDM - Product Data Management.	
Module-4	**8Hrs**
ERP Market : ERP Market Place, SAP AG, People Soft, Baan Company, JD Edwards World Solutions Company, Oracle Corporation, QAD , System Software Associates.	
Module-5	**8Hrs**
ERP–Present And Future : Turbo Charge the ERP System, EIA, ERP and E–Commerce, ERP and Internet, Future Directions in ERP.	

Course Outcomes: At the end of the course the student will be able to:	
24MC206C.1	Analyze the pros and cons of ERP, Data warehousing/Mining and OLAP for the given problem/application.
24MC206C.2	Analyze the implementation of ERP in the context of business of the different organizations.
24MC206C.3	Analyze and apply ERP for different manufacturing prospective.
24MC206C.4	Explain ERP marketing with the help of a case study
24MC206C.5	Analyze the design ERP with future E-commerce and internet.
24MC206C.6	Describe how to modernize and integrate business processes and systems

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	ERP Demystified	Alexis Leon	Tata McGraw Hill	Third Edition, 2014
2	Concepts in Enterprise Resource Planning	Joseph A. Brady, Ellen F. Monk, Bret J. Wangner	Thomson Learning	4th Edition 2012
Reference Books				
1	Enterprise Resource Planning	Vinod Kumar Garg and N.K Venkata Krishnan	Prentice Hall	2nd Edition 2011

Web links/Video Lectures/MOOCs

1. Introduction to ERP: https://www.coursera.org/lecture/enterprise-systems/1-1b-introduction-to-enterprise-resource-planning-erp-LneSo
2. Operations Management-ERP: https://freevideolectures.com/course/4539/nptel-operations-management/60

Course Articulation Matrix

Course Outcomes	Program Outcomes (POs)							
(COs)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
24MC206C.1	2	2						
24MC206C.2		2	2	2				
24MC206C.3				2		2		
24MC206C.4		2	2					
24MC206C.5		2	2	3				2
24MC206C.6				2		2		

1: Low 2: Medium 3: High

MOBILE APPLICATION DEVELOPMENT			
Course Code	**24MC206D**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. Develop effective user interfaces that leverage evolving mobile devices.
2. Develop an application using android SDK and setting Kotlin in android studio.
3. Implement suitable methods to integrate databases and multimedia.
4. Design and develop open source software based mobile applications to the given problem.
5. Build and deploy competent mobile applications to solve the industrial/societal Problems.
6. Apply Kotlin concepts and Android tools to design, develop, and test efficient mobile applications.

Module-1	**8Hrs**
Introduction to Android Studio: Introduction to Android, Installing the Android SDK, Creating Android Virtual Devices, anatomy of android studio,interface elements in android studio. **Introduction to Kotlin:**What is Kotlin? ,Kotlin vs Java, Installing Kotlin, Setting up Kotlin in Android Studio	
Module-2	**8Hrs**
Android UI Design: ViewGroup,Basic Views **Components of android**: Activity, Services, Content Provider,BroadCast Receiver **Personalize the appearance of UI**:Creating Custom Button with unique shapes, colors, and sizes, creating custom backgrounds with shapes, colors, gradients.	
Module-3	**8Hrs**
Variables and Constants: Declaring variables,Data Types,Conditional Statements,Loops,Return & Break,**Functions:**Defining a function,Function parameters and return types,Default parameters and named arguments.**Lambda Expressions**:Lambda syntax,Higher-order functions, Creating the First Android Project**.**	
Module-4	**8Hrs**
Exception Handling:Basic try-catch block, Catching specific exceptions.**Throwing Exceptions**:throw keyword, Custom exception.**Event Handling & Intents:** Intro to Event Handling, Handling Long Clicks, What Intents are for, Implicit Intents & Explicit intent,Introduction to Fragments.The UI Thread, Threads and Runnables **Graphics and Animation:** Drawing graphics in Android, Creating Animation with Android.	
Module-5	**8Hrs**
Data Storage: Storing simple data, Read and write a text file to internal storage and external storage, Creating and using an SQLite database.**Multimedia**: Playing music in the background using Service, publishing android applications.	

Course Outcomes : At the end of the course the student will be able:	
24MC206D.1	Demonstrate the concepts of variable, functions, lambda expression in Kotlin
24MC206D.2	Demonstrate the knowledge of Android tools by developing basic android Applications..
24MC206D.3	To Design effective user interfaces by leveraging all basic views.
24MC206D.4	To Implement Exception handling and Event handling in building efficient applications.

24MC206D.5	To develop an Android application that incorporates intents and leverages animation and advanced design concepts for enhanced user experience.
24MC206D.6	Apply data storage techniques using internal and external storage, SQLite databases, and integrate multimedia features to develop functional mobile applications.

Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition And year**
Textbooks				
1	Android Development with Kotlin	John Horton	Packt Publishing Ltd	1st Edition 2017
2	Beginning Android Programming with Android Studio	DiMarzio J F	New Delhi , Wiely India	4th Edition 2017
Reference Books				
1.	"Kotlin Programming: The Big Nerd Ranch Guide"	Josh Skeen, David Greenhalgh	Big Nerd Ranch Guides	2021,2 nd edition
2.	Android Programming with Kotlin for Beginners	John Horton	Packt Publisher	2019,1 st Edition

Web links/Video Lectures/MOOCs
1. **https://archive.nptel.ac.in/courses/106/106/106106156/ : Introduction to Modern Application Development**
2. **https://onlinecourses.swayam2.ac.in/aic20_sp02/preview :** Android app using Kotlin

Course Articulation Matrix

Course Outcomes	**Program Outcomes (POs)**							
(COs)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
24MC206D.1	3	3			2			
24MC206D.2	3		3		2			
24MC206D.3	3	2			3			1
24MC206D.4		3	3	2				
24MC206D.5		3	3		3			
24MC206D.6	3		3		3			

1: Low 2: Medium 3: High

PARALLEL COMPUTING			
Course Code	**24MC206E**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Course Learning Objectives:

1. Understand the need of parallel programming.
2. Apply the MPI rules for distributed memory programming.
3. Analyse the thread programming.
4. Develop the shared memory programming with openMP
5. Implement the parallel programs using algorithms
6. Use the parallel program algorithms in real world scenario

Module-1 **8Hrs**

Introduction to Parallel Computing.
Need of Performance, Building Parallel Systems, Why to Write Parallel Programs? How to Write Parallel Programs? Approach : Concurrent, Parallel, Distributed

Parallel Hardware and Parallel Software
Background, Modifications to the von Neumann Model, Parallel Hardware, Parallel Software, Input and Output, Performance, Parallel Program Design and Writing and Running Parallel Programs

Module-2 **8Hrs**

Distributed Memory Programming with MPI:
Getting Started, The Trapezoidal Rule in MPI, Dealing with I/O, Collective Communication, MPI Derived Data types, A Parallel Sorting Algorithm

Module-3 **8Hrs**

Shared Memory Programming with Pthreads:
Processes, Threads and Pthreads, Hello, World program ,Matrix-Vector Multiplication, Critical Sections Busy-Waiting, Mutexes, Producer-Consumer Synchronization and Semaphores, Barriers and Condition Variables, Read-Write Locks, Caches, CacheCoherence, and False Sharing and Thread-Safety

Module-4 **8Hrs**

Shared Memory Programming with OpenMP: Introduction to OpenMP, The Trapezoidal Rulem Scope of Variables, The Reduction Clause, The Parallel For Directive, More About Loops in OpenMP: Sorting, Scheduling Loops, Producers and Consumers, Caches, Cache-Coherence, and False Sharing and Thread-Safety

Module-5 **8Hrs**

6 Parallel Program Development and Parallel Algorithms: Two N-Body Solvers, Tree Search and Case Studies

Course Outcomes: At the end of the course the student will be able to:	
24MC206E.1	Understand the need of parallel programming.
24MC206E.2	Apply the MPI rules for distributed memory programming.
24MC206E.3	Analyse the thread programming.
24MC206E.4	Develop the shared memory programming with openMP
24MC206E.5	Implement the parallel programs using algorithms
24MC206E.6	Use the parallel program algorithms in real world scenario.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	An Introduction to Parallel Programming	Peter s. Pacheco	Morgan Kaufmann Publishers	2011 Edition
Reference Books				
1	Using OpenMP: Portable Shared Memory Parallel Programming	Gabriele Jost and Ruud van der Pas	The MIT Press	October 12, 2007
2	Using MPI - 2nd Edition: Portable Parallel Programming with the Message Passing Interface	William Gropp and Ewing Lusk	MIT Press	1999, 2nd Edition
3	Pthreads Programming: A Posix Standard for Better Multiprocessing	Dick Buttlar, Jacqueline Farrell & Bradford Nichols	Oreilly	1996, I Edition

Course Articulation Matrix

Course Outcomes (COs)								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
24MC206E.1	1							
24MC206E.2				1				
24MC206E.3							2	
24MC206E.4							2	
24MC206E.5				1				
24MC206E.6							2	

1: Low 2: Medium 3: High

SALESFORCE ADMINISTRATOR			
Course Code	**24MC206F**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	**03**	Exam Hours	03

Summary of the Course:

A Salesforce Administrator solves business problems by customizing the Salesforce Platform. They build, configure, and automate technology solutions to deliver business value. Salesforce Administrators work with stakeholders to define system requirements and customize the platform. Most importantly, they enable users to get the most from Salesforce technology. A Salesforce Admin best understands how to make the platform work for their company's goals. Core responsibilities include supporting users, managing data, maintaining security standards, and delivering actionable analytics.

Course Learning Objectives:

1. Help in collaborating with business and technical stakeholders to design, configure, and implement Salesforce.
2. Develop a mindset in solving business problems using the Salesforce Platform.
3. Proactively set up processes to manage and protect customer and business data.
4. Hands on practice on provide reporting on a regular basis to help users and executives gain insights and make decisions from Salesforce data.
5. Learn how to create human-centered user experiences in Salesforce.
6. Understand how to Create, maintain, and enhance automated business processes.

Module-1 **8Hrs**

e Salesforce Platform Basics: Get Started with the Salesforce Platform, Discover Use Cases for the Platform, Understand the Salesforce Architecture, Navigate Setup, Power Up with AppExchange. Prepare Your Salesforce Org for Users : Set Up the Exchange Rate, Update the Exchange Rate with ACM, Customize the Home Page, Create a Unique Account List View, Create Chatter Groups User Management: Add New Users, Control What Your Users Can Access.

Customize an Org to Support a New Business Unit: Manage User Access, Manage Chatter, Modify Your Data Model, Configure an Email Letterhead and Template, Automate Your Business Process Identity Basics: Get to Know Salesforce Identity, Get To Know Your Salesforce Identity Users, Learn the Language of Identity

Module-2 **8Hrs**

Data Security: Overview of Data Security, Control Access to the Org, Control Access to Objects, Control Access to Fields, Control Access to Records, Create a Role Hierarchy, Define Sharing Rules.

Permission Set Groups: Get Started with Permission Set Groups, Create a Permission Set Group, Mute Permissions in Permission Set Groups Protect Your Data in Salesforce: Restrict Login Hours and IP Ranges, Create New Users and Allow a User to Delete Accounts, Set Organization-Wide Defaults and Create a Role Hierarchy, Create Sharing Rules, Set Up Account Teams.

Protect Your Data in Salesforce: Restrict Login Hours and IP Ranges, Create New Users and Allow a User to Delete Accounts, Set Organization-Wide Defaults and Create a Role Hierarchy, Create Sharing Rules, Set Up Account Teams.

Data Modeling: Understand Custom & Standard Objects, Create Object Relationships, Work with Schema Builder.

Module-3 **8Hrs**

Lightning Experience Customization: Set Up Your Org, Create and Customize Lightning Apps, Create and Customize List Views, Customize Record Highlights with Compact Layouts, Customize Record Details with Page Layouts, Create Custom Buttons and Links, Empower Your Users with Quick Actions.

Customize a Salesforce Object: Work with Standard and Custom Fields, Create Picklists and Field Dependencies, Create Lookup Filters, Create Formula Fields, Create Record Types, Create Account Page Layouts, Enable Account Field History Tracking, Create Validation Rules.
Lightning App Builder: Get Started with the Lightning App Builder, Build a Custom Home Page for Lightning Experience, Build a Custom Record Page for Lightning Experience and Salesforce Mobile App, Build an App Home Lightning Page, Work with Custom Lightning Components.
Formulas and Validations: Use Formula Fields, Implement Roll-Up Summary Fields, Create Validation Rules

Module-4 **8Hrs**

Service Cloud for Lightning Experience: Begin Your Customer Service Journey, Administer Service Cloud, Automate Case Management, Create Digital Engagement on Multiple Channels.
Set Up the Service Console: Set Up the Lightning Service Console, Customize Your Lightning Service Console Pages, Add the Softphone Utility to Your App, Set Up Web Chats for Your Console.
Create a Process for Managing Support Cases: Create Support Processes, Create Record Types, Create an Escalation Rule Set Up Case Escalation and Entitlements: Create Support Processes, Create Case Queues and Assignment Rules, Create a Case Escalation Rule, Create an Automation with Flow Builder, Enable Entitlements and Set Up Service Contracts, Create an Entitlement Process, Create Service Contracts with Entitlements

Module-5 **8Hrs**

Reports & Dashboards for Lightning Experience: Introduction to Reports and Dashboards in Lightning Experience, Create Reports with the Report Builder, Format Reports, Visualize Your Data with the Lightning Dashboard Builder, Extend Your Reporting Strategy with AppExchange
Create Reports and Dashboards for Sales and Marketing Managers: Create Report and Dashboard Folders, Create a Simple Custom Report, Filter Your Reports, Group and Categorize Your Data, Use Summary Formulas in Your Reports, Manage Reported Data, Visualize Your Data
Approve Records with Approval Processes: Customize How Records Get Approved, Build an Approval Process Build a Discount Approval Process: Prepare Your Org, Create an Approval Process, Create Initial Submission Actions, Specify Final Approval and Rejection Actions
Build a Simple Flow: Collect Contact Info from Your User, Check for a Matching Contact in Your Org, Branch the Flow, Create or Update a Contact Flow Builder Basics: Get Started with Automation, Go with the Flow, Meet Flow Builder,
Learn About Flow Variables

Course Outcomes: At the end of the course the student will be able to:	
24MC206F.1	Understand how to manage changes to business processes, technology, and people with Salesforce.
24MC206F.2	Improve the efficiency of business operations by proactively undertaking regular process analysis and documentation.
24MC206F.3	Customize the user experience and manage profiles, permissions, roles, and groups with Salesforce.
24MC206F.4	Apply the Beginner's mind and continually stay up to date with new Salesforce technology and inspire others too
24MC206F.5	Manage the end-to-end implementation of Salesforce, including the overall strategy and day-to-day activities involved in administering Salesforce.
24MC206F.6	Develop and Application using Salesforce platform.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Salesforce for Beginners: A step-by-step guide to optimize sales and marketing and automate business processes with the Salesforce platform	Sharif Shaalan and Timothy Royer	PACKT Publishers	2nd Ed, 2022
2	Salesforce CRM - The Definitive Admin Handbook: Build, configure, and customize Salesforce CRM and mobile solutions	Paul Goodey	PACKT Publisher	5th Ed, 2019
3	Learn Salesforce Lightning: The Visual Guide to the Lightning UI	Felicia Duarte, Rachelle Hoffman	Wiley Apress	2018
Reference Books				
1	Salesforce Data Architecture and Management: A pragmatic guide for aspiring Salesforce architects and developers to manage, govern, and secure their data effectively	Ahsan Zafar	PACKT Publishers	2021

Web links/Video Lectures/MOOCs

- Use the Trailhead Platform: *https://www.salesforce.com/blog/what-is-trailhead/*

The Salesforce Administrator Trailmix :

- https://trailhead.salesforce.com/users/srebello7/trailmixes/salesforce-administrator-explorer

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
24MC206F.1	2							
24MC206F.2		2						
24MC206F.3							2	
24MC206F.4				1		2		
24MC206F.5			2				2	
24MC206F.6			2		2			2

1: Low 2: Medium 3: High

DATA ANALYTICS USING PYTHON LAB

Course Code	**24MCL207**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**(1:0:2)**	**SEE Marks**	**50**
Credits	**02**	**Exam Hours**	**03**

Course Learning Objectives:

1: Apply control structures to the given problems and write Python programs for search/sort on a given data set.
2: Implement object oriented principles in Python
3: Implement string and file handling in Python.
4: Demonstrate data visualization using matplotlib and seaborn for a given problem
5: Demonstrate regression model for a given problem
6: Demonstrate Time series analysis with Pandas

PART- A

1. Write a python program to find factorial of a number using Recursion.
2. Write a Python program to perform linear search
3. Write a Python program to insert an element into a sorted list
4. Write a python program using object oriented programming to demonstrate encapsulation, inheritance and overriding.
5. Write a Python Script to check whether the given string is palindrome or not.
6. Write Python script to copy file contents from one file to another.

Part- B

1. Write a Python program that creates a mXn integer array and Prints its attributes.
2. Implement a python program to demonstrate the following using numpy
   a) Array manipulation, Searching, Sorting and splitting.
   b) broadcasting and Plotting numpy arrays
3. Implement a python program to demonstrate 1) Importing Datasets 2) Cleaning the Data 3) Data frame manipulation using Pandas.
4. Implement a python program to demonstrate Data visualization with various types of Graphs using matplotlib.
5. Write a Python program to demonstrate the generation of linear regression models.
6. Write a Python program to demonstrate the generation of logistic regression models using Python.
7. Write a Python program to demonstrate Time series analysis with Pandas.
8. Write a Python program to demonstrate Data Visualization using Seaborn.

- Each student has to execute two programs- one from Part A and one from Part B during the Semester End Examination.
- Part A and Part B shall be given 50% weightage each.

Course Outcomes: At the end of the course the student will be able to:	
24MCL207.1	Apply basic python programming concepts with collection objects.
24MCL207.2	Apply String and File handling in Python.
24MCL207.3	Implement numpy and pandas libraries for data handling.
24MCL207.4	Demonstrate regression model for a given problem.
24MCL207.5	Demonstrate Time series analysis with Pandas.
24MCL207.6	Demonstrate data visualization using matplotlib and seaborn libraries

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Think Python: How to Think Like a Computer Scientist	Allen B. Downey	Shroff/O'Reilly Publishers	2nd Edition, Updated for Python 3,2016
2	An Introduction to Python	Guido van Rossum and Fred L. Drake Jr	Shroff Publishers and Distributors	2011
3	Python Data Science Handbook: Essential tools for working with data	Jake Vander plas	O'Reilly Media, Inc	1st Edition 2016
Reference Books				
1	Programming Python	Mark Lutz	O'Reilly	4th Edition 2010
2	Python 3 for Absolute Beginners	Tim Hall and J-P Stacey	Apress	1st Edition 2009
3	Beginning Python: From Novice to Professional	Magnus Lie Hetland	Apress	2nd Edition 2005
4	Beginning Python Visualization Crafting Visual Transformation Scripts	Shai Vaingast,	Apress	2nd Edition 2014

Course Articulation Matrix

Course Outcomes	Program Outcomes (POs)							
(COs)	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
24MCL207.1	3	2						
24MCL207.2	2	2						
24MCL207.3	2	2						
24MCL207.4			2	3				
24MCL207.5			2	2				
24MCL207.6			2	3				

1: Low 2: Medium 3: High

ENTERPRISE JAVA LABORATORY			
Course Code	**24MCL208**	CIE Marks	50
Teaching Hours/Week (L:T:P)	**(1:0:2)**	SEE Marks	50
Credits	**02**	Exam Hours	03

Course Learning Objectives:

1. Implement the fundamental concept of java programming by writing executable programs.
2. Solve the object oriented principles with the help of java programs.
3. Construct reusable and efficient applications using inheritance and multi-threading concepts of java and design user friendly interfaces.
4. Use servlets and JSP tags and its services to develop a web application
5. Demonstrate the Database connections for the Java applications.
6. Design enterprise applications using different Java Beans concepts for the given problem.

PART A

1. Write a JAVA program to demonstrate Constructor Overloading and Method Overloading.
2. Write a JAVA program to implement Inner class and demonstrate its Access protection.
3. a) Write a JAVA program to demonstrate Inheritance.

b) Simple Program on Java for the implementation of Multiple inheritance using interfaces to calculate the area of a rectangle and triangle.

4. Write a JAVA program which has:
   a. A Class called Account that creates an account with Rs. 500 minimum balance, a deposit () method to deposit amount, a withdraw () method to withdraw amount and also throws Less Balance Exception if an account holder tries to withdraw money which makes the balance become less than Rs. 500.
   b. A Class called Less_ Balance_ Exception which returns the statement that says withdrawal amount (Rs.) is not valid.
   c. A Class which creates 2 accounts, both account deposit money and one account tries to withdraw more money which generates a Less Balance Exception and takes appropriate action for the same.
5. Write a JAVA program using Synchronized Threads, which demonstrates the Producer Consumer concept.
6. Complete the following:

a) Create a package named shape.

b) Create some classes in the package representing some common shapes like Square, Triangle, and Circle.

c) Import and compile these classes in other programs.

PART B

1. Write a JAVA Servlet Program to implement a dynamic HTML using Servlet (user name and Password should be accepted using HTML and displayed using a Servlet).
2. Write a JAVA Servlet Program to implement and demonstrate GET and POST methods (Using HTTP Servlet Class).
3. Write a JAVA Servlet Program using cookies to remember user preferences. Write a JSP Program to get student information through an HTML and create a JAVA Bean class, populate Bean, and display the same information through another JSP.
4. Write a JSP program to implement all the attributes of the page directive tag.
5. Write a JAVA Program to insert data into the Student DATABASE and retrieve info based on particular queries (For example update, delete, search, etc…)

6. An EJB application that demonstrates Session Bean (with appropriate business logic).

7. An EJB application that demonstrates MDB (with appropriate business logic).

Note :- Each student has to execute two programs- one from Part A and one from Part B during the Semester End Examination. Part A and Part B shall be given 50% weightage each

Course Outcomes: At the end of the course the student will be able to:	
24MCL208.1	Illustrate the object oriented principles with the help of java programs.
24MCL208.2	Implement user defined exceptions.
24MCL208.3	Develop reusable and efficient applications using inheritance and multi-threading concepts of java as well as design user friendly interfaces.
24MCL208.4	Apply the concept of Servlet and its life cycle to create web applications and also demonstrate the JSP tags and its services to web applications.
24MCL208.5	Build Database connection for the web applications.
24MCL208.6	Develop application programs using Java beans concept.

Sl. No.	**Title of the Book**	**Name of the Author**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Java Fundamentals, A Comprehensive Introduction.	Herbert Schildt, Dale Skrien	Tata Mc Graw Hill	First Edition, 2013
2	JAVA the Complete Reference	Herbert Schildt	Tata McGraw Hill	2019
3	Java Server Programming Java EE 7 (J2EE 1.7), Black Book	DT Editorial Srvices	Dreamtech press	2014
Reference Books				
1	Java Programming	Hari Mohan Pandey	Pearson Education	First Edition 2012
2	Java 6 Programming, Black Book	KoGenT	Dreamtech Press	2012
3	Java 2 Essentials	Cay Horstmann	Wiley	Second Edition,1999

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
24MCL208.1	3	2						
24MCL208.2	3	2						
24MCL208.3	2	2						
24MCL208.4		3		3				
24MCL208.5	3		2	2				2
24MCL208.6				3				2

1: Low 2: Medium 3: High

ABILITY ENHANCEMENT COURSE WITH SEMINAR -1			
Course Code	**24AEC209**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	-
Credits	1	Exam Hours	02

Course Learning Objectives:

1. To understand IoT fundamentals and interface sensors and actuators with microcontrollers.
2. To explore Smart Manufacturing, Digital Twins, and their applications.
3. To design automation tasks using UiPath software and analyze its applications in process automation.
4. To gain hands-on experience in digital manufacturing processes like 3D printing and CNC laser cutting.
5. To develop teamwork and effectively present project outcomes.

Module-1: Internet of things-Hardware/System Design (06 Hours)

Introduction to IOT fundamentals, Introduction to sensors, Difference between analog and digital sensors, Interfacing Temperature, Light and Humidity sensors with Arduino, Interfacing Motors with Arduino, Simple program to control actuator based on the analog sensor. Internet of Things.

Module-2: Smart Manufacturing and Robotic Process Automation (06 Hours)

Smart Manufacturing and Digital Twins: The concept of Smart Manufacturing, Digital Twins and its applications, In-Class Assignment: Explore the designs of Digital Twins, Homework Assignment: Analysing a Smart Manufacturing Case Study.

Robotic Process Automation: Understanding Robotic Process Automation (RPA), Types of robots and their applications, Human-robot collaboration, In-Class Assignment: Automating a Task with RPA, Homework Assignment: Researching Advances in Robotics.

Module-3: Digital Manufacturing processes (06 Hours)

Additive manufacturing using 3D printing- simple 3D modelling using TinkerCAD, use of slicing software and hands-on practice, Creating art drawing using artCAM and Lightburn softwares, Hands-on practice of CNC laser cutting and wood engraving machine, Hands-on practice of 3D Scanner

Module-4: Project Work (06 Hours)

Team Formation, Synopsis submission, Mid-Term Progress Review, Final Project Presentation.

Course Outcomes: At the end of the course the student will be able to:

24AEC209.1	Understand the fundamentals of the Internet of Things (IoT) and demonstrate the ability to interface sensors and actuators with microcontrollers for basic IoT applications.
24AEC209.2	Differentiate between analog and digital sensors and implement a program to control actuators based on sensor data.
24AEC209.3	Analyze the concept of Smart Manufacturing and Digital Twins, and apply the knowledge to explore the designs and applications of Digital Twins.
24AEC209.4	Understand the principles of Robotic Process Automation (RPA) and demonstrate automation of simple tasks using RPA.
24AEC209.5	Develop expertise in utilizing additive manufacturing tools such as 3D printers, slicing software, CNC laser cutters, wood engraving machines, and 3D scanners.
24AEC209.6	Develop a solution using emerging technologies for a real-world problem in teams.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Internet of Things (A Hands-on-Approach)	Vijay Madisetti and Arshdeep Bahga	Orient Blackswan Private Limited	1 st Edition, 2015
2	Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath	Alok Mani Tripathi	Packt Publishing	First Edition 2018
Reference Books				
1	Smart Manufacturing Technologies for Industry 4.0: Integration, Benefits, and Operational Activities	Edited By: Jayakrishna Kandasamy, Kamalakanta Muduli, V. P. Kommula, Purushottam L. Meena	CRC Press	First Edition 2022
2	The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems	Tom Taulli	Apress Berkeley, CA	2020

Web links/Video Lectures:

Smart Manufacturing and Digital Twins:

1. https://www.youtube.com/watch?v=nwFed03fS_s
2. https://www.youtube.com/watch?v=ScmK-bKJ4MI

RPA and Robotics:

1. https://www.youtube.com/watch?v=9URSbTOE4YI
2. https://www.youtube.com/watch?v=UEbw7dIOg0g
3. https://www.uipath.com/resources/automation-case-studies
4. https://www.ibm.com/products/robotic-process-automation/case-studies

Course Articulation Matrix

Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
24AEC209.1	**2**	-	**2**	**2**		-	-	**3**
24AEC209.2	-	-	-	-	-	-	-	-
24AEC209.3	-	-	-	**3**	**2**	-	-	-
24AEC209.4	-	-	-	-	**3**	-		-
24AEC209.5	-	-	-	-	-	-	-	-
24AEC209.6	-	-	**2**	-	**3**	-	--	-

1: Low 2: Medium 3: High

INDUSTRY ORIENTED TRAINING II (PROBLEM SOLVING SKILLS)			
Course Code	**24ITP210**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	-
Credits	-	Exam Hours	-

Course Learning Objectives:

1. Know the components of self-introduction
2. Develop resume with inclusion of core competencies
3. Involve and contribute in group discussions
4. Develop effective communication to succeed in professional career
5. Know the etiquettes of digital communication

Module-1	**2 Hrs**
Self-Introduction: Learn the Secret to Introducing Yourself, Things to avoid when introducing you. Activity: Video record the self-introduction. **Essentials of grooming:** Creating the first impression, what does the well-dressed professional wear? Personal hygiene and habits.	
Module-2	**2 Hrs**
Resume Writing: Purpose, Identifying Relevant Competencies, Understanding Applicant Tracking Systems, Lists of Competencies, Writing Accomplishment/ Objective Statements, Finding the Right Words- Action verbs, The Most Popular Resume Format, Other Popular Resume Formats, Do's and Don'ts. Activity: Students have to submit a copy of their resume.	
Module-3	**2 Hrs**
Group discussion: Types, process, Evaluation criteria, Do's and Don'ts Activity: Group discussions have to be held during the training sessions.	
Module-4	**2 Hrs**
Communicate Effectively: Understanding common interview questions, mastering the STAR method for behavioral questions, answering technical and non-technical questions, responding confidently to questions you don't know, handling stress and nervousness, practicing mock interviews, asking insightful questions to the interviewer, negotiation and salary discussion, final tips and follow-up.	
Module-5	**2 Hrs**
Digital Right and Wrong: Virtual Communication: Agenda, being prepared, Dressing appropriately, background, Use Microphone and camera the right way, restraining from off tasks during virtual meetings, protecting confidential data during online presentations, time management.	

Course Outcomes: At the end of the course the student will be able to:	
24ITP210.1	Identify and articulate the essential components required for an effective self-introduction in business and networking events.
24ITP210.2	Recognize and demonstrate the importance of appropriate professional attire for a successful career in the corporate sector.
24ITP210.3	Develop a resume inclusive of core competencies, action verbs which are compatible with Applicant Tracking Systems.
24ITP210.4	Recognize the types, process and evaluation of Group Discussion and carry out effective group discussions.

24ITP210.5	Develop skills required for effective communication in interviews
24ITP210.6	Associate and be accustomed to the etiquettes to be followed during online meetings

Sources

1. English for Common Interactions in the Workplace: Basic Level: Coursera: https://www.coursera.org/learn/english-common-interactions-workplace-basic-level
2. Personal Communication-Introduce Yourself With Confidence: https://www.udemy.com/course/how-to-introduce-yourself/
3. Professionalism, Grooming and Etiquette: https://www.edx.org/course/professionalism-grooming-and-etiquette
4. How to Write a Resume: https://www.coursera.org/learn/how-to-write-a-resume#syllabus
5. Group Discussion Strategies: https://www.udemy.com/course/group-discussion-strategies/
6. Communication Strategies for a Virtual Age: https://www.coursera.org/learn/communication-strategies-virtual-age#syllabus

References

1. https://simplifytraining.com/course/personal-hygiene-and-good-grooming/
2. https://www.udemy.com/course/group-discussion-strategies/
3. https://www.educba.com/course/group-discussion/
4. https://getrafiki.ai/meetings/rules-of-virtual-meeting-etiquette-every-sales-professional-should-follow/
5. https://thedigitalworkplace.com/articles/online-meeting-etiquette-for-attendees/
6. https://rigorousthemes.com/blog/virtual-meeting-etiquette-guidelines-ground-rules/

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
24ITP210.1					2			2
24ITP210.2					2		1	2
24ITP210.3					2			2
24ITP210.4					2			2
24ITP210.5					2		1	2
24ITP210.6					2			2

1: Low 2: Medium 3: High

Core Values of the Institution

SERVICE

A Josephite will keep service as the prime goal in everything that is undertaken. Meeting the needs of the stakeholders will be the prime focus of all our endeavors.

EXCELLENCE

A Josephite will not only endeavor to serve, but serve with excellence. Preparing rigorously to excel in whatever we do will be our hallmark.

ACCOUNTABILITY

Every member of the SJEC Family will be guided to deliver on assurances given within the constraints set. A Josephite will always keep budgets and deadlines in mind when delivering a service.

CONTINUOUS ADAPTATION

Every member of the SJEC Family will strive to provide reliable and continuous service by adapting to the changing environment.

COLLABORATION

A Josephite will always seek to collaborate with others and be a team-player in the service of the stakeholders.

Objectives

- Provide Quality Technical Education facilities to every student admitted to the College and facilitate the development of all round personality of the students.
- Provide most competent staff and excellent support facilities like laboratory, library and internet required for good education on a continuous basis.
- Encourage organizing and participation of staff and students in in-house and outside Training programmes, seminars, conferences and workshops on continuous basis.
- Provide incentives and encouragement to motivate staff and students to actively involve in research-innovative projects in collaboration with industry and R &D centres on continuous basis
- Invite more and more number of persons from industry from India and abroad for collaboration and promote Industry-Institute Partnership.
- Encourage consultancy and testing and respond to the needs of the immediate neighbourhood.

St Joseph Engineering College

AN AUTONOMOUS INSTITUTION

Affiliated to VTU, Belagavi | Recognised by AICTE, New Delhi
Accredited by NAAC with A+ Grade
B.E. (CSE, ECE, EEE, ME, CIV), MBA & MCA Accredited by NBA, New Delhi

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