8. Write SQL Triggers for insert, delete, and update operations in a database table.
9. Create View and index for database tables with a large number of records.
10. Create an XML database and validate it using XML schema.
11. Create Document, column and graph based data using NOSQL database tools.
12. Develop a simple GUI based database application and incorporate all the above-mentioned features
13. Case Study using any of the real life database applications from the following list
    a) Inventory Management for a EMart Grocery Shop
    b) Society Financial Management
    c) Cop Friendly App – Eseva
    d) Property Management – eMall
    e) Star Small and Medium Banking and Finance
    - Build Entity Model diagram. The diagram should align with the business and functional goals stated in the application.
    - Apply Normalization rules in designing the tables in scope.
    - Prepared applicable views, triggers (for auditing purposes), functions for enabling enterprise grade features.
    - Build PL SQL / Stored Procedures for Complex Functionalities, ex EOD Batch Processing for calculating the EMI for Gold Loan for each eligible Customer.

● Ability to showcase ACID Properties with sample queries with appropriate settings

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of this course, the students will be able to:

CO1: Create databases with different types of key constraints.

CO2: Construct simple and complex SQL queries using DML and DCL commands.

CO3: Use advanced features such as stored procedures and triggers and incorporate in GUI based application development.

CO4: Create an XML database and validate with meta-data (XML schema).

CO5: Create and manipulate data using NOSQL database.

CO's-PO's & PSO's MAPPING

CO's	**PO's**												**PSO's**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	3	3	-	-	-	-	3	1	3	2	2	3	2
2	2	2	3	2	2	-	-	-	1	2	3	3	2	1	2
3	3	3	2	1	1	-	-	-	1	1	1	3	2	3	3
4	1	3	3	3	1	-	-	-	1	1	3	2	3	1	3
5	3	2	1	1	1	-	-	-	2	2	3	1	3	1	2
AVg.	2	3	2	2	1	-	-	-	2	1	3	2	2	2	2

1 - low, 2 - medium, 3 - high, '-"- no correlation

CS3591 COMPUTER NETWORKS L T P C
3 0 2 4

COURSE OBJECTIVES:

- To understand the concept of layering in networks.
- To know the functions of protocols of each layer of TCP/IP protocol suite.
- To visualize the end-to-end flow of information.

- To learn the functions of network layer and the various routing protocols
- To familiarize the functions and protocols of the Transport layer

UNIT I INTRODUCTION AND APPLICATION LAYER 10

Data Communication - Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Introduction to Sockets - Application Layer protocols: HTTP – FTP – Email protocols (SMTP - POP3 - IMAP - MIME) – DNS – SNMP

UNIT II TRANSPORT LAYER 9

Introduction - Transport-Layer Protocols: UDP – TCP: Connection Management – Flow control - Congestion Control - Congestion avoidance (DECbit, RED) – SCTP – Quality of Service

UNIT III NETWORK LAYER 7

Switching : Packet Switching - Internet protocol - IPV4 – IP Addressing – Subnetting - IPV6, ARP, RARP, ICMP, DHCP

UNIT IV ROUTING 7

Routing and protocols: Unicast routing - Distance Vector Routing - RIP - Link State Routing – OSPF – Path-vector routing - BGP - Multicast Routing: DVMRP – PIM.

UNIT V DATA LINK AND PHYSICAL LAYERS 12

Data Link Layer – Framing – Flow control – Error control – Data-Link Layer Protocols – HDLC – PPP - Media Access Control – Ethernet Basics – CSMA/CD – Virtual LAN – Wireless LAN (802.11) - Physical Layer: Data and Signals - Performance – Transmission media- Switching – Circuit Switching.

45 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and trace route PDUs using a network protocol analyzer and examine.
2. Write a HTTP web client program to download a web page using TCP sockets.
3. Applications using TCP sockets like: a) Echo client and echo server b) Chat
4. Simulation of DNS using UDP sockets.
5. Use a tool like Wireshark to capture packets and examine the packets
6. Write a code simulating ARP /RARP protocols.
7. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
8. Study of TCP/UDP performance using Simulation tool.
9. Simulation of Distance Vector/ Link State Routing algorithm.
10. Simulation of an error correction code (like CRC)

COURSE OUTCOMES:

At the end of this course, the students will be able to:

CO 1: Explain the basic layers and its functions in computer networks.
CO 2: Understand the basics of how data flows from one node to another.
CO 3: Analyze routing algorithms.
CO 4: Describe protocols for various functions in the network.
CO 5: Analyze the working of various application layer protocols.

TOTAL :75 PERIODS

TEXT BOOKS

1. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Eighth Edition, Pearson Education, 2021.
2. Behrouz A. Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, Sixth Edition TMH, 2022

REFERENCES

1. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
2. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.
3. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
4. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, “Computer Networks: An Open Source Approach”, McGraw Hill, 2012.

CO’s-PO’s & PSO’s MAPPING

CO’s	PO’s												PSO’s		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	-	2	-	-		-	-	-	-	-	-	-	3	-	-
2	-	1	-	-	2	-	-	-	-	-	-	2	-	2	-
3	-	2	-	-	3	-	-	-	-	-	-	-	-	3	-
4	-		-	1	2	-	-	-	-	3	-	-	-	-	-
5	-	3	2	-	-	-	-	-	-	-	-	-	-	-	3
AVg.	-	**1**	-	-	**1**	-	-	-	-	**1**	-	-	-	**1**	**1**

1 - low, 2 - medium, 3 - high, ‘-“- no correlation

IT3501 FULL STACK WEB DEVELOPMENT L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand the various components of full stack development
- To learn Node.js features and applications
- To develop applications with MongoDB
- To understand the role of Angular and Express in web applications
- To develop simple web applications with React

UNIT I BASICS OF FULL STACK 9

Understanding the Basic Web Development Framework - User - Browser – Webserver - Backend Services – MVC Architecture - Understanding the different stacks –The role of Express – Angular – Node – Mongo DB – React

UNIT II NODE JS 9

Basics of Node JS – Installation – Working with Node packages – Using Node package manager – Creating a simple Node.js application – Using Events – Listeners –Timers - Callbacks – Handling Data I/O – Implementing HTTP services in Node.js

UNIT III MONGO DB 9

Understanding NoSQL and MongoDB – Building MongoDB Environment – User accounts – Access control – Administering databases – Managing collections – Connecting to MongoDB from Node.js – simple applications

UNIT IV EXPRESS AND ANGULAR 9

Implementing Express in Node.js - Configuring routes - Using Request and Response objects - Angular - Typescript - Angular Components - Expressions - Data binding - Built-in directives

UNIT V REACT 9

MERN STACK – Basic React applications – React Components – React State – Express REST APIs - Modularization and Webpack - Routing with React Router – Server-side rendering

COURSE OUTCOMES:

At the end of the course, students will be able to

CO1: Understand the various stacks available for web application development

CO2: Use Node.js for application development

CO3: Develop applications with MongoDB

CO4: Use the features of Angular and Express

CO5: Develop React applications

TOTAL:45 PERIODS

TEXT BOOKS

1. Brad Dayley, Brendan Dayley, Caleb Dayley, ‘Node.js, MongoDB and Angular Web Development’, Addison-Wesley, Second Edition, 2018
2. Vasan Subramanian, ‘Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node’, Second Edition, Apress, 2019.

REFERENCES

1. Chris Northwood, ‘The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer’, Apress; 1st edition, 2018
2. Kirupa Chinnathambi, ‘Learning React: A Hands-On Guide to Building Web Applications Using React and Redux’, Addison-Wesley Professional, 2nd edition, 2018
3. https://www.tutorialspoint.com/the_full_stack_web_development/index.asp
4. https://www.coursera.org/specializations/full-stack-react
5. https://www.udemy.com/course/the-full-stack-web-development/

CO’s-PO’s & PSO’s MAPPING

CO’s	PO’s												PSO’s		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	0	0	0	0	0	0	1	1	1	1	1	1	0
2	3	3	3	3	2	1	0	0	2	0	2	3	2	2	1
3	3	3	2	2	2	2	0	0	2	2	2	3	2	2	1
4	3	3	2	2	2	1	0	0	1	1	2	2	2	1	1
5	3	3	3	3	3	1	0	0	0	0	2	2	2	2	1
AVg.	3	3	2	2	2	1	0	0	1	1	2	2	2	2	1

1 - low, 2 - medium, 3 - high, ‘-“- no correlation

CS3551 **DISTRIBUTED COMPUTING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To introduce the computation and communication models of distributed systems
- To illustrate the issues of synchronization and collection of information in distributed systems
- To describe distributed mutual exclusion and distributed deadlock detection techniques
- To elucidate agreement protocols and fault tolerance mechanisms in distributed systems
- To explain the cloud computing models and the underlying concepts

UNIT I INTRODUCTION 8

Introduction: Definition-Relation to Computer System Components – Motivation – Message -Passing Systems versus Shared Memory Systems – Primitives for Distributed Communication – Synchronous versus Asynchronous Executions – Design Issues and Challenges; A Model of Distributed Computations: A Distributed Program – A Model of Distributed Executions – Models of Communication Networks – Global State of a Distributed System.

UNIT II LOGICAL TIME AND GLOBAL STATE 10

Logical Time: Physical Clock Synchronization: NTP – A Framework for a System of Logical Clocks – Scalar Time – Vector Time; Message Ordering and Group Communication: Message Ordering Paradigms – Asynchronous Execution with Synchronous Communication – Synchronous Program Order on Asynchronous System – Group Communication – Causal Order – Total Order; Global State and Snapshot Recording Algorithms: Introduction – System Model and Definitions – Snapshot Algorithms for FIFO Channels.

UNIT III DISTRIBUTED MUTEX AND DEADLOCK 10

Distributed Mutual exclusion Algorithms: Introduction – Preliminaries – Lamport’s algorithm – Ricart- Agrawala’s Algorithm –– Token-Based Algorithms – Suzuki-Kasami’s Broadcast Algorithm; Deadlock Detection in Distributed Systems: Introduction – System Model – Preliminaries – Models of Deadlocks – Chandy-Misra-Haas Algorithm for the AND model and OR Model.

UNIT IV CONSENSUS AND RECOVERY 10

Consensus and Agreement Algorithms: Problem Definition – Overview of Results – Agreement in a Failure-Free System(Synchronous and Asynchronous) – Agreement in Synchronous Systems with Failures; Checkpointing and Rollback Recovery: Introduction – Background and Definitions – Issues in Failure Recovery – Checkpoint-based Recovery – Coordinated Checkpointing Algorithm -- Algorithm for Asynchronous Checkpointing and Recovery

UNIT V CLOUD COMPUTING 7

Definition of Cloud Computing – Characteristics of Cloud – Cloud Deployment Models – Cloud Service Models – Driving Factors and Challenges of Cloud – Virtualization – Load Balancing – Scalability and Elasticity – Replication – Monitoring – Cloud Services and Platforms: Compute Services – Storage Services – Application Services

COURSE OUTCOMES:

Upon the completion of this course, the student will be able to

CO1: Explain the foundations of distributed systems (K2)

CO2: Solve synchronization and state consistency problems (K3)
CO3 Use resource sharing techniques in distributed systems (K3)
CO4: Apply working model of consensus and reliability of distributed systems (K3)
CO5: Explain the fundamentals of cloud computing (K2)

TOTAL:45 PERIODS

TEXT BOOKS

1. Kshemkalyani Ajay D, Mukesh Singhal, "Distributed Computing: Principles, Algorithms and Systems", Cambridge Press, 2011.
2. Mukesh Singhal, Niranjan G Shivaratri, "Advanced Concepts in Operating systems", Mc-Graw Hill Publishers, 1994.

REFERENCES

1. George Coulouris, Jean Dollimore, Time Kindberg, "Distributed Systems Concepts and Design", Fifth Edition, Pearson Education, 2012.
2. Pradeep L Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.
3. Tanenbaum A S, Van Steen M, "Distributed Systems: Principles and Paradigms", Pearson Education, 2007.
4. Liu M L, "Distributed Computing: Principles and Applications", Pearson Education, 2004.
5. Nancy A Lynch, "Distributed Algorithms", Morgan Kaufman Publishers, 2003.
6. Arshdeep Bagga, Vijay Madisetti, " Cloud Computing: A Hands-On Approach", Universities Press, 2014.

CO's-PO's & PSO's MAPPING

CO's	**PO's**												**PSO's**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	2	3	3	1	-	-	-	2	1	3	3	2	1	1
2	1	3	2	1	2	-	-	-	2	2	2	2	1	3	2
3	2	2	1	3	3	-	-	-	3	2	1	1	1	2	1
4	1	2	2	3	1	-	-	-	3	3	2	1	3	1	1
5	3	3	1	2	3	-	-	-	3	3	3	1	3	2	3
AVg.	1.8	2.4	1.8	2.4	2	-	-	-	2.6	2.2	2.2	1.6	2	1.8	1.6

1 - low, 2 - medium, 3 - high, '-"- no correlation

CS3691 EMBEDDED SYSTEMS AND IOT

L T P C
3 0 2 4

COURSE OBJECTIVES:

- To learn the internal architecture and programming of an embedded processor.
- To introduce interfacing I/O devices to the processor.
- To introduce the evolution of the Internet of Things (IoT).
- To build a small low-cost embedded and IoT system using Arduino/Raspberry Pi/ open platform.
- To apply the concept of Internet of Things in real world scenario.

UNIT I 8-BIT EMBEDDED PROCESSOR 9

8-Bit Microcontroller – Architecture – Instruction Set and Programming – Programming Parallel Ports – Timers and Serial Port – Interrupt Handling.

UNIT II EMBEDDED C PROGRAMMING 9

Memory And I/O Devices Interfacing – Programming Embedded Systems in C – Need For RTOS – Multiple Tasks and Processes – Context Switching – Priority Based Scheduling Policies.

UNIT III IOT AND ARDUINO PROGRAMMING 9

Introduction to the Concept of IoT Devices – IoT Devices Versus
Computers – IoT Configurations – Basic Components – Introduction to Arduino – Types of Arduino – Arduino Toolchain – Arduino Programming Structure – Sketches – Pins – Input/Output From Pins Using Sketches – Introduction to Arduino Shields – Integration of Sensors and Actuators with Arduino.

UNIT IV IOT COMMUNICATION AND OPEN PLATFORMS 9

IoT Communication Models and APIs – IoT Communication Protocols – Bluetooth – WiFi – ZigBee – GPS – GSM modules – Open Platform (like Raspberry Pi) – Architecture – Programming – Interfacing – Accessing GPIO Pins – Sending and Receiving Signals Using GPIO Pins – Connecting to the Cloud.

UNIT V APPLICATIONS DEVELOPMENT 9

Complete Design of Embedded Systems – Development of IoT Applications – Home Automation – Smart Agriculture – Smart Cities – Smart Healthcare.

45 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

1. Write 8051 Assembly Language experiments using simulator.
2. Test data transfer between registers and memory.
3. Perform ALU operations.
4. Write Basic and arithmetic Programs Using Embedded C.
5. Introduction to Arduino platform and programming
6. Explore different communication methods with IoT devices (Zigbee, GSM, Bluetooth)
7. Introduction to Raspberry PI platform and python programming
8. Interfacing sensors with Raspberry PI
9. Communicate between Arduino and Raspberry PI using any wireless medium
10. Setup a cloud platform to log the data
11. Log Data using Raspberry PI and upload to the cloud platform
12. Design an IOT based system

COURSE OUTCOMES:

CO1: Explain the architecture of embedded processors.
CO2: Write embedded C programs.
CO3: Design simple embedded applications.
CO4: Compare the communication models in IOT
CO5: Design IoT applications using Arduino/Raspberry Pi /open platform.

TOTAL:75 PERIODS

TEXTBOOKS

1. Muhammed Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, “The 8051 Microcontroller and Embedded Systems”, Pearson Education, Second Edition, 2014

2. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, “IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things”, CISCO Press, 2017.

REFERENCES

1. Michael J. Pont, “Embedded C”, Pearson Education, 2007.
2. Wayne Wolf, “Computers as Components: Principles of Embedded Computer System Design”, Elsevier, 2006.
3. Andrew N Sloss, D. Symes, C. Wright, “Arm System Developer's Guide”, Morgan Kauffman/ Elsevier, 2006.
4. Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015

CO’s-PO’s & PSO’s MAPPING

CO’s	PO’s												PSO’s		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	3	-	-	-	-	1	2	3	3	2	1	3
2	2	1	3	2	2	-	-	-	1	2	2	3	3	1	3
3	3	1	3	3	1	-	-	-	1	2	1	1	1	3	3
4	3	2	3	2	1	-	-	-	1	2	2	3	2	2	1
5	2	3	3	2	2	-	-	-	1	3	3	2	3	1	3
AVg.	2.6	2	3	2.4	1.5	-	-	-	1	2.2	2.2	2.4	2.2	1.6	2.6

1 - low, 2 - medium, 3 - high, ‘-“- no correlation

IT3511 FULL STACK WEB DEVELOPMENT LAB L T P C
0 0 4 2

COURSE OBJECTIVES:

- To develop full stack applications with clear understanding of user interface, business logic and data storage.
- To design and develop user interface screens for a given scenario
- To develop the functionalities as web components as per the requirements
- To implement the database according to the functional requirements
- To integrate the user interface with the functionalities and data storage.

LIST OF EXPERIMENTS:

The Instructor can choose the technology stack to develop the following full stack experiments – based on the Full Stack Web Development Theory Course.

1. Develop a portfolio website for yourself which gives details about yourself for a potential recruiter.
2. Create a web application to manage the TO-DO list of users, where users can login and manage their to-do items
3. Create a simple micro blogging application (like twitter) that allows people to post their content which can be viewed by people who follow them.
4. Create a food delivery website where users can order food from a particular restaurant listed in the website.
5. Develop a classifieds web application to buy and sell used products.

6. Develop a leave management system for an organization where users can apply different types of leaves such as casual leave and medical leave. They also can view the available number of days.
7. Develop a simple dashboard for project management where the statuses of various tasks are available. New tasks can be added and the status of existing tasks can be changed among Pending, InProgress or Completed.
8. Develop an online survey application where a collection of questions is available and users are asked to answer any random 5 questions.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

CO1: Design full stack applications with clear understanding of user interface, business logic and data storage.

CO2: Design and develop user interface screens

CO3: Implement the functional requirements using appropriate tool

CO4: Design and develop database based on the requirements

CO5: Integrate all the necessary components of the application

CO's-PO's & PSO's MAPPING

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	1	3	1	1	1	2	1	1	1	2	2	1
2	3	3	3	2	3	1	1	1	2	1	1	1	2	2	1
3	3	3	3	3	3	1	1	1	2	1	1	1	2	2	1
4	3	3	3	3	3	2	1	1	1	1	2	1	1	2	1
5	3	3	3	3	2	1	1	1	1	1	1	1	2	2	1
AVg.	3	3	3	2	3	1	1	1	1	1	1	1	2	2	1

1 - low, 2 - medium, 3 - high, '-"- no correlation

CCS356 OBJECT ORIENTED SOFTWARE ENGINEERING

L T P C
3 0 2 4

COURSE OBJECTIVES:

- To understand Software Engineering Lifecycle Models
- To Perform software requirements analysis
- To gain knowledge of the System Analysis and Design concepts using UML.
- To understand software testing and maintenance approaches
- To work on project management scheduling using DevOps

UNIT I SOFTWARE PROCESS AND AGILE DEVELOPMENT 9

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models –Introduction to Agility-Agile process-Extreme programming-XP Process-Case Study.

UNIT II REQUIREMENTS ANALYSIS AND SPECIFICATION 9

Requirement analysis and specification – Requirements gathering and analysis – Software Requirement Specification – Formal system specification – Finite State Machines – Petrinets –