VISION OF THE DEPARTMENT
To educate students with conceptual knowledge and technical skills in the field of Information Technology with moral and ethical values to achieve excellence in academic, industry and research centric environments.

MISSION OF THE DEPARTMENT
1. To inculcate in students a firm foundation in theory and practice of IT skills coupled with the thought process for disruptive innovation and research methodologies, to keep pace with emerging technologies.
2. To provide a conducive environment for all academic, administrative and interdisciplinary research activities using state-of-the-art technologies.
3. To stimulate the growth of graduates and doctorates, who will enter the workforce as productive IT engineers, researchers and entrepreneurs with necessary soft skills, and continue higher professional education with competence in the global market.
4. To enable seamless collaboration with the IT industry and Government for consultancy and sponsored research.
5. To cater to cross-cultural, multinational and demographic diversity of students.
6. To educate the students on the social, ethical, and moral values needed to make significant contributions to society.
1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

1. To prepare students with breadth of knowledge to comprehend, analyze, design and create computing solutions to real-life problems and to excel in industry/technical profession.
2. To provide students with solid foundation in mathematical and computing fundamentals and techniques required to solve technology related problems and to pursue higher studies and research.
3. To inculcate a professional and ethical attitude in students, to enable them to work towards a broad social context.
4. To empower students with skills required to work as member and leader in multidisciplinary teams and with continuous learning ability on technology and trends needed for a successful career.

2. PROGRAMME OUTCOMES (POs):

After going through the two years of study, our master's in computer applications Graduates will exhibit ability to:

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<td>An ability to create, select, adapt and apply appropriate innovative techniques, resources, and modern computing tools to complex computing activities with an understanding of the limitations.</td>
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<td>An ability to recognize the need and to engage in independent learning for continual development as a computing professional.</td>
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<td>An ability to function effectively as an individual and as a member/leader of a team in various technical environments.</td>
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ANNA UNIVERSITY, CHENNAI  
UNIVERSITY DEPARTMENTS  
REGULATIONS – 2023  
CHOICE BASED CREDIT SYSTEM  
MASTER OF COMPUTER APPLICATIONS  
CURRICULUM AND SYLLABI  

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ATTTested  
DIRECTOR  
Centre for Academic Courses  
Anna University, Chennai-600 025
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UNIT I  LINEAR ALGEBRA  12

UNIT II  ONE DIMENSIONAL RANDOM VARIABLES  12

UNIT III  RANDOM PROCESSES  12
Classification – Auto correlation - Cross correlation - Stationary random process – Markov process — Markov chain - Poisson process – Gaussian process.

UNIT IV  LINEAR PROGRAMMING  12
Formulation – Graphical solution – Simplex method – Two phase method - Transportation and Assignment Models

UNIT V  FOURIER TRANSFORM FOR PARTIAL DIFFERENTIAL EQUATIONS  12

TOTAL: 60 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1 Apply the concepts of linear algebra to solve practical problems.
CO2 Use the ideas of probability and random variables in solving engineering problems.
CO3 Classify various random processes and solve problems involving stochastic processes.
CO4 Formulate and construct mathematical models for linear programming problems and solve the transportation and assignment problems.
CO5 Apply the Fourier transform methods of solving standard partial differential equations.

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RM3151 RESEARCH METHODOLOGY AND IPR L T P C 2 1 0 3

UNIT I RESEARCH PROBLEM FORMULATION 9
Objectives of research, types of research, research process, approaches to research; conducting literature review - information sources, information retrieval, tools for identifying literature, Indexing and abstracting services, Citation indexes, summarizing the review, critical review, identifying research gap, conceptualizing and hypothesizing the research gap.

UNIT II RESEARCH DESIGN AND DATA COLLECTION 9
Statistical design of experiments - types and principles; data types & classification; data collection - methods and tools.

UNIT III DATA ANALYSIS, INTERPRETATION AND REPORTING 9
Sampling, sampling error, measures of central tendency and variation; test of hypothesis - concepts; data presentation - types of tables and illustrations; guidelines for writing the abstract, introduction, methodology, results and discussion, conclusion sections of a manuscript; guidelines for writing thesis, research proposal; References – Styles and methods, Citation and listing system of documents; plagiarism, ethical considerations in research.

UNIT IV INTELLECTUAL PROPERTY RIGHTS 9
Concept of IPR, types of IPR - Patent, Designs, Trademarks and Trade secrets, Geographical indications, Copy rights, applicability of these IPR; IPR & biodiversity; IPR development process, role of WIPO and WTO in IPR establishments, common rules of IPR practices, types and features of IPR agreement, functions of UNESCO in IPR maintenance.

UNIT V PATENTS 9
Patents – objectives and benefits of patent, concept, features of patent, inventive steps, specifications, types of patent application; patenting process - patent filling, examination of patent, grant of patent, revocation; equitable assignments; Licenses, licensing of patents; patent agents, registration of patent agents.

TOTAL: 45 PERIODS

COURSE OUTCOMES
Upon completion of the course, the student can
CO1: Describe different types of research; identify, review and define the research problem
CO2: Select suitable design of experiment s; describe types of data and the tools for collection of data
CO3: Explain the process of data analysis; interpret and present the result in suitable form
CO4: Explain about Intellectual property rights, types and procedures

Attested,

DICTOR
CA3101 DATA STRUCTURES

UNIT I LINEAR DATA STRUCTURES

UNIT II TREES

UNIT III GRAPHS
The Graph Abstract Data Type, Introduction, Definition, Graph Representation, Elementary Graph Operation, Depth First Search, Breadth First Search, Connected Components, Spanning Trees, Biconnected Components, Minimum Cost Spanning Trees, Kruskal Algorithm, Prim’s Algorithm - All-Pairs Shortest Path, Transitive Closure.

UNIT IV PRIORITY QUEUES (HEAPS), SORTING AND SEARCHING

UNIT V HASHING AND FILE STRUCTURES

LIST OF EXPERIMENTS:
1. Implementation of Linked List.
2. Implementation of Stack using Arrays and Linked List.
3. Implementation of Queue using Arrays and Linked List.
4. Implementation of Stack and Queue applications.
5. Implementation of Binary Search Tree.
8. Implementation of a spanning tree for a given graph using Prim’s algorithm.
9. Implementation of shortest path algorithms such as Dijkstra’s algorithm.
10. Implementation of basic heap operations.
11. Implementation of Insertion Sort, Heap Sort.
12. Implementation of Quick Sort, Merge Sort.
13. Implementation any application using Linear Search.
15. Implementation of Hashing techniques such as quadratic probing and separate chaining.

TOTAL: 90 PERIODS

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

CO1: Handle operations like searching, insertion, deletion, traversing mechanism etc. on various linear data structures like list, stack and queues.

CO2: Design and implement tree data structures and its variations.

CO3: Design algorithms using graph structures to solve real life problems.

CO4: Familiarize the concepts of heaps and apply sorting/searching algorithms for a given problem.

CO5: Familiarize the concepts of hashing and understand the file structure mechanisms

CO6: Choose and implement appropriate data structures for a given application.

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UNIT I  RELATIONAL DATABASES  

UNIT II  DATABASE DESIGN  

UNIT III  TRANSACTION MANAGEMENT  

UNIT IV  INDEXING AND HASHING TECHNIQUES  

UNIT V  ADVANCED TOPICS  

LIST OF EXPERIMENTS:
1. Create a database table, add constraints (primary key, unique, check, Not Null), insert rows, update and delete rows using SQL DDL and DML commands.
2. Create set of tables, add foreign key constraints, and incorporate referential integrity.
3. Query the database tables using different ‘where’ clause conditions and implement aggregate functions.
4. Query the database tables and explore sub queries and simple join operations.
5. Query the database tables and explore natural, equi, and outer joins.
6. Write user defined functions and stored procedures in SQL.
7. Execute complex transactions and realize DCL and TCL commands.
8. Write SQL Triggers for insert, delete, and update operations in database table.
9. Create View and index for database tables with large number of records.
11. Develop a simple GUI based database application and incorporate all the above-mentioned features.

TOTAL: 90 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Understand the key principles, structures, and the organization of relational databases and to
formulate queries using Relational Algebra/ SQL.

**CO2**: Identify the methodology of conceptual modelling through ER Model and write various advanced queries such as relational constraints, joins, set operations, aggregate functions, and views.

**CO3**: Demonstrate the transactions and estimate the procedures for controlling the consequences of concurrent data access.

**CO4**: Analyze and access various query processing and optimization techniques.

**CO5**: Understand and use the principles and common features of the distributed, Design and Create NoSQL databases.

**CO6**: Analyze, Design, Create and Evaluate the real database applications using DBMS APIs.

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**CA3103**  
**JAVA PROGRAMMING**  
**L T P C**  
**3 0 2 4**

**UNIT I**  
**JAVA BASICS**  

**UNIT II**  
**GUI, I/O AND NETWORK PROGRAMMING**  
UNIT III  DISTRIBUTED OBJECTS  9
JSON – AJAX Enabled Rich Internet Applications with JSON – Java Mail API – SMTP, POP3 & IMAP.

UNIT IV  JDBC AND WEB APPLICATION DEVELOPMENT  9

UNIT V  ADVANCED FRAMEWORKS  9

LIST OF EXPERIMENTS:
1. Design and Implement Java programs that deals with the following:
   a. Classes, Objects and Interfaces.
   b. Exception handling using user defined exceptions.
   c. String Handling (String Class objects – string manipulation functions).
   d. Creation of User Interfaces using SWING and graphic features.
   e. Creation and Manipulation of Generic objects.
2. Java socket programming.
   b. Implementation of simple http client/server application.
3. Reading websites using URL class.
4. Developing JSON based AJAX enabled rich Internet Applications.
5. Implementation of SMTP, POP3 & IMAP protocols.
6. Implementation of any Information System using JDBC.
7. Web Application development using JSP and JSF.
8. Session Management and Implementation of Cookies using JSF.
10. Web application development using Spring framework.

TOTAL: 75 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Implement Object-Oriented concepts of Java programming.
CO2: Work with Generics, Networking and GUI based application development.
CO3: Create responsive applications using AJAX & JSON.
CO4: Develop dynamic web applications with database connectivity using server-side technologies.
CO5: Design and development of applications using advanced frameworks.
CO6: To obtain knowledge on usage of IDEs for design and implementation of real time application in Java.

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CA3104 COMPUTER NETWORKS AND MANAGEMENT L T P C
3 0 2 4

UNIT I DATA COMMUNICATION AND NETWORKING

UNIT II PHYSICAL AND DATA LINK LAYERS

UNIT III NETWORK LAYER

UNIT IV TRANSPORT AND APPLICATION LAYERS

UNIT V NETWORK MONITORING AND MANAGEMENT
Network provisioning – Fault detection, location and isolation – Data plane and control plane management using SDN concepts.

LIST OF EXPERIMENTS:
1. Practice different network commands available in Windows and Linux Operating Systems and troubleshoot the network.
2. Configure the network devices such as Router, Switch, Hub, Bridge and Repeater.
3. Analyzing the Network traffic using Packet Analyzer (Wireshark) and understanding the various protocol headers.
5. Configure firewalls and honeypots
6. Performance analysis of Network using NS2/NS3/OPNET (Delay, Bandwidth etc.)
7. Develop client/server-based applications using TCP and UDP sockets.

TOTAL: 75 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Become familiar and identify the networking devices and protocol reference models.
CO2: Design and implement Local Area Networks.
CO3: Configure routers and troubleshoot the network layer level connectivity issues.
CO4: Monitor and analyze the packet flow in networks.
CO5: Choose transport layer and application layer protocols and configure them as per the requirements.
CO6: Manage and secure the networks.

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UNIT I SOFTWARE DEVELOPMENT APPROACHES 9

UNIT II REQUIREMENTS ENGINEERING 9
Elicitation and Analysis Techniques; Specification and Validation Methods, Use Case Modeling and Behavior Driven Development, Quality Attributes and Non-functional Requirements, Requirements Traceability and Management.

UNIT III DESIGN PRINCIPLES 9
Design by Contract and Design Constraints, Interface-based Design and Design Patterns, Aspect-Oriented Software Development (AOSD), Generative Programming and Domain-Specific Languages (DSLs), Advanced Object-Oriented Design Techniques.

UNIT IV SOFTWARE TESTING AND QUALITY ASSURANCE 9

UNIT V SOFTWARE PROJECT MANAGEMENT 9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Develop models for the software to be developed
CO2: Understand the need of system requirements
CO3: Acquire knowledge about various design patterns and principles
CO4: Learn various testing strategies and the relevant software quality models
CO5: Analyze, Design and implement a system based on software engineering practice and principles.
CO6: Manage the software for any futuristic emerging systems

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CA3202 PYTHON PROGRAMMING WITH DATA SCIENCE L T P C

UNIT I PYTHON FUNDAMENTALS

UNIT II INTRODUCTION TO FUNCTIONS

UNIT III MODULES AND PACKAGES

UNIT IV PYTHON PACKAGES FOR DATA SCIENCE

UNIT V DATA SCIENCE USING PYTHON

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Know the Basics of Python decision and looping structures.
CO2: Understand the basics of function writing.
CO3: Learn to create user-defined modules and packages.
CO4: Understand Python Ecosystem for Data Science.
CO5: Understand the needs for Big Data and applications.
CO6: Design and Implement a Python based Data science application.

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CA3203 FULL STACK SOFTWARE DEVELOPMENT

UNIT I SERVER-SIDE ACTION

UNIT II CLIENT-SIDE ACTIONS
React - Writing different components - Introduction to Typescript - Programming structures - Boolean - Arrays - Tuples - function.

UNIT III ADVANCED TYPESCRIPT
Classes - Inheritance - Interfaces - Namespaces - Modules - Decorators - Debugging Typescript apps - development of a simple web application with typescript.

UNIT IV WEBPACK
Introduction to webpack - dependency graph - Plugins - Modules - Adding node modules - REST Endpoint - mailer - other examples

UNIT V DEPLOYMENT THROUGH CONTAINERS
Containerization - Installation of Docker - Pulling Images - Creating Images - Deploying to Dockerhub - Development and deployment of js applications in docker.
LIST OF EXPERIMENTS:
1. Working with git commands
2. Installation of Typescript
3. Programming with different data structures and functions using Typescript
4. Programming with classes and inheritance
5. Organization of the code with namespace
6. Packaging the code with added modules
7. Development of a web application using React.js
8. Development of a web application using Node.js
9. Development of a full stack web application
10. Deployment of web application using Docker

TOTAL: 90 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Work with collaborative version control
CO2: Develop web applications using Node
CO3: Use Typescript for Client-side actions
CO4: Develop web applications with Typescript
CO5: Explore webpack for creating web applications
CO6: Deploy Web applications through containers

REFERENCES:
2. David Choi, Full-Stack React, TypeScript, and Node, Packt Publications, 2020

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CA3204       INTERNET OF THINGS       L T P C
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UNIT I       INTRODUCTION
UNIT II DEVICE LAYER

UNIT III IoT PROTOCOLS

UNIT IV CLOUD OFFERINGS AND ANALYTICS

UNIT V IoT MANAGEMENT & CASE STUDIES

LIST OF EXPERIMENTS:
1. Develop a BLINK sketch in Arduino.
2. Develop an Arduino sketch that repeats an LED to glow brightly, decrease the brightness, switches off the LED, increases the brightness and LED glows with maximum intensity (a sketch for fading).
3. Develop an Arduino sketch that takes sensor readings for five seconds during the startup, and tracks the highest and lowest values it gets. These sensor readings during the first five seconds of the sketch execution define the minimum and maximum of expected values for the readings taken during the loop (a sketch for calibrating a sensor).
4. Develop an Arduino sketch that reads the value of a variable resistor as an analog input and changes blink rate of the LED.
5. Develop an Arduino sketch to use a piezo element to detect the vibration.
6. Develop a Python program to control an LED using Raspberry Pi.
7. Develop a Python program to interface an LED with a switch using Raspberry Pi.
8. Miniproject.

TOTAL: 75 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Understand the evolution of the Internet and the impact of IoT in the society.
CO2: Design portable IoT devices using Arduino IDE/ Raspberry Pi with Python.
CO3: Apply appropriate protocols in various parts of IoT based systems.
CO4: Use cloud offerings and big data tools in IoT based systems.
CO5: Implement Map-Reduce based programs using Apache frameworks.
CO6: Design, deploy and manage complex IoT based systems.

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CA3205 DESIGN AND ANALYSIS OF ALGORITHMS L T P C 3 0 0 3

UNIT I FUNDAMENTALS

UNIT II DESIGN TECHNIQUES

UNIT III GREEDY ALGORITHMS AND MATRIX OPERATIONS

UNIT IV LINEAR PROGRAMMING, BACKTRACKING AND BRANCH & BOUND
Linear Programming: Formulation of LPPs– Simplex Algorithm- Backtracking: Basics of Backtracking- 8-queen - Sum of Subsets, Branch and Bound: 0/1 Knapsack.

UNIT V COMPUTATIONAL COMPLEXITY

TOTAL: 45 PERIODS
COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Analyze algorithms based on time and space complexity
CO2: Design efficient algorithms and analyze with appropriate sorting and dynamic programming strategies
CO3: Apply greedy methods and matrix methods involving Gaussian elimination for solving computational problems
CO4: Design and Solve Linear programming, backtracking and branch and bound technique towards efficient problem solving
CO5: Solve a problem in polynomial time or prove that to be an NP-Complete problem
CO6: Obtain the knowledge of Randomized and approximate algorithms.

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CA3211 MOBILE APPLICATION DEVELOPMENT LABORATORY L T P C 0 0 3 1.5

LIST OF EXPERIMENTS:
1. Install and configure Java Development Kit (JDK), android studio and android SDK.
2. Develop an application that uses GUI components, fonts and colours.
3. Design an application that uses Layout Managers, Event listeners, Event handling and push notification in Android.
4. Build a simple native calculator application to do simple arithmetic operations.
5. Create animations and graphical primitives in Android environment.
6. Develop an application that makes use of SQL Lite mobile database.
7. Develop an application that makes use of internet for communication using Firebase to send SMS and E-Mail services.
8. Implement an android application that writes data into the SD card and makes use of Notification Manager.
9. Develop a native application that uses Location based services such as GPS tracking, Geo-fencing, and activity recognition using Google play services.

10. Implement simple gaming application using open-source tools like flutter or Unity.

TOTAL: 45 PERIODS

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

CO1: Design the right user interface for mobile application.
CO2: Implement mobile application using UI toolkits and frameworks.
CO3: Design mobile applications that are aware of the resource constraints of mobile devices.
CO4: Develop web based mobile application that accesses internet and location data.
CO5: Implement android application with multimedia support.
CO6: Configure open source tools like Flutter or Unity.

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CA3301 MACHINE LEARNING

UNIT I INTRODUCTION


UNIT II SUPERVISED LEARNING - I


UNIT III SUPERVISED LEARNING II

UNIT IV PROBABILISTIC GRAPHICAL MODELS

UNIT V UNSUPERVISED LEARNING AND REINFORCEMENT LEARNING

LIST OF EXPERIMENTS:
1. Develop python programs to import and export data using NumPy, Pandas library functions.
2. Demonstrate various data pre-processing techniques for a given dataset.
3. Develop Python programs to demonstrate various Data Visualization techniques.
4. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples.
5. Develop an application that makes predictions from data using Linear Regression.
6. Develop an application that makes predictions from data using Logistic Regression.
7. Implement a classifier using ID3, C4.5 algorithms.
8. Implement a classifier using CART algorithm and visualize the decision tree.
9. Implement a classifier using Perceptron.
10. Implement a classifier using Multi Layer Perceptron.
11. Develop a system to implement a classifier using SVM
12. Implement Ensemble Models using Random Forest
14. Develop a system that can extract the word from the given sentences using the Hidden Markov model.
15. Develop a system that can automatically group articles by similarity using K–Means clustering.

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Disseminate the key elements of machine learning, types of data and the basics of learning theory.
CO2: Describe Instance based learning and apply regression analysis and decision tree models for regression and classification problems.
CO3: Implement SVM or Neural Network model for an appropriate application and improve the performance using ensemble models.
CO4: Design and implement a BBN, HMM for a sequence model type of application and implement a PGM for any real time application using an open-source tool.
CO5: Use a tool to implement typical clustering algorithms for different types of applications.
CO6: Analyze and apply Reinforcement learning for suitable learning tasks.

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CA3302 CLOUD COMPUTING TECHNIQUES L T P C 3 0 3 4.5

UNIT I INTRODUCTION TO DISTRIBUTED SYSTEM CONCEPTS 9

UNIT II INTRODUCTION TO CLOUD COMPUTING 9

UNIT III CLOUD ENABLING TECHNOLOGIES 9

UNIT IV CLOUD MANAGEMENT AND SECURITY 9

UNIT V CLOUD SOFTWARE AND COMPUTING PLATFORMS 9

LIST OF EXPERIMENTS:
1. Study about virtual environment using VMware
2. Installation of VMware and creation of virtual environment
3. Implement simple chat application incorporating virtual machine communication.
4. Installation of OpenStack.
5. Creation of VMs and installing applications and executing simple programs in OpenStack.
6. Simple applications for communication across VMs.
7. Test ping command to test the communication between the guest OS and Host OS.
8. Install Hadoop and manipulate a large dataset and run on Hadoop.
9. Simulate a Cloud scenario using Cloud Sim and implement a scheduling algorithm not present in Cloud sim.
10. Install Google App Engine. Create hello world app and other simple web applications using Python/Java.
11. Use GAE launcher to launch the above developed web applications
12. Establish an AWS account. Use the AWS Management Console to launch an EC2 instance and connect to it and run the simple web applications developed above.
13. Create a Windows Azure account and launch a virtual machine in Azure platform and run the developed applications in the VM.

TOTAL: 90 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Appreciate distributed computing, distributed resource management.
CO2: Articulate the main concepts, key technologies, strengths and limitations of cloud computing and deploy applications over commercial cloud computing infrastructures.
CO3: Gain knowledge about cloud and virtualization along with it how one can migrate over it.
CO4: Develop the ability to manage the cloud environment and understand the concepts of cloud storage, security.
CO5: Choose the appropriate technologies, algorithms and approaches for implementation of cloud environment using Openstack, AWS and Google App engine.
CO6: Apply the knowledge of cloud computing techniques to solve real world problems through group collaborations.

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CA3303 CRYPTOGRAPHY AND SECURITY L T P C
3 0 2 4

UNIT I INTRODUCTION TO SECURITY AND NUMBER THEORY 9

UNIT II SYMMETRIC KEY CRYPTOGRAPHY 9

UNIT III ASYMMETRIC KEY CRYPTOGRAPHY 9

UNIT IV SECURITY APPLICATIONS 9

UNIT V SYSTEM SECURITY 9
Malwares – Password Management – Firewall – Intrusion Detection System and types – Intrusion Prevention System — Penetration testing: concept, types, steps – OWASP top ten vulnerabilities – Secure Coding

LIST OF EXPERIMENTS:
The following exercises are based on cryptographic algorithms and cryptanalysis. They can be implemented using any Programming Language:
1. Implement basic mathematical requirements for cryptography.
2. Write a program to perform encryption and decryption of classic cryptosystems. Perform cryptanalysis using Brute-force Attack.
3. Write a program to demonstrate symmetric key encryption process using DES and AES algorithm (academic versions). Also perform cryptanalysis using CCA, CPA.
4. Write a program to implement RSA algorithm and demonstrate the key generation and encryption process and analyze the same using factorization attack.
5. Write a program to generate message digest for the given message using the SHA/MD5 algorithm and verify the integrity of message.
6. Perform Penetration testing on a web application to gather information about the system, then initiate XSS and SQL injection attacks using tools like kali Linux.
7. Study and exploration of Wireshark tool
   a. To analyze network traffic for various protocols, e.g. ping, DNS and telnet.
   b. To learn about setting up ssh keys and configure the ssh client.
   c. To verify whether the data are encrypted or not.
8. Study and exploration of Metasploit tool to learn about cracking of hashed files in Windows environment.
9. Configure a firewall on Ubuntu platform.

TOTAL: 75 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Apply the basic security algorithms and policies required for a computing system.
CO2: Predict the vulnerabilities across any computing system and hence be able to design security solution for any computing system.
CO3: Identify any network security issues and resolve the issues.
CO4: Manage the firewall and WLAN security.
CO5: Evaluate the system related vulnerabilities and mitigation.
CO6: Design secured web applications in real-time.

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CA3001 DEEP LEARNING TECHNIQUES

UNIT I BASICS OF NEURAL NETWORKS
Basic concept of Neurons – Perceptron Algorithm – Feed Forward and Back Propagation Networks.

UNIT II CONVOLUTIONAL NEURAL NETWORKS
CNN Architectures – Convolution – Pooling Layers – Transfer Learning – Image Classification using Transfer Learning

UNIT III MORE DEEP LEARNING ARCHITECTURES

UNIT IV DEEP REINFORCEMENT LEARNING

UNIT V APPLICATIONS OF DEEP LEARNING

TOTAL: 45 PERIODS

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

CO1: Understand the role of Deep learning in Machine Learning Applications.
CO2: To get familiar with the use of TensorFlow/Keras in Deep Learning Applications.
CO3: To design and implement Deep Learning Applications.
CO4: Critically Analyse Different Deep Learning Models in Image Related Projects.
CO5: To design and implement Convolutional Neural Networks.
CO6: To know about applications of Deep Learning in NLP and Image Processing.

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CA3002 ARTIFICIAL INTELLIGENCE L T P C 3 0 0 3

UNIT I INTELLIGENT AGENTS AND SEARCH TECHNIQUES 9

UNIT II REASONING WITH LOWER ORDER LOGICS 9

UNIT III KNOWLEDGE REPRESENTATION AND AI PLANNING 9

UNIT IV LEARNING TECHNIQUES 9

UNIT V AI APPLICATIONS 9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Understand and use the various search strategies based on the problem domain.
CO2: Apply various reasoning techniques to real world problems.
CO3: Analyze and apply the appropriate knowledge representation technique based on the application.

CO4: Understand the usage of various AI Planning techniques.

CO5: Design and implement various learning models based on the problem requirements.

CO6: Create AI applications to address real world problems.

REFERENCES:
6. NPTEL, “Artificial Intelligence”, [http://nptel.ac.in/courses/106105079/2](http://nptel.ac.in/courses/106105079/2).

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CA3003 AUTONOMOUS GROUND VEHICLE SYSTEMS  L T P C  3 0 0 3

UNIT I INTRODUCTION TO AUTONOMOUS DRIVING

UNIT II SENSORS FOR AUTONOMOUS GROUND VEHICLES
UNIT III  ENVIRONMENT PERCEPTION AND MODELING  9
Road Recognition: Basic Mean Shift Algorithm, Mean Shift Clustering, Mean Shift Segmentation, Mean Shift Tracking, Road Recognition Algorithm – Vehicle Detection and Tracking: Generating ROIs, Multi Resolution Vehicle Hypothesis, Vehicle Validation using Gabor Features and SVM, Boosted Gabor Features – Multiple Sensor Based Multiple Object Tracking.

UNIT IV  NAVIGATION FUNDAMENTALS  9

UNIT V  VEHICLE CONTROL AND CONNECTED VEHICLE  9

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

CO1: Identify the requirements and design challenges of AGVs.
CO2: Select suitable sensors to sense the internal state and external world of AGVs.
CO3: Implement lane detection, road detection & vehicle detection algorithms.
CO4: Simulate/Implement ground vehicle navigation algorithms.
CO5: Simulate/Implement ground vehicle control systems.
CO6: Design communication protocols for connected vehicles.

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CA3004 BIG DATA ANALYTICS

UNIT I INTRODUCTION TO BIG DATA

UNIT II MAPREDUCE AND NEW SOFTWARE STACK
Distributed File System – MapReduce, algorithms using MapReduce, Extensions – Communication model – Complexity Theory for MapReduce. Overview of Spark.

UNIT III BIG-DATA TECHNOLOGY OVERVIEW

UNIT IV BIG DATA ANALYTICS

UNIT V MORE BIG-DATA APPLICATIONS

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Understand the basics of Big Data
CO2: Know about Hadoop and MapReduce
CO3: Know about Big Data Technology, Tools, and Algorithms
CO4: Analyze the stream data and Link analysis.
CO5: Know about the role of big data in Recommender systems and social network analysis.
CO6: Design and Implementation of basic data intensive applications.

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CA3005 BLOCKCHAIN TECHNOLOGIES

UNIT I INTRODUCTION TO BLOCKCHAIN
Historical Background and Evolution of Blockchain; Blockchain Architecture - Distributed Ledger Technology (DLT); Blocks and Chain Structure; Types of Blockchains; Consensus algorithms-Proof of Work (PoW), Proof of Stake (PoS), Delegated Proof of Stake (DPoS), Proof of Authority, Proof of Elapsed Time- Role of Consensus Algorithms in Achieving Trust and Security; Smart Contracts and Decentralized Applications (DApps).

UNIT II INTRODUCTION TO CRYPTOCURRENCY

UNIT III ETHEREUM
Ethereum and its features; Ethereum Architecture : Ethereum Virtual Machine (EVM) and bytecode, Accounts and Addresses, Gas and Fees, Ethereum Clients; Ethereum Development: Solidity Programming Languages, Smart Contracts Development ; Ethereum Scaling Solutions, Ethereum DApps and Use Cases; Ethereum Community and Ecosystem.

UNIT IV WEB3 AND HYPERLEDGER

UNIT V ALTERNATIVE BLOCKCHAINS AND NEXT EMERGING TRENDS

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Understand the technology components of Blockchain and how it works behind-the-scenes.
CO2: Aware of different approaches to developing decentralized applications.
CO3: Understand the Bitcoin and its limitations by comparing with other alternative coins.
CO4: Establish deep understanding of the Ethereum model, its consensus model, code execution.
CO5: Understand the architectural components of a Hyperledger and its development framework.

CO6: Come to know the Alternative blockchains and emerging trends in blockchain.

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CA3006    C# AND .NET PROGRAMMING   L T P C
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UNIT I   C# LANGUAGE BASICS   9
Classes and Structs – Inheritance– Generics – Arrays and Tuples – Operators and Casts – Indexers–
Assemblies – Shared Assemblies – CLR Hosting – Appdomains.

UNIT II  C# ADVANCED FEATURES   9
Delegates – Lambdas – Lambda Expressions – Events – Event Publisher – Event Listener – Strings
and Regular Expressions – Generics – Collections – Memory Management and Pointers – Errors
and Exceptions – Reflection.

UNIT III  BASE CLASS LIBRARIES AND DATA MANIPULATION   9
Diagnostics Tasks – Threads and Synchronization – Manipulating XML – SAX and DOM –
Manipulating files and the Registry – Transactions – Data access with ADO.NET: Introduction, LINQ
to Entities and the ADO.NET Entity Framework, Querying a Database with LINQ – Creating the
ADO.NET Entity Data Model Class Library, Creating a Windows Forms Project – Data Bindings
Between Controls and the Entity Data Model – Dynamically Binding Query Results.
UNIT IV  WINDOW AND WEB BASED APPLICATIONS  9

UNIT V  .NET COMPACT FRAMEWORK  9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Understand the difference between .NET and Java framework.
CO2: Work with the basic and advanced features of C# language.
CO3: Create applications using various data providers.
CO4: Create web application using ASP.NET.
CO5: Create mobile application using .NET compact framework.
CO6: Integrate all the features of C# language and build complex web applications in .NET framework.

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CA3007  VISUALIZATION TECHNIQUES  L T P C
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UNIT I  INTRODUCTION
Presentation-Explorative Analysis-Confirmative Analysis-Mental Model-Scientific Visualization-

UNIT II VISUAL REPRESENTATION

UNIT III MULTIMODAL PRESENTATION

UNIT IV INTERACTION TYPES

UNIT V ADVANCE DESIGN TECHNIQUES

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the student should be able to:
CO1: Understand the concepts and techniques used in Visualization Techniques.
CO2: Implement different techniques of information representation.
CO3: Implement various presentations of information.
CO4: Apply different interaction types used to present information.
CO5: Design and implement effective Visualization.
CO6: Create and evaluate interactive data Visualization real-time problem.

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UNIT I  
FUNDAMENTALS OF IMAGE PROCESSING  

UNIT II  
IMAGE ENHANCEMENT AND TRANSFORMS  

UNIT III  
RESTORATION AND BOUNDARY DETECTION  

UNIT IV  
IMAGE SEGMENTATION AND FEATURE EXTRACTION  

UNIT V  
IMAGE CLASSIFIER AND APPLICATIONS  

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Implement basic image processing operations.
CO2: Apply and develop new techniques in the areas of image enhancement and frequency transforms
CO3: Restore images from noise and to extract edges and boundaries.
CO4: Understand the image segmentation algorithms and Extract features from images.
CO5: Apply classifiers and clustering algorithms for image classification and clustering.
CO6: Design and develop an image processing application that uses different concepts of image processing.
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CA3009  ETHICAL HACKING  L.T.P.C  3 0 0 3

UNIT I  INTRODUCTION  9

UNIT II  FOOT PRINTING, RECONNAISSANCE AND SCANNING NETWORKS  9

UNIT III  ENUMERATION AND VULNERABILITY ANALYSIS  9

UNIT IV  SYSTEM HACKING  9
UNIT V NETWORK PROTECTION SYSTEMS


TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Express knowledge on basics of computer-based vulnerabilities
CO2: Gain understanding on different footprinting, reconnaissance and scanning methods.
CO3: Demonstrate the enumeration and vulnerability analysis methods
CO4: Gain knowledge on hacking options available in Web and wireless applications.
CO5: Acquire knowledge on the options for network protection.
CO6: Use tools to perform ethical hacking to expose the vulnerabilities.

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CA3010 GAME PROGRAMMING

UNIT I INTRODUCTION TO GAME PROGRAMMING

UNIT II MATH FOR GAME PROGRAMMING
Cartesian Coordinate Systems-Vectors-Multiple Coordinate Spaces-Matrices and Linear Transformations - Polar Coordinate Systems-3D Rotations-Geometric Primitives-Viewing in 3D.
UNIT III  MECHANICS FOR GAME PROGRAMMING  9
Linear Kinematics and Calculus – Linear and Rotational Dynamics - Curves in 3D – Lighting - Intersection Testing - Rigid Body Dynamics - Animation System – Controller based animation - Sound – Cameras Details.

UNIT IV  ARCHITECTURE AND ALGORITHMS FOR GAME PROGRAMMING  9

UNIT V  LANGUAGE FOR GAME PROGRAMMING  9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the student should be able to:
CO1: Understand the concepts and techniques used in game development.
CO2: Apply the mathematical concept for game development
CO3: Apply the mechanic's concepts for game development.
CO4: Design and implement algorithms and techniques applied to game development.
CO5: Analyse the various language and platforms of game development.
CO6: Create and implement interactive games.

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UNIT I  INTRODUCTION TO HUMAN-COMPUTER INTERACTION  9

UNIT II  DESIGNING INTERACTIVE SYSTEMS  9

UNIT III  EVALUATION AND UNIVERSAL DESIGN PRINCIPLES  9

UNIT IV  MODELS AND THEORIES  9

UNIT V  HCI IN COLLABORATIVE APPLICATIONS  9

TOTAL: 45 PERIODS

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

CO1:  Demonstrate a comprehensive understanding of the concepts and theories related to human-computer interaction and their application in designing interactive systems.

CO2:  Apply user-centred design principles and guidelines to create intuitive and effective user interfaces for interactive systems.

CO3:  Utilize appropriate evaluation methods and techniques to assess the usability and user experience of interactive systems, and report evaluation results effectively.

CO4:  Analyze and apply various HCI models, such as task models and dialogue models, to design interactive systems.

CO5:  Explore and discuss the challenges and implications of HCI in collaborative applications, such as groupware and computer-mediated communication.

CO6:  Demonstrate a comprehensive understanding of the principles, theories, and methodologies of human-computer interaction and effectively apply them in the design of user-friendly and efficient interactive systems.
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CA3012 SOCIAL NETWORK ANALYSIS L T P C 3 0 0 3

UNIT I  INTRODUCTION

UNIT II  SOCIAL NETWORK ANALYSIS
Introduction to Social Networks Profiles – Types of Commercial Social Network Profiles (CSNP) – Quantitative and Qualitative Analysis of CSNP – Analysis of Social Networks Extracted from Log Files – Data Mining Methods Related to SNA and Log Mining – Clustering Techniques – Case Study.

UNIT III  SEMANTIC TECHNOLOGY FOR SOCIAL NETWORK ANALYSIS
Introduction to Ontology-based Knowledge Representation – Ontology Languages for the Semantic Web – RDF and OWL – Modeling Social Network Data – Network Data Representation, Ontological Representation of Social Individuals and Relationships – Aggregating and Reasoning with Social Network Data – Advanced Representations.

UNIT IV  SOCIAL NETWORK MINING
Detecting and Discovering Communities in Social Network: Evaluating Communities – Methods for Community Detection – Trust factor- Applications of Community Mining Algorithms – Ethical

UNIT V – VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Understand basic principles behind network analysis algorithms and develop practical skills in network analysis.
CO2: Model and represent knowledge for social semantic Web.
CO3: Apply data mining techniques on social networks.
CO4: Use extraction and mining tools for analyzing Social networks.
CO5: Develop secure social network applications.

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CA3013  MIXED REALITY  L T P C  3 0 0 3

UNIT I  INTRODUCTION TO MIXED REALITY  9
Introduction to virtual reality (VR), Augmented reality (AR), and Mixed Reality (MR) – History – MR
Use cases & Designing for MR platforms – Mixing Virtual with Real - MR hardware and devices –
The Input – The output – Optical see-through displays – Eye Tracking- Computer vision for MR

UNIT II  INTERACTION DESIGN IN MR  9
Integrating Framework For MR –Embedded MR environment - Tangible Interaction – Auditory-
Induced presence – Exertion in MR systems – Mixed Interaction in MR

UNIT III  SOFTWARE DESIGN AND IMPLEMENTATION  9
Outdoor MR Systems – Multimodal Excitatory Interfaces – Tracking in Mixed Reality – Authoring

UNIT IV  MIXED REALITY AND HUMAN-ROBOT INTERACTION  9
Mixed Reality for Robots – User-centered HRI – Mental Transformation in HRI – Computational
Cognitive Modeling – Evaluating the usability of the virtual environment – Security Robot

UNIT V  APPLICATIONS OF MIXED REALITY  9
MR Companion Robots

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
  CO1:  Demonstrate knowledge and understanding of VR, AR, and MR concepts, technologies,
  and applications.
  CO2:  Apply design principles and considerations specific to Mixed Reality platforms.
  CO3:  Understand interaction design principles in Mixed Reality.
  CO4:  Apply software design and implementation skills for Mixed Reality systems.
  CO5:  Demonstrate knowledge of the intersection of Mixed Reality and Human-Robot Interaction
  (HRI).
  CO6:  Analyze and evaluate the integration of Mixed Reality technologies and principles into real-
  world applications.

REFERENCES:
  Business Media, 2011.
CA3014 MULTICORE ARCHITECTURE AND PROGRAMMING  L T P C  3 0 0 3

UNIT I  MULTI-CORE PROCESSORS  9

UNIT II  PARALLEL PROGRAM CHALLENGES  9
Performance – Scalability – Synchronization and data sharing – Data races – Synchronization primitives (mutexes, locks, semaphores, barriers) – deadlocks and livelocks – communication between threads (condition variables, signals, message queues and pipes).

UNIT III  SHARED MEMORY PROGRAMMING WITH OpenMP  9

UNIT IV  DISTRIBUTED MEMORY PROGRAMMING WITH MPI  9
MPI program execution – MPI constructs – libraries – MPI send and receive – Point-to-point and Collective communication – MPI derived datatypes – Performance evaluation

UNIT V  PARALLEL PROGRAM DEVELOPMENT  9
Case studies – n-Body solvers – Tree Search – OpenMP and MPI implementations and comparison.

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Explore multicore architectures and identify their characteristics and challenges.
CO2: Identify the issues in programming Parallel Processors.
CO3: Write programs using OpenMP and MPI.
CO4: Design parallel programming solutions to common problems.
CO5: Compare and contrast programming for serial processors and programming for parallel processors.
CO6: Utilize parallel program design for High Power Computation processor

TOTAL: 45 PERIODS

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CA3015 MULTIMEDIA TECHNOLOGIES

UNIT I INTRODUCTION TO MULTIMEDIA ELEMENTS 9

UNIT II MULTIMEDIA COMPRESSION 9

UNIT III MULTIMEDIA ARCHITECTURES 9

UNIT IV MULTIMEDIA OPERATING SYSTEM AND DATABASES 9

UNIT V MULTIMEDIA COMMUNICATION & APPLICATIONS


TOTAL: 45 PERIODS

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

CO1: Handle the multimedia elements effectively.
CO2: Encode and decode the multimedia elements.
CO3: Understand the underlying multimedia computing architectures used for media development.
CO4: Develop effective strategies to deliver Quality-of-Experience in multimedia applications.
CO5: Design and implement algorithms and techniques related to multimedia objects.
CO6: Design and develop multimedia applications in various domains.

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CA3016 NETWORK PROGRAMMING AND MANAGEMENT

UNIT I SOCKETS AND APPLICATION DEVELOPMENT

Introduction to Socket Programming – System Calls – Address Conversion Functions – POSIX
Signal Handling – Server with Multiple Clients – Boundary Conditions – Server Process Crashes,

UNIT II  SOCKET OPTIONS  9

UNIT III  ADVANCED SOCKETS  9

UNIT IV  SIMPLE NETWORK MANAGEMENT  9

UNIT V  NETWORK MANAGEMENT TOOLS & SYSTEMS  9

TOTAL: 45 PERIODS

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

CO1: Implement client/server communications using TCP and UDP Sockets.
CO2: Describe the usage of socket options for handling various Sockets in programming.
CO3: Understand handling of raw sockets.
CO4: Explain functionalities of SNMP and MIB structure.
CO5: Experiment with various tools available to manage a network.
CO6: Handle technical issues in a network.

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CA3017       NEXT GENERATION NETWORKS          L T P C
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UNIT I       5G INTERNET AND LEAP TO 6G VISION  9

UNIT II      SMALL CELLS FOR 5G MOBILE NETWORKS  9

UNIT III     COOPERATION FOR NEXT GENERATION WIRELESS NETWORKS  9

UNIT IV      NETWORKING TECHNIQUES AND APPLICATIONS FOR 5G NETWORKS  9

UNIT V       FUTURISTIC TECHNOLOGICAL ASPECTS OF 6G  9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Compare the 5G network with older generations of networks.
CO2: Identify suitable small cells for different applications in 5G networks.
CO3: Simulate 5G network scenarios.
CO4: Connect applications of FOG Computing
CO5: Design applications with 5G network support.  
CO6: Analyze the 6G Networks  

REFERENCES:  
4. 5G Mobile Communications: Concepts and Technologies First Edition  

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CA3018 SERVICE ORIENTED ARCHITECTURES AND MICROSERVICES  

UNIT I SOFTWARE ENGINEERING PRACTICES  

UNIT II SOA AND MICROSERVICE ARCHITECTURE BASICS  

UNIT III CONTENTS SERVICE – ORIENTED ENTERPRISE APPLICATIONS  
Considerations for Service-Oriented Enterprise Applications – Patterns for SOA – Pattern Based Architecture for Service-Oriented Enterprise Applications: Reference Model of Service Oriented Java EE Enterprise Application – SOA Programming Models,  

UNIT IV SERVICE ORIENTED ANALYSIS AND DESIGN  

UNIT V MICROSERVICE ARCHITECTURE  

TOTAL: 45 PERIODS

52
COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Analyze and design SOA based solutions.
CO2: Understand the basic principles of Service Orientation.
CO3: Implement and analyze Java EE Enterprise Application
CO4: Understand the technology underlying service design.
CO5: Implement SOA with Micro Services applications.
CO6: Classify and make reasoned decision about the adoption of different SOA platforms.

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CA3019 SOFTWARE ARCHITECTURE L T P C 3 0 0 3

UNIT I INTRODUCTION 9
Software architecture; Importance of software architecture; Architectural Views and Perspectives- Functional View, Concurrency View, Development View, Deployment View, Operational View, Use Cases and Scenarios.

UNIT II DESIGN PATTERNS 9
UNIT III  ARCHITECTURAL FRAMEWORKS AND VIEWS  9

UNIT IV  DESIGN PRINCIPLES  9

UNIT V  MANAGING ARCHITECTURE  9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Understand the creation and evolution of software architecture
CO2: Learn the importance of design patterns in building the systems
CO3: To analyze the different styles of architecture
CO4: To exercise different architectural styles and their deployment in various domains
CO5: To learn the architectures for emerging technologies and how to document them
CO6: Obtain an insight into the concepts of architectural evolution

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UNIT I TESTING PRINCIPLES AND AXIOMS 9

UNIT II BLACK BOX, WHITE BOX TESTING AND TEST ADEQUACY 9

UNIT III LEVELS OF TESTING 9

UNIT IV TEST MANAGEMENT 9

UNIT V TEST AUTOMATION 9

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Obtain an insight to software testing.
CO2: Apply both black box testing and white box testing.
CO3: Understand and apply multiple levels of testing.
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.
CO6: Maintain documentation on testing.

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CA3021 MOBILE COMPUTING L T P C 3 0 0 3

**UNIT I WIRELESS COMMUNICATION AND CELLULAR NETWORKS**

**UNIT II 4G AND 5G WIRELESS MOBILE NETWORKS**

**UNIT III MOBILITY SUPPORT IN IP AND TCP**

**UNIT IV APPLICATION DESIGN**

**UNIT V APPLICATION DEVELOPMENT**

TOTAL: 45 PERIODS
COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Obtain knowledge on the architecture and protocols of 2G, 3G, and 4G cellular system.
CO2: Deploy various protocols that support mobility at network layer and transport layer.
CO3: Design and implement the user interfaces for mobile applications.
CO4: Design the mobile applications that are aware of the resource constraints of mobile devices.
CO5: Develop advanced mobile applications that access the databases and the web.
CO6: Understand the intricacies in deploying cellular networks and developing mobile applications based on resilient programming practices.

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CA3022 UNIX internals L T P C 3 0 0 3

UNIT I OVERVIEW
UNIT II  FILE SUBSYSTEM
Internal Representation of Files: inodes – Structure of a Regular File – Directories – Conversion of a Path Name to an Inode – Super Block – Inode Assignment to a New File – Allocation of Disk Blocks.

UNIT III  SYSTEM CALLS FOR THE FILE SYSTEM

UNIT IV  PROCESSES

UNIT V  MEMORY MANAGEMENT AND I/O

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Understand UNIX architecture and explain how they interact with computer hardware.
CO2: Critically analyze the internal structure of files in the UNIX system and algorithms used in the building of a kernel.
CO3: Gain a deeper understanding of system calls for the file system in Unix operating system.
CO4: Implement the process state model and its control for the UNIX system
CO5: Implement the memory management policies in an operating system.
CO6: Implement the I/O subsystems in UNIX system.

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UNIT I  INTRODUCTION  9

UNIT II  DEVICES, DISKS and FILE SYSTEMS  9

UNIT III  KERNEL SPACE AND USER SPACE  9

UNIT IV  SYSTEM CONFIGURATION, PROCESS AND RESOURCE UTILIZATION  9

UNIT V  NETWORK CONFIGURATION AND SERVICES  9

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Understand an overall view of the structure of Linux
CO2: Access the different devices through commands
CO3: Work with kernel and user spaces in Linux environment
CO4: Automate tasks using scheduling tools
CO5: Configure network files based on the specific need
CO6: Acquire Linux Administration skills to manage a server

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UNIT I  FUNDAMENTALS OF WSN

UNIT II  MAC LAYER OF WSN AND ZIGBEE STANDARD

UNIT III  DATA CENTRIC COMPUTING IN WSN

UNIT IV  SYNCHRONIZATION, LOCALIZATION AND TRACKING IN WSNs

UNIT V  DESIGN REQUIREMENT OF BAN AND WBAN
BAN Positioning- Architecture of BAN - Requirements of BAN - BAN Standardization - The Media Access Control (MAC) - Frame Processing- Physical Layer (PHY) - Design Requirement of WBAN - WBAN Reference architecture - Software frameworks for programming WBAN- Hardware Development and systems for WBAN.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Understand different types of sensors, their actuators and the architecture of motes.
CO2: Design a WBAN using different networking concepts and hardware interfaces.
CO3: Understand and apply data centric computing in wireless sensor networks.
CO4: Apply appropriate localization techniques for different scenarios.
CO5: Manage sensor networks by synchronizing the time, locating and tracking objects.
CO6: Design a Wireless Sensor and body area network for a real-world application.
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CA3025  
MEDIA PROCESSING  
L T P C  
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UNIT I  
TEXT PROCESSING  
NLP- Tokenization - content retrieval-keyword generation- Text summarization-question generation- language translation - text analysis-report analysis- recent trends –Applications  

UNIT II  
SPEECH PROCESSING  
Speech processing– Central analysis of speech, format and pitch estimation. Applications of speech processing - Speech recognition, Speech synthesis and speaker verification - voice to text conversion- language processing-API s for audio processing-recent trends-applications  

UNIT III  
IMAGE PROCESSING FUNDAMENTALS  

UNIT IV  
IMAGE CLASSIFICATION  
Image Segmentation -Thersholding-Feature extraction-Image classification- supervised-unsupervised – ANN classifier- deep learning-based image classification-object detection and tracking- applications
UNIT V  VIDEO PROCESSING
Basic Concepts and Terminology- Key frame extraction-Video Segmentation—motion detection-Motion Estimation -Video Mining –Video Content Analysis -Video Indexing and Abstraction for Retrieval – Applications

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Implement basic text processing operations
CO2: Implement basic audio processing operations
CO3: Implement basic image processing operations
CO4: Apply classifiers and clustering algorithms for images
CO5: Implement basic video processing operations
CO6: Design and develop different media processing application that uses different concepts of text, image, audio and video processing

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CA3026  ADVANCED DATABASE SYSTEMS L T P C 3 0 0 3

UNIT I  RELATIONAL DATABASES
UNIT II  DISTRIBUTED DATABASES

UNIT III  NOSQL DATABASES

UNIT IV  DOCUMENT DATABASES
Document (MongoDB) Data Model – JSON and BSON – Polymorphic Schemas – Using MongoDB Shell – Basic Querying – Create and Insert – Creating Collections

UNIT V  GRAPH DATABASES

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Demonstrate an understanding of normalization theory and apply such knowledge to normalize real time databases.
CO2: Design a distributed database system and execute distributed queries.
CO3: Understand the usage of NoSQL database systems and manipulate the data associated with it.
CO4: Design and develop document databases using XML /JSON databases.
CO5: Build a simple real time application using graph databases and execute queries on it.
CO6: Analyse and evaluate the user requirements and develop a real time database accordingly.

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CA3027 SOFTWARE PROJECT MANAGEMENT  
UNIT I INTRODUCTION  9

UNIT II SOFTWARE EFFORT ESTIMATION AND ACTIVITY PLANNING  9

UNIT III SOFTWARE RISK AND PEOPLE MANAGEMENT  9

UNIT IV SOFTWARE PROJECT MONITORING AND CONTROL  9

UNIT V SOFTWARE QUALITY MANAGEMENT  9

TOTAL: 45 PERIODS
COURSE OUTCOMES:
At the end of the course, students will be able to

CO1: Differentiate between various software process models.
CO2: Prepare project planning documents.
CO3: Estimate the software cost for projects.
CO4: Perform effective activity planning.
CO5: Prepare effective project scheduling work product.
CO6: Perform software quality management activities.

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UNIT I  INTRODUCTION  9+6

LIST OF EXPERIMENTS:
1. Develop a program to perform various array operations
2. Write a program to find running time complexity by considering each statement in the program for a given set of numbers.

UNIT II  LINEAR DATA STRUCTURES  9+6

LIST OF EXPERIMENTS:
1. Perform Polynomial Manipulation using Single Linked List.
2. Implement the various operations of doubly linked list.

UNIT III  LINEAR DATA STRUCTURES – STACK AND QUEUE  9+6

LIST OF EXPERIMENTS:
1. Write a program to convert Infix to Postfix using stack data structure
2. Develop a program to perform circular queue operations

UNIT IV  SEARCHING AND SORTING  9+6

LIST OF EXPERIMENTS:
1. Write a program to perform Binary Search
2. Write a program to sort a given set of numbers and compare among Bubble Sort, Selection Sort and Insertion Sort with respect to computational complexity.

UNIT V  NON-LINEAR DATA STRUCTURES - TREES AND GRAPHS  9+6

LIST OF EXPERIMENTS:
1. Write a program to create a Binary tree and perform traversals on it.

TOTAL: 75 PERIODS
COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Analyze a given algorithm and determine its time complexity.
CO2: Understand the concepts of linear data structures and its usage.
CO3: Apply linear data structures to solve the given problem.
CO4: Apply different sorting and searching techniques based on the given application.
CO5: Understand the usage of non-linear data structures.
CO6: Solve the given problem by applying suitable data structures.

REFERENCES:

BX3002 PROBLEM SOLVING AND PROGRAMMING IN C L T P C
3 0 2 4

UNIT I COMPUTATIONAL THINKING AND PROBLEM SOLVING 9

UNIT II BASICS OF C PROGRAMMING 9+8
Introduction to programming paradigms – Applications of C Language - Structure of C program - C programming: Data Types - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements – Decision making statements - Switch statement - Looping statements – Preprocessor directives - Compilation process.

LIST OF EXPERIMENTS:
1. Write programs to get some input, perform some operation and display the output using I/O statements.
2. Write a program to execute some specific statements based on the test condition.
3. Write programs to implement nested loop.

UNIT III ARRAYS AND STRINGS - FUNCTIONS AND POINTERS 9+8
Introduction to Arrays: Declaration, Initialization – One dimensional array – Two dimensional arrays - String operations: length, compare, concatenate, copy – Selection sort, linear and binary search. Modular programming - Function prototype, function definition, function call, Built-in functions (string functions, math functions) – Recursion, Binary Search using recursive functions – Pointers – Pointer

LIST OF EXPERIMENTS:
1. Write a program in C to get the largest element of an array using functions.
2. Display all prime numbers between two intervals using functions.
3. Reverse a sentence using recursion.
4. Write a C program to concatenate two strings.

UNIT IV STRUCTURES AND UNION
9+7

LIST OF EXPERIMENTS:
1. Write a C program to Store Student Information in Structure and Display it.

UNIT V FILE PROCESSING
9+7
Files – Types of file processing: Sequential access, Random access – Sequential access file - Random access file - Command line arguments.

LIST OF EXPERIMENTS:
1. The annual examination is conducted for 10 students for five subjects. Write a program to read the data from a file and determine the following:
   a. Total marks obtained by each student.
   b. Topper of the class.

TOTAL: 75 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Develop algorithmic solutions to simple computational problems.
CO2: Write simple C programs using conditionals and loops for solving problems.
CO3: Develop and implement arrays, strings, functions and pointers using C.
CO4: Develop applications in C using structures and union.
CO5: Design applications using sequential and random-access file processing.
CO6: Developing application to solve real world problem using C.

REFERENCES:
UNIT I  INTRODUCTION

UNIT II  RELATIONAL MODEL AND QUERY PROCESSING

UNIT III  ADVANCED QUERY PROCESSING
Complex Queries – Join Expressions – Views – Functions and procedures – Triggers – Embedded SQL.

UNIT IV  DATABASE DESIGN

UNIT V  STORAGE AND FILE STRUCTURE

LIST OF EXPERIMENTS:
1. Data Definition Commands to create, describe, alter, rename, drop and truncate the tables.
2. Data Manipulation Commands for inserting, deleting, updating and retrieving in Tables.
3. Transaction Control Language Commands like Commit, Rollback and Save Point.
4. Illustrate the statements to create index and drop index.
5. Perform database querying using simple query and nested query operations.
6. Perform database querying using complex queries, Joins and Views.
7. Create a PL/SQL block to implement implicit and explicit cursors.
8. Create a PL/SQL block to implement procedures and functions.
9. Create a PL/SQL block to execute triggers.
10. Execute a procedure which handles exception using PL/SQL.
11. Create an embedded PL/SQL block to connect with any host language like ‘C’.

TOTAL: 75 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1:  Understand the basic concepts of the database and data models.
CO2:  Acquire the knowledge of query processing to run queries for a given application.
CO3:  Perform Advanced SQL queries based on the user requirements.
CO4:  Design a database using ER diagrams and map ER into Relations.
CO5:  Understand the usage of various DB storage techniques.
CO6:  Develop a small database application by understanding user requirements properly.

REFERENCES:

<table>
<thead>
<tr>
<th>BX3004</th>
<th>INTRODUCTION TO OPERATING SYSTEM</th>
<th>L T P C</th>
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**UNIT I**  
**INTRODUCTION**  

**UNIT II**  
**PROCESS MANAGEMENT**  

**UNIT III**  
**PROCESS SYNCHRONIZATION**  

**UNIT IV**  
**MEMORY MANAGEMENT**  

**UNIT V**  
**FILE SYSTEM**  

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**
At the end of the course, students will be able to

- **CO1**: Articulate the main concepts, key ideas, strengths and limitations of operating systems.
- **CO2**: Design various process scheduling algorithms.
- **CO3**: Understanding process synchronization and deadlock handling.
- **CO4**: Design and implement memory management schemes.
- **CO5**: Understand various file management systems.
- **CO6**: Understand operating system components and services with the recent OS

**REFERENCES:**

BX3005 INTRODUCTION TO WEB PROGRAMMING L T P C 3 0 2 4

UNIT I WEB ESSENTIALS

UNIT II FRONT-END TECHNOLOGIES

UNIT III OVERVIEW OF JAVASCRIPT

UNIT IV RESPONSIVE WEB DESIGN AND DATABASES
Introduction to JSON – JSON Structure – Introduction to jQuery – AJAX - Structured Query Language (SQL) for interacting with databases.

UNIT V SERVER-SIDE ESSENTIALS (PHP)

LIST OF EXPERIMENTS:
1. Design of static webpage primarily with text and CSS.
2. Apply the inline and block level elements to identify the difference in the layout.
3. Design the HTML forms (text boxes, text areas, radio buttons, check boxes and other elements by understanding the input types and specified needs).
4. Include image/audio and video elements in the web pages.
5. Format and position the text using CSS borders, background and color by understanding the box model.
6. Validate the HTML form elements by creating small client-side validation scripts using JavaScript.
7. Create small PHP scripts to manipulate data using various operators and PHP functions and display the results.
8. Write two different PHP scripts to demonstrate passing variables to a URL.
9. Create Website Registration Form using text box, check box, radio button, select, submit button, and display user inserted value in new PHP page.
10. Create a dynamic web site using PHP and MySQL.

TOTAL: 75 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Understand all the web essentials.
CO2: Design and develop static web pages by using the markup languages that meet the specified needs and interests.
CO3: Validate HTML forms developed using the JavaScript.
CO4: Design rich responsive websites using Ajax.
CO5: Address/solve the real-time issues by developing data centric applications using PHP.
CO6: Develop responsive websites using the programming languages and techniques associated with the World Wide Web.

REFERENCES:

BX3006 INTRODUCTION TO COMPUTER ORGANIZATION L T P C 3 0 0 3

UNIT I DIGITAL FUNDAMENTALS

UNIT II COMBINATIONAL AND SEQUENTIAL CIRCUITS

UNIT III BASIC STRUCTURE OF COMPUTER
Functional Units - Basic Operational Concepts – Bus structures – Performance and Metrics –
instruction and instruction sequencing – Hardware Software Interface – Addressing modes – Instruction Sets – RISC and CISC – ALU Design – Fixed point and Floating point operations

UNIT IV: PROCESSOR DESIGN
9
Processor basics – CPU Organization – Data Path Design – Control Design – Basic concepts – Hardwired control – Micro Programmed control – Pipe control – Hazards super scale operations

UNIT V: MEMORY AND I/O SYSTEMS
9
Memory technology – Memory Systems- Virtual Memory – Caches – Design Methods – Associative memories – Input /output system – Programmed I/O – DMA and interrupts – I/O devices and Interfaces

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to
CO1: Simplify using laws of Boolean algebra and Karnaugh map method
CO2: Design various combinational and sequential circuits
CO3: Trace the flow of execution of an instruction in a processor
CO4: Differentiate between the various mapping policies used in cache memories
CO5: Understand the implementation of virtual memory
CO6: Analyze the various types of I/O transfers

REFERENCES: