E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

NAGAPATTINAM – 611002

(Affiliated to Anna University, Chennai | Accredited by NAAC with 'A++' Grade|Accredited by NBA T1(B.E. – CSE, CIVIL, ECE, EEE, MECH& B.Tech – IT) | Approved by AICTE, New Delhi)

MASTER OF COMPUTER APPLICATIONS R - 2024

FIRST YEAR

CURRICULUM AND SYLLABUS FOR SECOND SEMESTER

Course Code	Course Name	L	T	P	C	Maximum Marks			Category
						CIA	ES	Total	
Theory Course									
2402CA201	Full Stack Web Development	3	-	-	3	40	60	100	PC
2402CA202	Advanced Database Technologies	3	-	-	3	40	60	100	PC
2402CA203	Mobile Application Development	2	-	2	3	50	50	100	PC
2402CA204	Cloud Computing	3	-	-	3	40	60	100	PC
2402CA205	Software Testing	3	-	-	3	40	60	100	PC
	Professional Elective–I	3	-	-	3	40	60	100	PE
	Audit Course II*	2	-	-	-	100	0	100	AC
Laboratory Course									
2402CA206	Full Stack Web Development Laboratory	-	-	4	2	60	40	100	PC
2402CA207	Advanced Database Technologies Laboratory	-	-	4	2	60	40	100	PC
2404CA208	Professional Development Course II	-	-	2	1	100	-	100	EEC
Total		**19**	**0**	**12**	**23**	**570**	**430**	**1000**	

L-Lecture |T –Tutorial |P- Practical |CA – Continuous Assessment |ES – End Semester

2402CA201   **FULL STACK WEB DEVELOPMENT**   L   T   P   C
                                                              3   0   0   3

PREREQUISITE:

Basic knowledge of HTML, CSS, JavaScript, databases, and programming concepts.

COURSE OBJECTIVES:

1. To understand the fundamentals of web programming and client side scripting.
2. To learn server side development using NodeJS.
3. To understand API development with Express Framework.
4. To understand and architect databases using NoSQL and SQL databases.
5. To learn the advanced client side scripting and React JS framework

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1:   Develop client side scripting using HTML, CSS and JS..
CO2:   Develop server side application using NodeJS
CO3:   Create NoSQL databases with MongoDB
CO4:   Develop web application using Reac tJS.
CO5:   Implement a full-stack Single Page Application using React, NodeJS and MongoDB and deploy on Cloud.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	3	3	3	3	-	-	-	3	3	-
CO2	3	3	3	3	-	-	-	3	-	3
CO3	3	3	3	3	-	-	-	3	-	3
CO4	3	3	3	3	-	-	-	3	3	-
CO5	3	3	3	3	-	-	-	3	3	3

COURSE CONTENTS:

MODULE I   **INTRODUCTION TO CSS and JAVASCRIPT**   **9 Hours**
Introduction to Web: Server - Client - Communication Protocol (HTTP) Structure of HTML Documents Basic Markup tags Working with Text and Images with CSS CSS Selectors CSS Flexbox - JavaScript: Data Types and Variables - Functions - Events AJAX: GET and POST

MODULE II   **SERVER SIDE PROGRAMMING WITH NODE JS**   **9 Hours**
Introduction to Web Servers Javascript in the Desktop with NodeJS NPM Serving files with the http module Introduction to the Express framework Server-side rendering with Templating Engines Static Files - async/await - Fetching JSON from Express

MODULE III   **ADVANCED NODE JS AND DATABASE**   **9 Hours**
Introduction to NoSQL databases MongoDB system overview - Basic querying with MongoDB shell Request body parsing in Express NodeJS MongoDB connection Adding and retrieving data to MongoDB from NodeJS Handling SQL databases from NodeJS Handling Cookies in NodeJS Handling User Authentication with NodeJS

MODULE IV	ADVANCED CLIENT SIDE PROGRAMMING	9 Hours

React JS: ReactDOM - JSX - Components - Properties Fetch API - State and Lifecycle - -JS Localstorage - Events - Lifting State Up - Composition and Inheritance

MODULE V	APP IMPLEMENTATION IN CLOUD	9 Hours

Cloud providers Overview Virtual Private Cloud Scaling (Horizontal and Vertical) VirtualMachines, Ethernet and Switches Docker Container Kubernetes

TOTAL: 45 HOURS

REFERENCES:

1. David Flanagan, Script: The Definitive Media, Inc, 7th Edition, 2020

2. Matt Frisbie, "Professional JavaScript for Web Developers", Wiley Publishing, Inc, 4th Edition,ISBN: 978-1-119-36656- 0, 2019

3. Alex Banks, Eve Porcello, "Learning React", Media, Inc, 2nd Edition, 2020

4. Marc Wandschneider, Addison-Wesley Professional, 2nd Edition, 2016

5. Joe Beda, Kelsey Hightower, Brendan Burns, Up and Media,1st edition, 2017

6. Paul Zikopoulos, Christopher Bienko, Chris Backer, Chris Konarski, Sai Vennam, Without lly Media, 1st edition, 2021

2402CA202	ADVANCED DATABASES TECHNOLOGIES	L	T	P	C
		3	0	0	3

PREREQUISITE:

1. Basic Data Structure"s
2. Database management system

COURSE OBJECTIVES:

1. To understand the working principles and query processing of distributed databases.
2. To understand the basics of spatial, temporal and mobile databases and their applications.
3. To distinguish the different types of NoSQL databases.
4. To understand the basics of XML and create well-formed and valid XML documents.
5. To gain knowledge about information retrieval and web search.

COURSE OUTCOMES:
On the successful completion of the course, students will be able to
CO1: Design a distributed database system and execute distributed queries.
CO2: Manage Spatial and Temporal Database systems and implement it in corresponding applications
CO3: Use NoSQL database systems and manipulate the data associated with it.
CO4: Design XML database systems and validate with XML schema.
CO5: Apply knowledge of information retrieval concepts on web databases.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	3	3	3	3	2	-	-	2	3	2
CO2	3	3	3	2	2	-	-	2	2	3
CO3	3	3	3	3	1	-	-	3	2	3
CO4	3	2	3	2	1	-	-	2	2	2
CO5	3	3	3	2	1	-	-	3	2	3

COURSE CONTENTS:

MODULE I	DISTRIBUTED DATABASES	9 Hours

Distributed Systems Introduction Architecture Distributed Database Concepts Distributed Data Storage Distributed Transactions Commit Protocols Concurrency Control Distributed Query Processing

MODULE II	SPATIAL AND TEMPORAL DATABASES	9 Hours

Active Databases Model Design and Implementation Issues - Temporal Databases - Temporal Querying - Spatial Databases: Spatial Data Types, Spatial Operators and Queries SpatialIndexing and Mining Applications - Mobile Databases: Location and Handoff Management, Mobile Transaction Models Deductive Databases - Multimedia Databases.

MODULE III	NOSQL DATABASES	9 Hours

NoSQL CAP Theorem Sharding - Document based MongoDB Operation: Insert, Update, Delete, Query, Indexing, Application, Replication, Sharding Cassandra: Data Model, Key Space, Table Operations, CRUD Operations, CQL Types HIVE: Data types, Database Operations, Partitioning Hive QL Orient DB Graph database Orient DB Features

MODULE IV	XML DATABASES	9 Hours

Structured, Semi structured, and Unstructured Data XML Hierarchical Data Model XML Documents Document Type Definition XML Schema XML Documents and Databases XML Querying XPath XQuery

MODULE V	INTELLIGENT DATABASES	9 Hours

IR concepts Retrieval Models Queries in IR system Text Preprocessing Inverted Indexing Evaluation Measures Web Search and Analytics Current trends.

TOTAL: 45 HOURS

REFERENCES:

1. Abraham Silberschatz, Henry F Korth, S. Sudharshan, System Seventh Edition, McGraw Hill, 2019.

2. R. Elmasri, S.B. Navathe, of Database Seventh Edition, PearsonEducation/Addison Wesley, 2017.

3. Guy Harrison, Generation Databases, NoSQL, NewSQL and Big First Edition,Apress publishers, 2015

4. Jiawei Han, Micheline Kamber, Jian Pei, Mining: Concepts and ThirdEdition, Morgan Kaufmann, 2012.

5. Brad Dayley, Yourself NoSQL with MongoDB in 24 Sams Publishing, FirstEdition, 2014.

6. C. J. Date, A. Kannan, S. Swamynathan, Introduction to Database EighthEdition, Pearson Education, 2006

2402CA203	MOBILE APPLICATION DEVELOPMENT	L	T	P	C
		2	0	2	3

PREREQUISITE:

Basic knowledge of programming (Java/Kotlin or similar), object-oriented concepts, database fundamentals, and UI design principles.

COURSE OBJECTIVES:

1. To understand the need and characteristics of mobile applications.
2. To design the right user interface for mobile applications.
3. To understand the design issues in the development of mobile applications.
4. To understand the development procedure for mobile applications.
5. To develop mobile applications using various tools and platforms

COURSE OUTCOMES:

At the end of the course, students will be able to
CO1: Understand the basics of mobile application development frameworks and tools.
CO2: Develop a UI for mobile applications.
CO3: Design mobile applications that manage memory dynamically.
CO4: Build applications based on mobile OS like Android, iOs.
CO5: Develop web applications with cloud database access

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	3	2	2	3	1	-	-	2	3	2
CO2	2	2	3	3	2	-	-	2	3	1
CO3	3	3	3	3	1	-	-	2	3	2
CO4	3	3	3	3	2	1	-	3	3	2
CO5	3	2	3	3	2	1	-	3	3	3

COURSE CONTENTS:

MODULE I	INTRODUCTION	12 Hours

Mobile applications -Mobile Application Model Characteristics and Benefits- Comparing Native vs. Hybrid Applications- Infrastructure and Managing Resources Mobile Software Engineering- The Mobile Application Development Lifecycle -Mobile Device Profiles Frameworks and Tools - -The Mobile Application Front-End- The Mobile Application Back-End

Lab Component:

1. Install and configure java development kit (JDK), android studio and android SDK
2. Implement mobile applications using frameworks
3. Develop an application that uses GUI components, fonts and colours.

MODULE II	USER INTERFACE	12 Hours

Generic UI Development - UI Components - Event Handling - activity and its lifecycle Material Design: new themes, new widgets, Cardlayouts Backward compatibility v7 appcompat library Intent object, intent filters, adding categories Menus fragment and its lifecycle- Multimodal and Multichannel UI Gesture Based UI Screen Elements and Layouts Drawing and Working with Animation. Playing Audio and Video, Recording Audio and Video, U Voice XML.

Lab Component:
1. Implement mobile applications using UI toolkits.
2. Design an application that uses Layout Managers and event listeners.
3. Build a simple native calculator application to do simple arithmetic operations.
4. Create animations and graphical primitives in Android environment.

MODULE III	APPLICATION DESIGN	12Hours

Memory Management Design Patterns for Limited Memory Workflow for Application development Java API Dynamic Linking Plugins and rule of thumb for using DLLs Multithreading in Java - Concurrency and Resource Management-Architecture SDK Tools Languages for Android - XML Java / Kotlin - UI Widgets Layouts-Overview of Application Components - Android Intents, Types - SQLite Database CRUD

Lab Component:
1. Design a mobile application that is aware of the resource constraints of mobile devices.
2. Design an application that uses Dynamic Linking
3. Develop an application that makes use of SQL Lite mobile database.
4. Implement an application that uses Multi-threading

MODULE IV	MOBILE OS	12 Hours

Mobile OS: Android, iOS Android Application Architecture Understanding the anatomy of a mobile application - Android basic components Intents and Services Storing and Retrieving data Packaging and Deployment Security and Hacking-Android architecture ART(Android Runtime) ADB(Android Debug Bridge) Application framework basics-Java &Kotlin for Android, Swift & Objective-C for iOS, Basics of React Native, Native Components, JSX, State, Props.

Lab Component:
1.   Develop an application that makes use of mobile database
2.   Implement an android application that writes data into the SD card.
3.   Write a mobile application that makes use of RSS feed

MODULE V	APP IMPLEMENTATION IN CLOUD	12 Hours

Communication via the Web Notification and Alarms Graphics and Multimedia: Layer Animation, Event handling and Graphics services Telephony Location based services- Cloud Database Connectivity: Firebase, AWS, Google Cloud-Consuming Web Services Using HTTP-Consuming JSON Services-Popular Cross-platform App Development Frameworks, Flutter, Xamarin, React-Native, Basics of React Native, Native Components, JSX, State, Props.

Lab Component:
1. Develop a web based mobile application that accesses internet and location data.
2. Develop an android application using telephony to send SMS.
3. Implement simple gaming application using open-source tools like flutter or Unity

TOTAL: 60 HOURS

REFERENCES:

1. Reto Meier, Ian Lake, Professional 4th Edition, Wrox, 2018 2. Zigurd Mednieks, Laird Dornin, G. Blake Meike, Masumi Nakamura

2. Zigurd Mednieks, Laird Dornin, G. Blake Meike, Masumi Nakamura, 2nd Edition, 2012
3. Alasdair Allan, iOS Third Edition, 2013
4. Bill Phillips, Chris Stewart, Brian Hardy, and Kristin Marsicano, Android Programming: TheBig Nerd Ranch Guide, 4th edition, 2019
5 Christian Keur, Aaron Hillegass, iOS Programming: The Big Nerd Ranch Guide, 6thEdition, 2016

6 Barry Burd, Application Development All-In-One for 3rd Edition, 2021
7 Building Cross-Platform Mobile and Web Apps for Engineers and Scientists: An Active Learning Approach, Pawan Lingras, Matt Triff, RuchaLingras

2402CA204	CLOUD COMPUTING	L	T	P	C
		3	0	0	3

PREREQUISITE:

    1. Computer Networks
    2. Operating Systems

COURSE OBJECTIVES:

    1. To understand the basic concepts of Distributed systems.
    2. To learn about the current trend and basics of Cloud computing.
    3. To be familiar with various Cloud concepts.
    4. To expose with the Server, Network and storage virtualization.
    5. To be aware of Microservices and DevOps

COURSE OUTCOMES:

On the successful completion of the course, students will be able to
    CO1:   Use Distributed systems in Cloud Environment.
    CO2:   Understand the Basics of Cloud computing
    CO3:   Identify the Architecture, Infrastructure and delivery models of Cloud computing
    CO4:   Choose the appropriate current technology for the implementation of Cloud
    CO5:   Develop the Application in cloud environments and implementation of Micro services and Dev Ops

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	3	3	3	3	2	1	-	2	3	3
CO2	3	2	2	2	1	-	-	3	2	2
CO3	3	3	3	3	2	1	-	2	3	3
CO4	3	3	3	3	2	1	-	3	3	3
CO5	3	3	3	3	3	2	-	3	3	3

COURSE CONTENTS:

MODULE I	**DISTRIBUTED SYSTEMS**	**9 Hours**

Introduction to Distributed Systems Characterization of Distributed Systems Distributed Architectural Models Remote Invocation Request-Reply Protocols Remote Procedure Call Remote Method Invocation Group Communication Coordination in Group Communication Ordered Multicast Time Ordering Physical Clock Synchronization Logical Time and Logical Clocks.

MODULE II	**BASICS OF CLOUD COMPUTING**	**9 Hours**

Cloud Computing Basics Desired features of Cloud Computing Elasticity in Cloud On demand provisioning - Applications Benefits Cloud Components: Clients, Datacenters & Distributed Servers Characterization of Distributed Systems Distributed Architectural Models - Principles of Parallel and Distributed computing - Applications of Cloud computing Benefits Cloud services Open source Cloud Software: Eucalyptus, Open Nebula, Open stack, Aneka, Cloudsim

MODULE III	**CLOUD INFRASTRUCTURE**	**9 Hours**

Cloud Architecture and Design Architectural design challenges Technologies for Network- Based system - NIST Cloud computing Reference Architecture Public, Private and Hybrid clouds Cloud Models : IaaS, PaaS and SaaS Cloud storage providers - EnablingTechnologies for the Internet of Things Innovative Applications of the Internet of Things

| MODULE IV | CLOUD ENABLING TECHNOLOGIES | 9 Hours |

Service Oriented Architecture Web Services Basics of Virtualization Emulation Types of Virtualization Implementation levels of Virtualization Virtualization structures Tools & Mechanisms Virtualization of CPU, Memory & I/O Devices Desktop Virtualization Server Virtualization Google App Engine - AWS - Federation in the Cloud.

| MODULE V | MICROSERVICES AND DEVOPS | 9 Hours |

Defining Microservices - Emergence of Microservice Architecture Design patterns of Microservices The Mini web service architecture Microservice dependency tree Challenges with Microservices - SOA vs Microservice Microservice and API Deploying and maintaining Microservices Reason for having DevOps Overview of DevOps Core elements of DevOps Life cycle of DevOps Adoption of DevOps-- DevOps Tools Build, Promotion and Deployment in DevOps.

TOTAL: 45 HOURS

REFERENCES:
1. Kai Hwang, Geoffrey C. Fox & Jack J.Dongarra, "Distributed and Cloud Computing, FromParallel
Processing to the Internet of Things", Morgan Kaufmann Publishers, First Edition,2012
2. drew S. Tanenbaum & Maarten Van Systems - Principles Third Edition, Pearson, 2017.
3. Thomas Erl, Zaigham Mahood & Ricardo Puttini, Computing, Concept, Technology & Prentice Hall, SecondEdition, 2013.
4. Richard Rodger, Tao of ISBN 9781617293146, Manning Publications,First Edition, December 2017
5.On Microservices with Spring Boot and Spring Cloud: Build anddeploy microservices using spring cloud, Istio and Packt Publishing Ltd, First Edition, September 2019.

2402CA205	SOFTWARE TESTING	L	T	P	C
		3	0	0	3

PREREQUISITE:

Software Engineering Principles

COURSE OBJECTIVES:

1. To introduce the basics and necessity of software testing.
2. To provide various testing techniques along with concepts of software bugs and its impact.
3. To develop and validate a test plan.
4. To build a testing team required.
5. To understand the need for and challenges in test automation and to develop testing scripts.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to
CO1: Understand the insight of software testing.
CO2: Apply black box testing and white box testing for software applications.
CO3: Apply multiple levels of testing for software applications
CO4: Understand the role of a tester as an individual and as a team member.
CO5: Apply software testing for large projects using automated testing tools and Maintain documentation on testing.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	3	3	2	2	1	-	1	2	3	2
CO2	3	3	3	3	1	-	-	2	3	2
CO3	3	3	3	3	1	-	-	2	3	2
CO4	2	2	2	2	3	1	1	2	2	1
CO5	3	3	3	3	2	1	1	3	3	2

COURSE CONTENTS:

MODULE I   **TESTING PRINCIPLES AND AXIOMS**   **9 Hours**
Testing as a Process Testing Axioms Software Testing Principles Origins and Cost of Defects Defect
Classes and Examples Developer/Tester Support of Developing a Defect Repository Defect Prevention
Strategies.

MODULE II   **BLACK BOX, WHITE BOX TESTING AND TEST ADEQUACY**   **9 Hours**
Test Case Design Strategies Black Box Approach Boundary Value Analysis Equivalence Class Partitioning
State-Based Testing User Documentation Testing White Box Approach Static Testing vs. Structural
Testing Code Functional Testing Coverage and Control Flow Graphs Covering Code Logic Paths
Cyclomatic Complexity Test Adequacy Criteria.

MODULE III   **LEVELS OF TESTING**   **9 Hours**
Unit Test Planning Designing the Unit Test Process Running the Unit Tests and Recording Results
Integration Test Planning Scenario Testing Defect Bash Elimination System Testing Acceptance Testing
Performance Testing Regression Testing Internationalization Testing Ad-Hoc Testing Alpha, Beta Tests.

MODULE IV   **TEST MANAGEMENT**   **9 Hours**

Organization Structures for Testing Teams Testing Services Test Planning Attachments Locating Test Items Test Management Reporting Test Results The Role of Three Groups in Test Planning and Policy Development Introducing the Test Specialist Skills Needed by a Test Specialist Building a Testing Group.

| MODULE V | TEST AUTOMATION | 9 Hours |

Skill Needed for Automation Scope of Automation Design and Architecture for Automation Requirements for a Test Tool Challenges in Automation Test Metrics and Measurements Project, Progress and Productivity Metrics Maintenance of Documents During Testing.

TOTAL: 45 HOURS

REFERENCES:

1. Kai Hwang, Geoffrey C. Fox & Jack J.Dongarra, "Distributed and Cloud Computing, FromParallel

Processing to the Internet of Things", Morgan Kaufmann Publishers, First Edition,2012

2. drew S. Tanenbaum & Maarten Van Systems - Principles Third Edition, Pearson, 2017.

3. Thomas Erl, Zaigham Mahood & Ricardo Puttini, Computing, Concept, Technology & Prentice Hall, SecondEdition, 2013.

4. Richard Rodger, Tao of ISBN 9781617293146, Manning Publications,First Edition, December 2017

5.On Microservices with Spring Boot and Spring Cloud: Build anddeploy microservices using spring cloud, Istio and Packt Publishing Ltd, First Edition, September 2019.

2402CA206	FULL STACK WEB DEVELOPMENT LABORATORY	L	T	P	C
		0	0	4	2

PREREQUISITE:

Basic knowledge of HTML, CSS, JavaScript, databases, and server-side programming.

COURSE OBJECTIVES:

To implement the client side of the web application using javascript.
To understand Javascript on the desktop using NodeJS.
To develop a web application using NodeJS and Express.
To implement a SPA using React.
To develop a full stack single page application using React, NodeJS, and a Database (MongoDB or SQL).

COURSE OUTCOMES:

CO1: To implement and deploy the client side of the web application.
CO2: To develop and deploy server side applications using NodeJS.
CO3: To use Express framework in web development.
CO4: To implement and architect database systems in both NoSQL and SQL environments.
CO5: To develop a full stack single page application using React, NodeJS, and a Database and deploy using containers.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	3	2	3	3	2	1	-	2	3	2
CO2	3	3	3	3	2	1	-	2	3	2
CO3	3	2	3	3	2	1	-	2	3	2
CO4	3	3	3	3	2	1	-	3	3	3
CO5	3	3	3	3	3	2	1	3	3	3

LIST OF EXPERIMENTS:

1. Create a form and validate the contents of the form using JavaScript.
2. Get data using Fetch API from an open-source endpoint and display the contents in the form of a card.
3. Create a NodeJS server that serves static HTML and CSS files to the user without using Express.
4. Create a NodeJS server using Express that stores data from a form as a JSON file and displays it in another page. The redirect page should be prepared using Handlebars.
5. Create a NodeJS server using Express that creates, reads, updates and deletes students' details and stores them in MongoDB database. The information about the user should be obtained from a HTML form.
6. Create a NodeJS server that creates, reads, updates and deletes event details and stores them in a MySQL database. The information about the user should be obtained from a HTML form.
7. Create a counter using ReactJS
8. Create a To do application using ReactJS. Store the data to a JSON file using a simple NodeJS

server and retrieve the information from the same during page reloads.

9. Create a simple Sign up and Login mechanism and authenticate the user using cookies. The user information can be stored in either MongoDB or MySQL and the server should be built using NodeJS and Express Framework.
10. Create and deploy a virtual machine using a virtual box that can be accessed from the host computer using SSH.
11. Create a docker container that will deploy a NodeJS ping server using the NodeJS image.

TOTAL: 60 HOURS

REFERENCES:

1. David Flanagan, Script: The Definitive Media, Inc, 7th Edition, 2020
2. Matt Frisbie, "Professional JavaScript for Web Developers", Wiley Publishing, Inc, 4th Edition,ISBN: 978-1-119-36656- 0, 2019
3. Alex Banks, Eve Porcello, "Learning React", Media, Inc, 2nd Edition, 2020
4. Marc Wandschneider, Addison-Wesley Professional, 2nd Edition, 2016
5. Joe Beda, Kelsey Hightower, Brendan Burns, Up and Media,1st edition, 2017
6. Paul Zikopoulos, Christopher Bienko, Chris Backer, Chris Konarski, Sai Vennam, Without lly Media, 1st edition, 2021

2402CA207   **ADVANCED DATABASE TECHNOLOGY LABORATORY**   L   T   P   C
                                                                                      0   0   4   2

PREREQUISITE:

Fundamental knowledge of SQL, database design, and basic concepts of data structures.

COURSE OBJECTIVES:

1. To understand the process of distributing tables across multiple systems
2. To understand the process of storing, retrieving spatial and temporal data
3. To understand the process of storing, retrieving objects in a database
4. To understand the process of storing and retrieving data from a XML Database
5. To use the open source database for building a mobile application

COURSE OUTCOMES:

On completion of the course, the student will be able to:
   CO1:   Design and implement advanced databases.
   CO2:   Use big data frameworks and tools.
   CO3:   Formulate complex queries using SQL.
   CO4:   Create an XML document and perform Xquery.
   CO5:   Query processing in Mobile databases using open source tools.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	3	3	3	3	2	1	-	2	3	2
CO2	3	3	3	3	2	1	-	3	3	3
CO3	3	3	3	3	1	-	-	2	3	2
CO4	3	2	3	3	1	-	-	2	3	2
CO5	3	3	3	3	2	1	-	3	3	3

LIST OF EXPERIMENTS:

1 NOSQL Exercises
                a. MongoDB CRUD operations, Indexing, Sharding
                b. Cassandra: Table Operations, CRUD Operations, CQL Types
                c. HIVE: Data types, Database Operations, Partitioning HiveQL
                d. OrientDB Graph database OrientDB Features
2 MySQL Database Creation, Table Creation, Query
3 MySQL Replication – Distributed Databases
4 Spatial data storage and retrieval in MySQL
5 Temporal data storage and retrieval in MySQL
6 Object storage and retrieval in MySQL
7 XML Databases , XML table creation, XQuery FLWOR expression
8 Mobile Database Query Processing using open source DB MongoDB/MySQL etc)
                                                                TOTAL: 60 HOURS

REFERENCES:

1. Abraham Silberschatz, Henry F Korth, S. Sudharshan, System Seventh Edition, McGraw Hill, 2019.

2. R. Elmasri, S.B. Navathe, of Database Seventh Edition, PearsonEducation/Addison Wesley, 2017.

3. Guy Harrison, Generation Databases, NoSQL, NewSQL and Big First Edition,Apress publishers, 2015

4. Jiawei Han, Micheline Kamber, Jian Pei, Mining: Concepts and ThirdEdition, Morgan Kaufmann, 2012.

5. Brad Dayley, Yourself NoSQL with MongoDB in 24 Sams Publishing, FirstEdition, 2014.

6. C. J. Date, A. Kannan, S. Swamynathan, Introduction to Database EighthEdition, Pearson Education, 2006

2402CA209	**Professional Development Courses**	L	T	P	C
		0	0	2	1

PREREQUISITE:

Completion of Professional Development Course I and basic communication and interpersonal skills.

COURSE OBJECTIVES:

1. To understand the fundamentals of web programming and client side scripting.
2. To learn server side development using NodeJS.
3. To understand API development with Express Framework.

COURSE OUTCOMES:

CO1: Enhance professional communication and interview skills through resume presentation, self-introduction, and mock interviews.
CO2: Develop strong writing abilities in emails, essays, letters, and paragraphs while improving listening and speaking skills.
CO3: Apply quantitative aptitude skills to solve problems related to time, work, distance, profit & loss, and data interpretation.

COs Vs POs MAPPING:

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

COURSE CONTENTS:

MODULE I	**Interview Essentials II**	**10 Hours**

Interview Skills, developing professional behavior, Resume presentation, Self-introduction presentation,Interview etiquettes, Telephone etiquettes, Mock interview practice, Teamwork skills

MODULE II	**Writing Skills**	**10 Hours**

E-mail writing, Essay writing, Letter writing, Paragraph writing, Listening and speaking skills

MODULE III	**Aptitudes**	**10Hours**

Time and Work - Time and Distance - Profit and Loss - Simple Interest and Compound Interest - Problem on Ages - Data Interpretations

TOTAL: 30 HOURS

REFERENCES:
1. Arun Sharma, ‗How to Prepare for Logical Reasoning for CAT‗‗, 4th edition, McGraw Hills publication, 2017.
2. R S Agarwal, ‗A modern approach to Logical reasoning‗‗, revised edition, S.Chand publication, 2017.
3. B.S. Sijwalii and Indu Sijwali, ―A New Approach to REASONING Verbal & Non-Verbal‖, 2nd edition, Arihnat publication, 2014

4. Objective General English by SP Bakshi
5. English Grammar in use by Murphy.

2401AU004	CONSTITUTION OF INDIA	L	T	P	C
		2	0	0	0

PREREQUISITE:

Basic understanding of Indian history, political science, and fundamental civic concepts**.**

COURSE OBJECTIVES:

1.Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective
2.To address the growth of Indian opinion regarding modern Indian intellectuals" constitutional
3.Role and entitlement to civil and economic rights as well as the emergence nation hood in the early years of Indian nationalism
4.To address the role of socialism in India after the commencement of the Bolshevik evolutionin1917and its impact on the initial drafting of the Indian Constitution.

COURSE OUTCOMES:

CO1: Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
CO2: Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
CO3: Discuss the circumstances surrounding the foundation of the Congress Socialist Party[CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

COs Vs POs MAPPING:

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

COURSE CONTENTS:

MODULE I   HISTORY OF MAKING OF THE INDIAN CONSTITUTION   3 Hours
History, Drafting Committee, (Composition & Working)
MODULE II   PHILOSOPHY OF THE INDIAN CONSTITUTION   3 Hours
Preamble, Salient Features
MODULE III   CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES   6 Hours
Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.
MODULE IV   ORGANS OF GOVERNANCE   6 Hours
Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions
MODULE V   LOCAL ADMINISTRATION   6 Hours

District"s Administration head: Role and Importance Municipalities introduction mayor and role of Elected Representative, CEO, Municipal Corporation. Pachayati raj: Introduction, PRI: Zila, Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy(Different departments), Village level:Role of Elected and Appointed officials, Importance of grass root democracy.

MODULE V	**ELECTION COMMISSION**	**6 Hours**

Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.

TOTAL: 30 HOURS

REFERENCES:
1. The Constitution of India,1950(Bare Act),Government Publication.
2. Dr.S.N.Busi, Dr.B. R.Ambedkar framing of Indian Constitution,1st Edition, 2015
3. M.P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis,2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

2401CA003   **MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**   **L   T   P   C**

                                                                     3   0   0   3

PREREQUISITE:

       Basic knowledge of algebra, discrete mathematics, and logical reasoning.

COURSE OBJECTIVES:

1. To introduce Mathematical Logic and their rules for validating arguments and programmes.
2. To introduce counting principles for solving combinatorial problems.
3. To give exposure to Graph models and their utility in connectivity problems.
4. To introduce abstract notion of Algebraic structures for studying cryptographic and its related areas.
5. To introduce Boolean algebra as a special algebraic structure for understanding logical circuit problems.

COURSE OUTCOMES:

On Completion of the course, the students should be able to:
CO1:   Apply Mathematical Logic to validate logical arguments and programmes
CO2:   Apply combinatorial counting principles to solve application problems.
CO3:   Apply graph model and graph techniques for solving network other connectivity related problems.
CO4:   Apply algebraic ideas in developing cryptograph techniques for solving network security problems.
CO5:   Apply Boolean laws in developing and simplifying logical circuits.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	3	2	2	2	1	-	1	2	2	1
CO2	3	3	2	2	1	-	1	2	2	1
CO3	3	3	3	2	1	1	1	2	2	2
CO4	3	3	2	2	1	1	3	2	2	2
CO5	3	2	2	3	1	1	1	2	2	1

COURSE CONTENTS:

MODULE I	**LOGIC AND PROOFS**	**9 Hours**

Propositional Logic – Propositional Equivalences – Predicates and Quantifiers – Nested Quantifiers – Rules of Inference – Introduction to Proofs – Proof Methods and Strategy.

MODULE II	**COMBINATORICS**	**9 Hours**

Mathematical Induction – Strong Induction and Well Ordering – The Basics of Counting - The Pigeonhole Principle – Permutations and Combinations – Recurrence Relations Solving Linear Recurrence Relations Using Generating Functions – Inclusion – Exclusion – Principle and Its Applications

MODULE III	**GRAPHS**	**9 Hours**

Graphs and Graph Models – Graph Terminology and Special Types of Graphs – Matrix Representation of Graphs and Graph Isomorphism – Connectivity – Euler and Hamilton Paths.

MODULE IV	**ALGEBRAIC STRUCTURES**	**9 Hours**

Groups – Subgroups – Homomorphisms – Normal Subgroup and Coset – Lagrange‚s Theorem – Definitions and Examples of Rings and Fields.

| **MODULE V** | **LATTICES AND BOOLEAN ALGEBRA** | **9 Hours** |

Partial Ordering – Posets – Lattices as Posets – Properties of Lattices – Lattices as Algebraic Systems – Sub Lattices – Direct Product And Homomorphism – Some Special Lattices – Boolean Algebra

TOTAL: 45 HOURS

REFERENCES:

1. Kenneth H.Rosen, "Discrete Mathematics and its Applications", Tata McGraw Hill Pub. Co.Ltd., Seventh Edition, Special Indian Edition, New Delhi, 2011.

2. Tremblay J.P. and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, 30th Reprint, New

3. Ralph. P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", Pearson Education, 3rd Edition, New Delhi, 2014.

4. ThomasKoshy, "Discrete Mathematics with Applications", 2nd Edition, Elsevier Publications, Boston, 2006.

5. SeymourLipschutz and Mark Lipson,"Discrete Mathematics", Schaum‚s Outlines, Tata McGraw Hill Pub. Co. Ltd., Third Edition, New Delhi, 2013

2401CA004	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	2	4

PREREQUISITE:

Fundamental knowledge of computer organization, data handling, and programming concepts.

COURSE OBJECTIVES:

1. To understand the fundamentals of data models and conceptualize and depict a database system using ER diagram.
2. To make a study of SQL and relational database design.
3. To know about data storage techniques and query processing.
4. To impart knowledge in transaction processing, concurrency control techniques and recovery procedures.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to
- **CO1:** Understand the basic concepts of the database and data models.
- **CO2:** Design a database using ER diagrams and map ER into Relations and normalize the relations
- **CO3:** Acquire the knowledge of query evaluation to monitor the performance of the DBMS.
- **CO4:** Develop a simple database applications using normalization.
- **CO5:** Acquire the knowledge about different special purpose databases and to critique how they differ from traditional database systems.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	3	2	2	2	1	-	-	2	3	2
CO2	3	3	3	3	2	1	-	2	3	2
CO3	3	3	3	3	1	1	-	2	3	3
CO4	3	2	3	3	2	1	-	2	3	2
CO5	3	2	2	2	1	-	-	2	3	3

COURSE CONTENTS:

MODULE I	**INTRODUCTION**	**9 Hours**

File systems versus Database systems – Data Models – DBMS Architecture – Data Independence – Data Modeling using Entity – Relationship Model –E-R Modeling.

MODULE II	**RELATIONAL MODEL AND QUERY EVALUATION**	**9 Hours**

Relational Model Concepts – Relational Algebra – SQL – Basic Queries – Complex SQL Queries – Views – Constraints

MODULE III	**DATABASE DESIGN & APPLICATION DEVELOPMENT**	**9 Hours**

Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

MODULE IV	**TRANSACTION PROCESSING**	**9 Hours**

Quey Pocessing-Transaction Processing – Properties of Transactions - Serializability – Transaction support in SQL - Locking Techniques –Validation Techniques — Recovery concepts – Shadow paging – Log Based Recovery.

MODULE V	**FILES AND INDEXING**	**9 Hours**

File operations – Hashing Techniques – Indexing – Single level and Multi-level Indexes – B+ tree – Static Hashing

TOTAL: 45 HOURS

LIST OF EXPERIMENTS:

Data Definition Commands to create, describe, alter, rename, drop and truncate the tables

1. Data Manipulation Commands for inserting, deleting, updating and retrieving in Tables
2. Transaction Control Language Commands like Commit, Rollback and Save Point
3. Illustrate the statements to create index and drop index
4. Perform database querying using simple query, nested query, subquery and join operations
5. Create a PL/SQL block to implement implicit and explicit cursors
6. Create a PL/SQL block to implement procedures and functions
7. Create a PL/SQL block to execute triggers
8. Execute a procedure which handles exception using PL/SQL
9. Create a embedded PL/SQL block to connect with any host language like „C"

TOTAL: 45 HOURS

REFERENCES:

1. Abraham Silberschatz, Henry F.Korth and S.Sundarshan "Database System Concepts", Seventh Edition, McGraw Hill, 2017.

2. Ramez Elmasri and Shamkant Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education Delhi, 2017

3. RaghuRamakrishnan, ―Database Management Systems‖, Fourth Edition, McGrawHill College Publications, 2015.

4. Lee Chao, "Database Development and Management", Auerbach Publications, 1st edition, 2010

5. Carlos Coronel, Peter Rob, and Stephen Morris, "Database Principles Fundamentals of Design, Implementation, and Management –10th Edition", Course Technology, Cengage Learning, 2013

6. C.J. Date, "An Introduction to Database Systems", Eighth Edition, Pearson Education Delhi, 2003

2403CA003	ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

PREREQUISITE:

1. Data Structures and Algorithms
2. Data Mining Techniques

COURSE OBJECTIVES:

1. To understand the various characteristics and search strategies of Intelligent agents
2. To learn to represent knowledge in solving AI Problems
3. To understand different software agents design methods and its applications

COURSE OUTCOMES:

On the successful completion of the course, students will be able to
CO1: Explain the core concepts of Artificial systems
CO2: Apply appropriate search algorithm for a given problem
CO3: Represent a problem using first order and predicate logic
CO4: Design software agents to solve a problem
CO5: Design applications for NLP that use AI

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	3	2	2	2	1	1	1	2	3	2
CO2	3	3	3	2	1	1	1	2	3	3
CO3	3	3	3	2	1	1	1	1	2	2
CO4	3	3	3	3	2	2	1	2	3	3
CO5	3	3	3	3	2	1	2	2	3	3

COURSE CONTENTS:

MODULE I	INTRODUCTION TO AI	9 Hours

Introduction–Definition - Future of Artificial Intelligence – Characteristics of Intelligent Agents–Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

MODULE II	PROBLEM SOLVING METHODS	9 Hours

Problem solving Methods - Search Strategies- Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing - Optimal Decisions in Games – Alpha - Beta Pruning - Stochastic Games

MODULE III	KNOWELDGE REPRESENTATION	9 Hours

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation - Ontological Engineering-Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information

MODULE IV	SOFTWARE AGENTS	9 Hours

Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining –Argumentation among Agents – Trust and Reputation in Multi-agent systems– Case Studies.

MODULE V	APPLICATIONS OF AI	9 Hours

AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing - Machine Translation – Speech Recognition – Robot – Hardware –Perception – Planning – Moving– Case Studies.

TOTAL: 45 HOURS

REFERENCES:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition, 2009.

2. I. Bratko, ―Prolog: Programming for Artificial Intelligence‖, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.

3. M. Tim Jones, ―Artificial Intelligence: A Systems Approach(Computer Science)‖, Jones and Bartlett Publishers, Inc.; First Edition, 2008

4. Gerhard Weiss, ―Multi Agent Systems‖, Second Edition, MIT Press, 2013. 5. David L. Poole and Alan K. Mackworth, ―Artificial Intelligence: Foundations of Computational Agents‖, Cambridge University Press, 2010.

5. https://www.javatpoint.com/artificial-intelligence-tutorial

6. https://www.tutorialspoint.com/artificial_intelligence/index.htm

7. https://intellipaat.com/blog/tutorial/artificial-intelligence-tutorial/

2403CA004   **DATA ANALYTICS**   L   T   P   C
                                                                       3   0   0   3

PREREQUISITE:

Big Data Technologies

COURSE OBJECTIVES:

1. To understand fundamentals of BigData and Hadoop
2. To learn about file system configuration in HADOOP
3. To learn MapReduce concept of Hadoop in executing Task
4. To learn the Queue Processing and stream processing of Data
5. To learn about Hadoop Frameworks

COURSE OUTCOMES:

On the successful completion of the course, students will be able to
  CO1:   Apply Hadoop for analyzing Big Volume of Data
  CO2:   Implement Big Data Activities using Hadoop
  CO3:   Design of Algorithms to solve Data Intensive Problems using Map Reduce Paradigm
  CO4:   Design and Implementation of Stream processing using kafka
  CO5:   Implement Big Data Activities using Hadoop Framework

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	3	2	2	3	1	1	1	2	3	3
CO2	3	2	2	3	1	1	1	2	3	3
CO3	3	3	3	3	1	1	1	2	3	3
CO4	3	3	3	3	2	2	1	2	3	3
CO5	3	2	3	3	2	1	1	2	3	3

COURSE CONTENTS:

  MODULE I   **INTRODUCTION TO BIGDATA AND HADOOP**   **9 Hours**
Types of Digital Data - Introduction to Big Data -Challenges of conventional systems - Web data Evolution of Analytic scalability - Analytic Processes and Tools -Analysis vs Reporting -History of Hadoop- Apache Hadoop - Analyzing Data with Hadoop- Hadoop Streaming
  MODULE II   **HDFS & HADOOP I/O**   **9 Hours**
Hadoop Distributed File System :The Design of HDFS- HDFS Concepts- The Command-Line Interface- Hadoop File Systems- Data Flow-Parallel Copying with distcp-Hadoop Archives- Hadoop I/O:Data Integrity- Compression-Serialization
  MODULE III   **MAPREDUCE**   **9 Hours**
Analyzing the Data with Hadoop- Hadoop Pipes- MapReduce Types - Input Formats- Output Formats- MapReduce Features - MapReduce Works - Anatomy of a MapReduce Job Run Failures -Job Scheduling- Shuffleand Sort -Task Execution

  MODULE IV   **QUEUEING AND STREAM PROCESSING SYSTEMS**   **9 Hours**
Queueing: Queueing systems, Introduction to kafka, producer consumer, brokers, types of queues - Single consumer, multi consumer queue servers. Streaming systems: Stream processing queues and workers-

micro batch streaming processing Introduction to kafka streaming processing API

| **MODULE V** | **HADOOP FRAMEWORKS** | **9 Hours** |

Pig: Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. Hive : Hive Shell, Hive Services, Hive Meta store, Comparison with Traditional Databases, Hive QL, Tables, Querying Data

TOTAL: 45 HOURS

REFERENCES:

1.Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with advanced analytics,JohnWiley&sons,2012.

2.Michael Berthold,DavidJ. Hand, Intelligent DataAnalysis, Springer,2007

3.Tom

4.Paul Zikopoulos ,Dirk DeRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles ,DavidCorigan,"HarnessthePowerBigDataTheIBMBigDataPlatform",TataMcGrawHillPublications,2012.

5.Kafka: The Definitive Guide- Real-Time Data and Stream Processing at Scale,by GwenShapira,Neha Narkhede,ToddPalino