1. **PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):**

Graduates will be able to:

I. Apply their computing skills to analyse, design and develop innovative software products to meet the industry needs and excel as software professionals.

II. Pursue lifelong learning and do research in the computing field based on solid technical foundations.

III. Communicate and function effectively in teams in multidisciplinary fields within the global, societal and environmental context.

IV. Exhibit professional integrity, ethics and an understanding of responsibility to contribute technical solutions for the sustainable development of society.

2. **PROGRAM SPECIFIC OUTCOMES (PSOs):**

1. Able to select suitable data models, appropriate architecture, and platform to implement a system with good performance.

2. Able to design and integrate various system based components to provide user interactive solutions for various challenges.

3. Able to develop applications for real time environments using existing and upcoming technologies.
### ANNA UNIVERSITY, CHENNAI
NON - AUTONOMOUS COLLEGES AFFILIATED ANNA UNIVERSITY
MASTER OF COMPUTER APPLICATIONS (2 YEARS)
REGULATIONS – 2021
CHOICE BASED CREDIT SYSTEM
I TO IV SEMESTERS CURRICULA AND 1st and 2nd SEMESTER SYLLABI

#### SEMESTER I

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## AUDIT COURSES (AC)
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## BRIDGE COURSES
(For the M.C.A students admitted under non-computer-science background category)

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<tr>
<th>SL. NO</th>
<th>COURSE CODE</th>
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Classes are to be conducted and completed before the start of the class of first semester, Examinations will be conducted along with first semester

Classes are to be conducted and completed before the start of the class of second semester, Examinations will be conducted along with second semester

Classes are to be conducted and completed before the start of the class of third semester, Examinations will be conducted along with third semester
MA4151  APPLIED PROBABILITY AND STATISTICS FOR COMPUTER SCIENCE ENGINEERS
(COMMON TO M.E.CSE, M.C.A., M.E.MULTIMEDIA TECHNOLOGY)  L  T  P  C
3  1  0  4

COURSE OBJECTIVES:

- To encourage students to develop a working knowledge of the central ideas of Linear Algebra.
- To enable students to understand the concepts of Probability and Random Variables.
- To understand the basic probability concepts with respect to two dimensional random variables along with the relationship between the random variables and the significance of the central limit theorem.
- To apply the small / large sample tests through Tests of hypothesis.
- To enable the students to use the concepts of multivariate normal distribution and principal components analysis.

UNIT I  LINEAR ALGEBRA  12

UNIT II  PROBABILITY AND RANDOM VARIABLES  12

UNIT III  TWO DIMENSIONAL RANDOM VARIABLES  12
Joint distributions – Marginal and conditional distributions – Functions of two dimensional random variables – Regression curve – Correlation.

UNIT IV  TESTING OF HYPOTHESIS  12
Sampling distributions – Type I and Type II errors – Small and Large samples – Tests based on Normal, t, Chi square and F distributions for testing of mean, variance and proportions – Tests for independence of attributes and goodness of fit.

UNIT V  MULTIVARIATE ANALYSIS  12
Random vectors and matrices – Mean vectors and covariance matrices – Multivariate normal density and its properties – Principal components – Population principal components – Principal components from standardized variables.

TOTAL : 60 PERIODS

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

- apply the concepts of Linear Algebra to solve practical problems.
- use the ideas of probability and random variables in solving engineering problems.
- be familiar with some of the commonly encountered two dimension random variables and be equipped for a possible extension to multivariate analysis.
- use statistical tests in testing hypothesis on data.
- develop critical thinking based on empirical evidence and the scientific approach to knowledge development.
REFERENCES:


RM4151 RESEARCH METHODOLOGY AND IPR L T P C
2 0 0 2

UNIT I RESEARCH DESIGN 6
Overview of research process and design, Use of Secondary and exploratory data to answer the research question, Qualitative research, Observation studies, Experiments and Surveys.

UNIT II DATA COLLECTION AND SOURCES 6
Measurements, Measurement Scales, Questionnaires and Instruments, Sampling and methods.
Data - Preparing, Exploring, examining and displaying.

UNIT III DATA ANALYSIS AND REPORTING 6
Overview of Multivariate analysis, Hypotheses testing and Measures of Association.
Presenting Insights and findings using written reports and oral presentation.

UNIT IV INTELLECTUAL PROPERTY RIGHTS 6

UNIT V PATENTS 6

TOTAL : 30 PERIODS

REFERENCES:

MC4101 ADVANCED DATA STRUCTURES AND ALGORITHMS

COURSE OBJECTIVES:

- To understand the usage of algorithms in computing
- To learn and use hierarchical data structures and its operations
- To learn the usage of graphs and its applications
- To select and design data structures and algorithms that is appropriate for problems
- To study about NP Completeness of problems.

UNIT I ROLE OF ALGORITHMS IN COMPUTING & COMPLEXITY ANALYSIS


UNIT II HIERARCHICAL DATA STRUCTURES


UNIT III GRAPHS


UNIT IV ALGORITHM DESIGN TECHNIQUES


UNIT V NP COMPLETE AND NP HARD


TOTAL : 45 PERIODS

SUGGESTED ACTIVITIES:

1. Write an algorithm for Towers of Hanoi problem using recursion and analyze the complexity (No of disc-4)
2. Write any one real time application of hierarchical data structure
3. Write a program to implement Make_Set, Find_Set and Union functions for Disjoint Set Data Structure for a given undirected graph G(V,E) using the linked list representation with simple implementation of Union operation
4. Find the minimum cost to reach last cell of the matrix from its first cell
5. Discuss about any NP completeness problem
COURSE OUTCOMES:
CO1: Design data structures and algorithms to solve computing problems.
CO2: Choose and implement efficient data structures and apply them to solve problems.
CO3: Design algorithms using graph structure and various string-matching algorithms to solve real-life problems.
CO4: Design one’s own algorithm for an unknown problem.
CO5: Apply suitable design strategy for problem solving.

REFERENCES

MC4102 OBJECT ORIENTED SOFTWARE ENGINEERING

COURSE OBJECTIVES:
- To understand the phases in object oriented software development
- To gain fundamental concepts of requirements engineering and analysis.
- To know about the different approach for object oriented design and its methods
- To learn about how to perform object oriented testing and how to maintain software
- To provide various quality metrics and to ensure risk management.

UNIT I SOFTWARE DEVELOPMENT AND PROCESS MODELS

UNIT II MODELING OO SYSTEMS

UNIT III DESIGN PATTERNS
UNIT IV SYSTEM TESTING

UNIT V SOFTWARE QUALITY AND METRICS

SUGGESTED ACTIVITIES:
1. Discuss the different phases in any domain like Health Monitoring System using extreme programming
2. Describe Business Requirement Specification (BRS) and SRS (Software Requirement Specification) for any Project like Automatic Intelligent Plant Watering System using any one of requirement analysis tool
3. Identify the classes, relationship between classes and draw standard UML diagrams using any one UML modeling tool (eg: ArgoUML that supports UML 1.4 and higher)
4. for a system (eg: Conference Management System, student management system)
5. Test the above UML for all the scenarios identified using Selenium /JUnit / Apache JMeter
6. Perform COCOMO estimation for Book Management System to find effort and development time considering all necessary cost estimation factors. (Use GanttPRO Software for estimation)

COURSE OUTCOMES:
On completion of the course the student would be able to :
CO1: Design object oriented software using appropriate process models.
CO2: Differentiate software processes under waterfall and agile methodology.
CO3: Design and Develop UML diagrams for software projects.
CO4: Apply Design Patterns for a software process.
CO5: Categorize testing methods and compare different testing tools for software processes.
CO6: Analyze object oriented metrics and quality for software engineering processes.

TOTAL: 45 PERIODS

REFERENCES:
MC4103 PYTHON PROGRAMMING L T P C 3 0 0 3

COURSE OBJECTIVES:
- To develop Python programs with conditionals, loops and functions.
- To use Python data structures – lists, tuples, dictionaries.
- To do input/output with files in Python.
- To use modules, packages and frameworks in python.
- To define a class with attributes and methods in python.

UNIT I BASICS OF PYTHON

UNIT II DATA TYPES IN PYTHON

UNIT III FILE HANDLING AND EXCEPTION HANDLING

UNIT IV MODULES, PACKAGES AND FRAMEWORKS

UNIT V OBJECT ORIENTED PROGRAMMING IN PYTHON
Creating a Class, Class methods, Class Inheritance, Encapsulation, Polymorphism, class method vs. static methods, Python object persistence.

SUGGESTED ACTIVITIES:
1. Display a multiplication Table Both players are given the same string, S ; Both players have to make substrings using the letters of the string S.
2. Player A has to make words starting with consonants. Player B has to make words starting with vowels. The game ends when both players have made all possible substrings. Do Scoring.
3. Write a function definition for JTOI() in Python that would display the corrected version of entire content of the file .TXT (has wrongly alphabet J in place of alphabet I ) with all the alphabets "J" to be displayed as an alphabet "I" on screen.
4. Consider a CSV file of profit of 10 items in monthly sales of a year . Read this file using Pandas or NumPy or using the in-built matplotlib function. Perform the following task.
5. Read Total profit of all months and show it using a line plot
Read all product sales data and show it using a multi-line plot
Read each item sales data of each month and show it using a scatter plot
Read each item product sales data and show it using the bar chart
Read sales data of bathing soap of all months and show it using a bar chart.
Calculate total sale data an year for each product and show it using a Pie chart
6. Create a Python class called Bank Account which represents a bank account, having as attributes: account Number (numeric type), name (name of the account owner as string type), balance. Create a constructor with parameters: account Number, name, balance. Create a Deposit() method which manages the deposit actions. Create a Withdrawal() method which manages withdrawals actions

COURSE OUTCOMES:
On completion of the course the student would be able to:
CO1: Develop algorithmic solutions to simple computational problems
CO2: Represent compound data using Python lists, tuples and dictionaries.
CO3: Read and write data from/to files in Python Programs
CO4: Structure simple Python programs using libraries, modules etc.
CO5: Structure a program by bundling related properties and behaviors into individual objects.

REFERENCES

MC4104 FUNDAMENTALS OF ACCOUNTING

COURSE OBJECTIVES:
- To understand the basic principles of Accounting
- To understand the Double entry system and the preparation of ledger.
- To understand the process and importance of the electronic accounting system.
- To Prepare the estimate for various business activities such as purchase, sale, production and cash budgets
- To ensure the decision making process of an organization.

UNIT I INTRODUCTION TO ACCOUNTING
Introduction to Financial, Cost and Management Accounting - Objectives of Financial Accounting – Accounting Principles, Concepts and Conventions – Bookkeeping and Accounting
Practical exercise session using Tally:
1. Company Creation, Creating Groups
2. Creation of Ledgers and Vouchers
UNIT II MANAGEMENT ACCOUNTING AND BOOKKEEPING
Practical exercise session using Tally.:  
1. Creating Contra, Journals, Credit and Debit Notes  
2. Preparing Trial Balance and Final Accounts

UNIT III BUDGETS AND BUDGETARY CONTROL
Budgets and Budgetary Control-Meaning-Types-Sales Budget-Production Budget-Cost of Production Budget-Flexible Budgeting-Cash Budget-Master Budget-Zero Base Budgeting-Computerized Accounting – with adjustments
Practical sessions using Advanced tools in MS-Excel:  
1. Preparing Revenue Management and Portfolio Selection  
2. Preparing Final Accounts with Adjustments

UNIT IV FINANCIAL MANAGEMENT
Practical exercise session using Tally.:  
1. Preparing Inventory Creation, Purchase order, Sales Order  
2. Preparing Sales Journal, Rejections, Delivery Note.

UNIT V BANK RECONCILIATION STATEMENT AND REPORTING
Preparing Bank Reconciliation Statement (simple problems) – Insurance Claim – Average Clause - Export and Import of Data, Data Security,  
Practical exercise session using Tally.:  
1. Preparing the Bank Reconciliation Statement  
2. Preparing the Trading, Profit And Loss Account and Trial Balance

TOTAL : 75 PERIODS

COURSE OUTCOMES:
On completion of the course the student would be able to:  
CO1. Able to understand the basic concepts of Accounting standards.  
CO2. Able to understand the process of maintaining Accounts in an organization  
CO3. Helps to understand and calculating the financial position of an organization  
CO4. Helps to understand Financial Management concepts and its components  
CO5. It helps to understand the importance of BRS and generation of various financial reports

REFERENCES:  
6. Advanced Accounting, R.L.Gupta and P.K.Gupta, Advanced Accounting, Sultan Chand, New Delhi
MC4111  ADVANCED DATA STRUCTURES AND ALGORITHMS  L T P C  0 0 4 2

LABORATORY

COURSE OBJECTIVES:
- To acquire the knowledge of using advanced tree structures
- To learn the usage of heap structures
- To understand the usage of graph structures and spanning trees
- To understand the problems such as matrix chain multiplication, activity selection and Huffman coding
- To understand the necessary mathematical abstraction to solve problems.

LIST OF EXPERIMENTS:
1: Implementation of recursive function for tree traversal and Fibonacci
2: Implementation of iteration function for tree traversal and Fibonacci
3: Implementation of Merge Sort and Quick Sort
4: Implementation of a Binary Search Tree
5: Red-Black Tree Implementation
6: Heap Implementation
7: Fibonacci Heap Implementation
8: Graph Traversals
9: Spanning Tree Implementation
10: Shortest Path Algorithms (Dijkstra’s algorithm, Bellman Ford Algorithm)
11: Implementation of Matrix Chain Multiplication
12: Activity Selection and Huffman Coding Implementation

HARDWARE/SOFTWARE REQUIREMENTS
1: 64-bit Open source Linux or its derivative
2: Open Source C++ Programming tool like G++/GCC

TOTAL : 60 PERIODS

COURSE OUTCOMES:
CO1: Design and implement basic and advanced data structures extensively
CO2: Design algorithms using graph structures
CO3: Design and develop efficient algorithms with minimum complexity using design techniques
CO4: Develop programs using various algorithms.
CO5: Choose appropriate data structures and algorithms, understand the ADT/libraries, and use it to design algorithms for a specific problem.

REFERENCES:
MC4112  PYTHON PROGRAMMING LABORATORY  L T P C  0 0 4 2

COURSE OBJECTIVES:
- Develop Python programs with conditionals, loops and functions
- Represent compound data using Python lists, tuples, dictionaries
- Read and write data from/to files in Python
- Implement NumPy, Pandas, Matplotlib libraries
- Implement object oriented concepts

LIST OF EXPERIMENTS:
Note: The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines.
1. Python programming using simple statements and expressions (exchange the values of two variables, calculate the values of n variables, distance between two points).
2. Scientific problems using Conditionals and Iterative loops.
3. Linear search and Binary search
4. Selection sort, Insertion sort
5. Merge sort, Quick Sort
6. Implementing applications using Lists, Tuples.
7. Implementing applications using Sets, Dictionaries.
8. Implementing programs using Functions.
9. Implementing programs using Strings.
10. Implementing programs using written modules and Python Standard Libraries (pandas, numpy, Matplotlib, scipy)
11. Implementing real-time/technical applications using File handling.
12. Implementing real-time/technical applications using Exception handling.
13. Creating and Instantiating classes

HARDWARE/SOFTWARE REQUIREMENTS
1: Processors: Intel Atom® processor Intel®Core™i3 processor
2: Disk space: 1GB.
3: Operating systems: Windows 7, macOS and Linux
4: Python versions: 2.7, 3.6, 3.8

TOTAL: 60 PERIODS

COURSE OUTCOMES:
On completion of the laboratory course, the student should be able to

CO1: Apply the Python language syntax including control statements, loops and functions to solve a wide variety of problems in mathematics and science.
CO2: Use the core data structures like lists, dictionaries, tuples and sets in Python to store, process and sort the data
CO3: Create files and perform read and write operations
CO4: Illustrate the application of python libraries.
CO5: Handle exceptions and create classes and objects for any real time applications

REFERENCES:
MC4113  COMMUNICATION SKILLS ENHANCEMENT – I

COURSE OBJECTIVES:
- To provide opportunities to learners to practice English and thereby make them proficient users of the language.
- To enable learners to fine-tune their linguistic skills (LSRW) with the help of technology.
- To improve the performance of students’ listening, speaking, reading and writing skills and thereby enhance their career opportunities.

LIST OF ACTIVITIES:
1. Listening:
   - Listening and practicing neutral accents
   - Listening to short talks and lectures and completing listening comprehension exercises
   - Listening to TED Talks
2. Speaking:
   - Giving one minute talks
   - Participating in small Group Discussions
   - Making Presentations
3. Reading:
   - Reading Comprehension
   - Reading subject specific material
   - Technical Vocabulary
4. Writing:
   - Formal vs Informal Writing
   - Paragraph Writing
   - Essay Writing
   - Email Writing

REFERENCES / MANUALS / SOFTWARE: Open Sources / websites

COURSE OUTCOMES:
On completion of the course, the students will be able to:
- Listen and comprehend lectures in English
- Articulate well and give presentations clearly
- Participate in Group Discussions successfully
- Communicate effectively in formal and informal writing
- Write proficient essays and emails

TOTAL: 30 PERIODS
MC4201  FULL STACK WEB DEVELOPMENT  L T P C  3 0 0 3

OBJECTIVES:
- To understand the fundamentals of web programming and client side scripting.
- To learn server side development using NodeJS.
- To understand API development with Express Framework.
- To understand and architect databases using NoSQL and SQL databases.
- To learn the advanced client side scripting and ReactJS framework

UNIT I  INTRODUCTION TO CSS and JAVASCRIPT  9

UNIT II  SERVER SIDE PROGRAMMING WITH NODE JS  9
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

UNIT III  ADVANCED NODE JS AND DATABASE  9
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

UNIT IV  ADVANCED CLIENT SIDE PROGRAMMING  9
React JS: ReactDOM - JSX - Components - Properties – Fetch API - State and Lifecycle - -JS Localstorage - Events - Lifting State Up - Composition and Inheritance

UNIT V  APP IMPLEMENTATION IN CLOUD  9
Cloud providers Overview – Virtual Private Cloud – Scaling (Horizontal and Vertical) – Virtual Machines, Ethernet and Switches – Docker Container – Kubernetes

SUGGESTED ACTIVITIES:
1. Build an online MCQ quiz app. The questions and options should be fetched based on the chosen topic from a NodeJS server. The questions can be stored in a JSON file in the backend. Once the user has answered the questions, the frontend must send the chosen options to the backend and the backend must identify the right answers and send the score back to the front end. The frontend must display the score in a separate neatly designed page.
2. Build a blog website where you can add blog posts through a simple admin panel and the users can view the blog posts. The contents of the blog posts can be stored in either MongoDB or MySQL database. The home page should contain the titles of the blog post and the full post can be viewed by clicking the title. Frontend can be built either using React or through template engines served by the NodeJS server.
3. Take any ecommerce or social media website/app. Analyze what the API endpoints would have been used for and how the frontend interacts with the backend. The networks tab in the browser's developer tools can be used if required.
4. Architect an entire database structure for an E-Commerce application for MongoDB. Discuss how the database would have been structured if you were using a SQL database.
5. Build a simple calculator app with React. The user should be able to add numbers and operations to the app by clicking on buttons, just like you would do in a mobile phone. The moment the operation and the two operations are defined, the answer should be displayed.

OUTCOMES:
Upon completion of the course the students should be able to:
- Write client side scripting HTML, CSS and JS.
- Implement and architect the server side of the web application.
- Implement Web Application using NodeJS.
- Architect NoSQL databases with MongoDB.
- Implement a full-stack Single Page Application using React, NodeJS and MongoDB and deploy on Cloud.

TOTAL PERIODS: 45

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MC4202 ADVANCED DATABASE TECHNOLOGY

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

UNIT I DISTRIBUTED DATABASES
UNIT II  SPATIAL AND TEMPORAL DATABASES

UNIT III  NOSQL DATABASES
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 – HiveQL – OrientDB Graph database – OrientDB Features

UNIT IV  XML DATABASES

UNIT V  INFORMATION RETRIEVAL AND WEB SEARCH

TOTAL: 45 PERIODS

Suggested Activities:
1. Create a distributed database for any application (ex. book store) and access it using PHP and Python
2. Create spatial database of any place and perform query operations
3. Creating Databases and writing simple queries using MongoDB, DynamoDB, Voldemort Key-Value Distributed Data Store Hbase and Neo4j.
4. Creating XML Documents, Document Type Definition and XML Schema for any e-commerce website and perform XML Querying
5. Perform sentiment analysis for any web document using text preprocessing techniques

COURSE OUTCOMES:
On completion of the course, the student will be able to:
1. Design a distributed database system and execute distributed queries.
2. Manage Spatial and Temporal Database systems and implement it in corresponding applications.
3. Use NoSQL database systems and manipulate the data associated with it.
4. Design XML database systems and validate with XML schema.
5. Apply knowledge of information retrieval concepts on web databases.

REFERENCES:

MC4203 CLOUD COMPUTING TECHNOLOGIES

OBJECTIVES:
- To understand the basic concepts of Distributed systems.
- To learn about the current trend and basics of Cloud computing.
- To be familiar with various Cloud concepts.
- To expose with the Server, Network and storage virtualization.
- To be aware of Microservices and DevOps.

UNIT I DISTRIBUTED SYSTEMS

UNIT II BASICS OF CLOUD COMPUTING

UNIT III CLOUD INFRASTRUCTURE

UNIT VI CLOUD ENABLING TECHNOLOGIES

UNIT V MICROSERVICES AND DEVOPS
SUGGESTED ACTIVITIES:
1. Write a client and server program to calculate the value of PI, in which server calls the remote procedure of the client side (C programming)
2. Create an an word document of your class time table and store locally and also on cloud and share it (use www.zoho.com , docs.google.com)
3. Create your resume in a neat format using google and zoho cloud Programs on PaaS
4. Discuss processor virtualization, memory virtualization, I/O virtualization in VMWare
5. Set up Azure DevOps, Import Code and Create the Azure DevOps Build Pipeline

OUTCOMES:
Upon completion of the course, the students will be able to
- Use Distributed systems in Cloud Environment.
- Articulate the main concepts, key technologies, strengths and limitations of Cloud computing.
- Identify the Architecture, Infrastructure and delivery models of Cloud computing.
- Install, choose and use the appropriate current technology for the implementation of Cloud.
- Adopt Microservices and DevOps in Cloud environments.

TOTAL PERIODS: 45

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OBJECTIVES:
- To understand the need and characteristics of mobile applications.
- To design the right user interface for mobile applications.
- To understand the design issues in the development of mobile applications.
- To understand the development procedure for mobile applications.
- To develop mobile applications using various tools and platforms.

UNIT I  INTRODUCTION  15
Mobile Application Model – Infrastructure and Managing Resources – Mobile Device Profiles – Frameworks and Tools
- Installation of necessary components and software

UNIT II  USER INTERFACE  15
Generic UI Development - Multimodal and Multichannel UI – Gesture Based UI – Screen Elements and Layouts – Voice XML.
Lab Component:
  i. Implement mobile applications using UI toolkits and frameworks.
  ii. Design an application that uses Layout Managers and event listeners.

UNIT III  APPLICATION DESIGN  15
Lab Component:
  i. Design a mobile application that is aware of the resource constraints of mobile devices.
  ii. Design an application that uses Dynamic Linking

UNIT IV  MOBILE OS  15
Lab Component:
  i. Develop an application that makes use of mobile database
  ii. Implement an android application that writes data into the SD card.

UNIT V  APPLICATION DEVELOPMENT  15
Communication via the Web – Notification and Alarms – Graphics and Multimedia: Layer Animation, Event handling and Graphics services – Telephony – Location based services
Lab Component:
  i. Develop a web based mobile application that accesses internet and location data.
  ii. Develop an android application using telephony to send SMS.
OUTCOMES:
On completion of the course, the student will be able to
- Understand the basics of mobile application development frameworks and tools.
- Develop a UI for mobile applications.
- Design mobile applications that manage memory dynamically.
- Build applications based on mobile OS like Android, iOs.
- Build location based services.

TOTAL PERIODS: 75

SOFTWARE REQUIREMENTS
1. JDK, ECLIPSE IDE / equivalent, ANDROID STUDIO

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MC4205 CYBER SECURITY

OBJECTIVES:
- To learn the principles of cyber security and to identify threats and risks.
- To learn how to secure physical assets and develop system security controls.
- To understand how to apply security for Business applications and Network Communications.
- To learn the technical means to achieve security.
- To learn to monitor and audit security measures.

UNIT I PLANNING FOR CYBER SECURITY
UNIT II  SECURITY CONTROLS

UNIT III  CYBER SECURITY FOR BUSINESS APPLICATIONS AND NETWORKS

UNIT VI  TECHNICAL SECURITY

UNIT V  SECURITY ASSESSMENT

SUGGESTED ACTIVITIES:
1. Discuss and debate information security policies that a privacy focused social media company should comply with.
2. Discuss data privacy policies implemented in various countries.
3. Demonstrate how ADB (Android debug bridge) is being used for malicious purposes.
4. Demonstrate how to troubleshoot networks and analyze packets using tools like WireShark.
5. Discuss the control challenges in virtual networks over cloud environments.

Discuss the common security flaws present in web applications and demonstrate how they can be identified using tools like ACUNETIX (or similar tools)
- OWASP ZAP: https://owasp.org/www-project-zap/
- ACUNETIX: https://www.acunetix.com/
- WireShark: https://www.wireshark.org/
- ADB: https://developer.android.com/studio/command-line/adb

OUTCOMES:
On completion of the course, the student will be able to
- Develop a set of risk and security requirements to ensure that there are no gaps in an organization’s security practices.
- Achieve management, operational and technical means for effective cyber security.
- Audit and monitor the performance of cyber security controls.
- Spot gaps in the system and devise improvements.
- Identify and report vulnerabilities in the system

**TOTAL PERIODS: 45**

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**MC4211 ADVANCED DATABASE TECHNOLOGY LAB**

**COURSE OBJECTIVES:**
- To understand the process of distributing tables across multiple systems
- To understand the process of storing, retrieving spatial and temporal data
- To understand the process of storing, retrieving objects in a database
- To understand the process of storing and retrieving data from a XML Database
- To use the open source database for building a mobile application

**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)

SOFTWARE REQUIREMENTS
1. Java / Python / R / Scala
2. Oracle, MySQL, MongoDB, Casandra, Hive

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

MC4212 FULL STACK WEB DEVELOPMENT LABORATORY L T P C 0 0 4 2

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).

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 Todo 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 PERIODS

SOFTWARE REQUIREMENTS
1. NodeJS/Express JS, ReactJS, Docker, any IDE like NOTEPAD++/visual studio code/sublime text etc.,
2. MySQL, MongoDB

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

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MC4213 COMMUNICATION SKILLS ENHANCEMENT - II

OBJECTIVES:
- To provide opportunities to learners to practice their communication skills to make them become proficient users of English.
- To enable learners to fine-tune their linguistic skills (LSRW) with the help of Technology to communicate globally.
- To enhance the performance of learners at placement interviews and group discussions and other recruitment procedures

1. SOFT SKILLS
- People skills
- Interpersonal skills
- Team building skills
- Leadership skills
- Problem solving skills

2. PRESENTATION SKILLS
- Preparing slides with animation related to the topic
- Introducing oneself to the audience
- Introducing the topic
• Presenting the visuals effectively – 5 minute presentation

3. **GROUP DISCUSSION SKILLS**
   • Participating in group discussions
   • Brainstorming the topic
   • Activities to improve GD skills.

4. **INTERVIEW SKILLS**
   • Interview etiquette – dress code – body language
   • Attending job interviews
   • Answering questions confidently
   • Technical interview – telephone/Skype interview
   • Emotional and cultural intelligence
   • Stress Interview

**TOTAL: 30 PERIODS**

**REFERENCES / MANUALS / SOFTWARE:** Open Sources / websites

**OUTCOMES:**
**Upon Completion of the course, the students will be able to:**
- Students will be able to make presentations and participate in Group discussions with confidence.
- Students will be able to perform well in the interviews.
- Students will make effective presentations.

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PROFESSIONAL ELECTIVES

MC4001 SOFTWARE PROJECT MANAGEMENT L T P C
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OBJECTIVES:
- To know how to do project planning for the software process.
- To learn the cost estimation techniques during the analysis of the project.
- To understand the quality concepts for ensuring the functionality of the software.

UNIT SOFTWARE PROJECT MANAGEMENT CONCEPTS
Introduction to Software Project Management: An Overview of Project Planning: Select Project, Identifying Project scope and objectives, infrastructure, project products and Characteristics. Estimate efforts, Identify activity risks, and allocate resources- Six Sigma.
Software Quality: defining software quality, ISO9126, External Standards.

UNIT II SOFTWARE EVALUATION AND COSTING

UNIT III SOFTWARE ESTIMATION TECHNIQUES

UNIT IV RISK MANAGEMENT

UNIT V GLOBALIZATION ISSUES IN PROJECT MANAGEMENT

SUGGESTED ACTIVITIES:
1. Reducing process variability using six-sigma model DMAIC on software company applications with respect to factors like quality aspects, production bugs classified and measured, the causes of the large number of production bugs leading to different improvement suggestions.
2. Do cost benefit analysis using Ms-Excel for Selecting the project (from available data in the web like https://img.chandoo.org/a/24-cost-benefit-analysis.xlsx)
3. Frequencying and Scheduling the Project activities using open source Ms-Project
4. Risk analysis of any project with special reference to performance time cost trilogy
5. Set up a project and its tasks; Communicate with everyone on the project team from within dotProject software.
OUTCOMES:
- Understand the activities during the project scheduling of any software application.
- Learn the risk management activities and the resource allocation for the projects.
- Apply the software estimation activities and recent quality standards for evaluation of the software projects.
- Acquire knowledge and skills needed for the construction of highly reliable software projects.
- Create reliable, replicable cost estimation that links to the requirements of project planning and managing.

TOTAL PERIODS: 45

REFERENCES

MC4002 PROFESSIONAL ETHICS IN IT

OBJECTIVES:
- To understand the concepts of computer ethics in the work environment.
- To understand the threats in computing environment.
- To understand the intricacies of accessibility issues.
- To ensure safe exits when designing the software projects.

UNIT I INTRODUCTION TO ETHICS
Definition of Ethics- Right, Good, Just- The Rational Basis of Ethics -Theories of Right: Intuitionist vs. End-Based vs. Duty-Based -Rights, Duties, Obligations -Theory of Value - Conflicting Principles and Priorities -The Importance of Integrity -The Difference Between Morals, Ethics, and Laws -Ethics in the Business World - Corporate Social Responsibility -
Creating an Ethical Work Environment - Including Ethical Considerations in Decision Making

UNIT II  ETHICS IN INFORMATION TECHNOLOGY, INTERNET CRIME

UNIT III  FREEDOM OF EXPRESSION, PRIVACY

UNIT IV  FREEDOM OF EXPRESSION, INTELLECTUAL PROPERTY RIGHTS

UNIT V  SOCIAL NETWORKING ETHICS AND ETIQUETTES
Social Networking Web Site - Business Applications of Online Social Networking - Social Network Advertising - The Use of Social Networks in the Hiring Process - Social Networking Ethical Issues - Cyberbullying - Online Virtual Worlds - Crime in Virtual Worlds - Educational and Business Uses of Virtual Worlds

SUGGESTED ACTIVITIES:
1. Prepare a report of CSR activities of any three organizations.
3. Do case study of two incidents that lead to IT Security breach in any of the organizations.
4. Recent cases (within last 5 years duration) of infringement of intellectual property rights.
5. A study on Creative commons and its effect on Open Educational Resources.
6. A study on the role of social networking advertising in the development of Business and Educational Sectors.

OUTCOMES:
Upon Completion of the course, the students will be able to

- Examine situations and to internalize the need for applying ethical principles, values to tackle various situations.
- Develop a responsible attitude towards the use of computers as well as the technology.
- Envision the societal impact on the products/projects they develop in their career.
- Understand the code of ethics and standards of computer professionals.
- Analyze professional responsibility and empower access to information in the workplace.

**TOTAL PERIODS: 45**

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**MC4003**

**E - LEARNING**

**OBJECTIVES:**
- To learn the various E-learning approaches and Components.
- To explore Design Thinking.
- To understand the types of design models of E-learning.
- To learn about E-learning Authoring tools.
- To know about evaluation and management of E-learning solutions

**UNIT I**

**INTRODUCTION** 9


**UNIT II**

**DESIGNING E-LEARNING COURSE CONTENT** 9

UNIT III  CREATING INTERACTIVE CONTENT

UNIT V  LEARNING PLATFORMS

UNIT V  COURSE DELIVERY AND EVALUATION
Components of an Instructor-Led or Facilitated Course – Planning and Documenting Activities – Facilitating Learners Activities – E-Learning Methods and Delivery Formats – Using Communication Tools for E-Learning – Course Evaluation

SUGGESTED ACTIVITIES:
1. Prepare the E-Learning Components and how will you measure the quality of the contents. Also, analyze synchronous and Asynchronous Modes of Learning, and discuss the advantages and disadvantages of both.
2. Explain how the course instructor design and create effective E-Learning content
3. List the types of authoring tools and discuss which tool is best according to you.
4. Explain about different types of Learning Platforms
5. Discuss about the Evaluation process of E-Learning courses in detail.

OUTCOMES:
On completion of course, the students will be able to:
- Distinguish the phases of activities in models of E-learning.
- Identify appropriate instructional methods and delivery strategies.
- Choose appropriate E-learning Authoring tools.
- Create interactive E-learning courseware.
- Evaluate the E-learning courseware

TOTAL PERIODS: 45

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OBJECTIVES:

- To review the fundamentals of Operating Systems
- To gain knowledge on Distributed Operating System concepts that includes issues, Mutual exclusion algorithms, Deadlock detection algorithms
- To gain insight on the distributed resource management components viz. the algorithms for implementation of distributed shared memory, and distributed scheduling.
- To know the components and management aspects of Real time, Mobile operating systems
- To acquire knowledge on the basics of Linux and Mobile OS like iOS, Android

UNIT I  FUNDAMENTALS OF OPERATING SYSTEMS  9

UNIT II DISTRIBUTED OPERATING SYSTEMS  9

UNIT III DISTRIBUTED RESOURCE MANAGEMENT  9

UNIT IV REAL TIME AND MOBILE OPERATING SYSTEMS  9

UNIT V CASE STUDIES  9

SUGGESTED ACTIVITIES:
1. Consider the following preemption method to prevent deadlocks: All processes are assigned unique priorities that can be totally ordered. A requesting process is allowed to preempt another process that holds the needed resource only if the requesting
process has higher priority, otherwise, it is blocked. Demonstrate that this method prevents deadlock.

2. Consider a distributed system where each node has its own clock. Assume that all the clocks in the system are perfectly synchronized. Also, assume that the communication network is reliable. Give an algorithm for recording the global state. Note that your algorithm should be simpler than the Chandy-Lamport algorithm.

3. Predict the performance of the receiver-initiated load sharing algorithm when the entire system workload is generated at only a few nodes in the system instead of equally at all the nodes in the system. (Hint: performance depends on how successful receivers will be in locating senders)

4. Consider two processes, P1 and P2, where \( p_1 = 50, t_1 = 25 \), \( p_2 = 75 \), and \( t_2 = 30 \).
   a. Can these two processes be scheduled using Rate-Monotonic Scheduling? Illustrate your answer by displaying a Gantt chart
   b. Implement the scheduling of these two processes using Earliest Deadline-First (EDF) scheduling.

5. Developers David and Peter of R & D belong to group A. Administrative staff Jack and Mike belong to group B.
   a. Create a shared directory "/project_a". The files in this directory can only be read, added, deleted, modified, and executed by developers in the R & D department. Other users cannot perform any access operation in this directory.
   b. Create a directory "/project_b". The files in this directory can only be read, added, deleted, modified and executed by the staff of the Administration Department, other users cannot do anything to this directory. Access operation.
   c. Create a directory "/project". The files in this directory can be read, added, deleted, modified, and executed by personnel in the R & D department and administrative department. Users in other departments can only use this directory and perform read-only access operations.

OUTCOMES:
Upon Completion of the course, students should be able to:
- Discuss various synchronization, scheduling and deadlock issues
- Demonstrate mutual exclusion and deadlock detection of Distributed Operating system
- Discuss various resource management techniques for distributed systems
- Identify the different features of real time and mobile operating systems
- Perform administrative tasks on Linux Servers, iOS and Android

TOTAL PERIODS: 45

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MC4005 INFORMATION RETRIEVAL TECHNIQUES

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OBJECTIVES:
- To understand the basics of information retrieval with pertinence to modeling, query operations and indexing
- To get an understanding of machine learning techniques for text classification and clustering.
- To understand the various applications of information retrieval giving emphasis to multimedia IR, web search
- To understand the concepts of digital libraries

UNIT I MOTIVATION


UNIT II MODELING


UNIT III INDEXING

Static and Dynamic Inverted Indices – Index Construction and Index Compression. Searching-Sequential Searching and Pattern Matching. Query Operations -Query Languages – Query Processing - Relevance Feedback and Query Expansion - Automatic Local and Global Analysis – Measuring Effectiveness and Efficiency

UNIT IV CLASSIFICATION AND CLUSTERING

Text Classification and Naïve Bayes – Vector Space Classification – Support vector machines and Machine learning on documents. Flat Clustering – Hierarchical Clustering – Matrix decompositions and latent semantic indexing – Fusion and Meta learning

UNIT V SEARCHING THE WEB AND RETRIEVAL

SUGGESTED ACTIVITIES:
1. Compare the features of any three search engines
2. Compare and contrast the IR models
3. List out features of the various IR Query languages
4. List out the applications of classification and clustering in Machine Learning
5. A Study on web crawler used by any Search Engine for indexing the sites
   (For eg., Google, Mozilla, Internet Explorer,....)

OUTCOMES:
Upon completion of this course, the students should be able to:
- Build an Information Retrieval system using the available tools.
- Identify and design the various components of an Information Retrieval system.
- Model an information retrieval system
- Apply machine learning techniques to text classification and clustering which is used for efficient Information Retrieval.
- Design an efficient search engine and analyze the Web content structure.

TOTAL PERIODS: 45

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MC4006 SOFT COMPUTING TECHNIQUES

OBJECTIVES:
- To gain knowledge of soft computing theories and its fundamentals.
- To design a soft computing system required to address a computational task.
- To learn and apply artificial neural networks, fuzzy sets and fuzzy logic and genetic algorithms in problem solving and use of heuristics based on human experience.
- To introduce the ideas of fuzzy sets, fuzzy logic and to become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems.
- To familiarize with genetic algorithms and other random search procedures while seeking global optimum in self–learning situations.

UNIT I Fuzzy Computing

UNIT II Fundamentals of Neural Networks

UNIT III Backpropagation Networks

UNIT IV Competitive Neural Networks
- Kohonen’s Self Organizing Map – SOM Architecture, learning procedure – Application; Learning Vector Quantization – learning by LVQ; Adaptive Resonance Theory – Learning procedure – Applications.

UNIT V Genetic Algorithm

SUGGESTED ACTIVITIES:
- Prepare a weekly timetable for classes in a college for different groups of students so that there are no clashes between classes. The task is to search for the optimum using GA.
- Species identification of a plant using Back propagation Algorithm.
- Bandwidth allocation for wireless system using Neural network.
- Apply Fuzzy logic for washing machines to determine the correct amount of water and detergent, speed of agitation, and length of the wash cycles.
- Apply Fuzzy logic for breast cancer diagnosis.
- Do a Case Study Effect of Road Traffic Noise Pollution on Human Work Efficiency in...
Offices/ Organizations/ Commercial Business Centers in cities Using Fuzzy Expert System:

OUTCOMES:
On completion of the course, the students will be able to:

- Identify and describe soft computing techniques and their roles in building intelligent machines.
- Recognize the feasibility of applying a soft computing methodology for a particular problem.
- Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.
- Apply genetic algorithms to optimization problems.
- Design neural networks to pattern classification and regression problems using a soft computing approach.

TOTAL PERIODS: 45

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MC4007 OPERATIONS RESEARCH

OBJECTIVES:

- To provide the concept and an understanding of basic concepts in Operations Research techniques for Analysis and Modeling in Applications.
- To understand, develop and solve mathematical model of linear programming problems.
- To understand, develop and solve mathematical model of Transport and assignment problems.
- To understand network modeling for planning and scheduling the project activities.
UNIT I  LINEAR PROGRAMMING MODELS  9
Formulation of LPP, Graphical solution of LPP. Simplex Method, Artificial variables: big-M method, degeneracy and unbound solutions.

UNIT II  TRANSPORTATION AND ASSIGNMENT MODELS  9

UNIT III  SCHEDULING BY PERT AND CPM  9
Introduction - Rules to frame a Network - Fullkerson’s Rule to numbering of events - Activity, Times - Critical Path Computation - Slack and Float - PERT- Steps and computing variance, Merits and demerits of PERT, CPM- Time estimating & Limitations, Comparison between PERT & CPM.

UNIT VI  QUEUEING MODELS  9
Characteristics of Queueing Models–Poisson Queues-(M /M/1):(FIFO/∞/∞), (M / M / 1) : (FIFO / N / ∞), (M / M / C) : (FIFO / ∞ / ∞), (M / M / C) : (FIFO / N / ∞)models.

UNIT V  GAME THEORY  9
Competitive game, rectangular game, saddle point, minimax (maximin) method of optimal strategies- value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.

SUGGESTED ACTIVITIES:
1. Do some research on nutrients that are essential for a balanced diet. Select three or four nutrients and constraints on it. Explore the framework of LPP. Formulate an LPP with suitable objective function and constraints.
2. Identify some electricity distribution centers and areas which have requirements. Think of the objective and try to provide the solution framework.
3. Break down the stages of completing a construction of a house (like Start, Framing, Plumbing etc…) and find the minimum days to complete the construction.
4. Try to observe the customer arrival rate in a departmental store near your residence for a week. Also the service rate rendered. Make your inference on appointing an extra salesgirl.
5. Decision making is very crucial. Consider the situation where two companies share a market, in which they currently make Rs 50, 00,000 each. Both need to determine whether they should advertise. For each company advertising costs Rs 20, 00,000 and captures Rs 30, 00, 000 from the competitor provided the competitor doesn’t advertise. What should the companies do?

OUTCOMES:
- Understand and apply linear programming to solve operational problem with constraints
- Apply transportation and assignment models to find optimal solution
- Prepare project scheduling using PERT and CPM
- Identify and analyze appropriate queuing models to reduce the waiting time in queue.
- Choose the best strategy using decision making methods under game theory.
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MC4008 BUSINESS DATA ANALYTICS

Objectives:
- To understand the basics of business analytics and its life cycle.
- To gain knowledge about fundamental business analytics.
- To learn modeling for uncertainty and statistical inference.
- To understand analytics using Hadoop and Map Reduce frameworks.
- To acquire insight on other analytical frameworks.

Unit I OVERVIEW OF BUSINESS ANALYTICS

Unit II ESSENTIALS OF BUSINESS ANALYTICS
UNIT III MODELING UNCERTAINTY AND STATISTICAL INERENCE


UNIT IV ANALYTICS USING HADOOP AND MAPREDUCE FRAMEWORK


UNIT V OTHER DATA ANALYTICAL FRAMEWORKS

Overview of Application development Languages for Hadoop – PigLatin – Hive – Hive Query Language (HQL) – Introduction to Pentaho, JAQL – Introduction to Apache: Sqoop, Drill and Spark, Cloudera Impala – Introduction to NoSQL Databases – Hbase and MongoDB.

SUGGESTED ACTIVITIES:
1. Study on some application of Business analytics in organizations of any domain
2. Study the statistics and data visualization charts of sales data like Amazon using R
3. Study on new strategies derived using data analytic tools on some business data set available and its impact on company progress
4. Prepare a report on the use of Hadoop framework in any two companies
5. Compare and contrast the various Data Analytical Frameworks

OUTCOMES:
On completion of the course, the student will be able to:
- Identify the real world business problems and model with analytical solutions.
- Solve analytical problems with relevant mathematics background knowledge.
- Convert any real world decision making problem to hypothesis and apply suitable statistical testing.
- Write and Demonstrate simple applications involving analytics using Hadoop and MapReduce
- Use open source frameworks for modeling and storing data

TOTAL PERIODS: 45

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OBJECTIVES:
- Be familiar with basic techniques of algorithm analysis.
- Be exposed to the concept of ADTs.
- Learn linear data structures - List, Stack and Queue.
- Learn nonlinear data structures - Tree and Graphs.
- Be exposed to sorting, searching and hashing algorithms

UNIT I  INTRODUCTION  9 +6

Lab 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 - STACK, QUEUE  9 +6

Lab Experiments:
1. Write a program to convert infix to postfix using stack data structure
2. Develop a program to perform circular queue operations

UNIT III  LINEAR DATA STRUCTURES – LIST  9+6

Lab Experiments:
1. Perform Polynomial Manipulation using Single Linked List.
2. Implement the various operations in double linked list.

UNIT IV  SEARCHING, SORTING AND HASH TECHNIQUES  9 +6

Lab 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
Trees and its representation – left child right sibling data structures for general trees- Binary Tree – Binary tree traversals — Binary Search Tree - Graphs and its representation - Graph Traversals - Depth-first
traversal – breadth-first traversal—Application of graphs.

Lab Experiments:
1. Write a program to delete a node from a given Binary search tree
2. Write a program to perform Graph Traversals

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
- analyze algorithms and determines their time complexity.
- understand the concepts of data types, data structures and linear structures
- apply data structures to solve various problems
- apply different Sorting, Searching and Hashing algorithms.
- understand non-linear data structures

REFERENCES

BX4002 PROBLEM SOLVING AND PROGRAMMING IN C L T P C
3 0 2 4

COURSE OBJECTIVES:
- To understand the basic concepts of problem solving approaches and to develop the algorithms
- Apply the techniques of structured (functional) decomposition to break a program into smaller pieces and describe the mechanics of parameter passing.
- To design, implements, test, and apply the basic C programming concepts

UNIT I INTRODUCTION TO COMPUTER PROBLEM SOLVING 9

UNIT II PROGRAMMING AND ALGORITHMS 9
Programs and Programming – building blocks for simple programs -pseudo code representation – flow charts - Programming Languages - compiler –Interpreter, Loader and Linker - Program execution – Classification of Programming Language - Structured Programming Concept – Illustrated Problems: Algorithm to check whether a given number is Armstrong number or not- Find factorial of a number
UNIT III  BASICS OF ‘C’, INPUT / OUTPUT & CONTROL STATEMENTS  9 +10


Lab 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 IV  ARRAYS, STRINGS, FUNCTIONS AND POINTERS  9 +10


Lab Experiments
1. Write a program in C to get the largest element of an array using the function.
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 V  USER-DEFINED DATATYPES & FILES  9 +10


Lab Experiments:
1. Write a C program to Store Student Information in Structure and Display it.
2. The annual examination is conducted for 10 students for five subjects.
3. Write a program to read the data from a file and determine the following:
   Total marks obtained by each student; Topper of the class

COURSE OUTCOMES:
- Able to design a computational solution for a given problem.
- Able to break a problem into logical modules that can be solved (programmed).
- Able to transform a problem solution into programs involving programming constructs.
- To write programs using structures, strings, arrays, pointers and files for solving complex computational problems.
- Able to introduce modularity using functions and pointers which permit ad hoc runtime polymorphism.

TOTAL : 75 PERIODS

REFERENCES:

<table>
<thead>
<tr>
<th>BX4003</th>
<th>INTRODUCTION TO COMPUTER ORGANIZATION AND OPERATING SYSTEM</th>
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**COURSE OBJECTIVES:**
- To learn the basic structure and operations of a computer.
- To learn the arithmetic and logic unit and implementation of fixed-point and floating point arithmetic unit.
- To understand the memory hierarchies, cache memories and virtual memories and to learn the different ways of communication with I/O devices.
- To understand the basic concepts and functions of Operating Systems
- To understand Process and various Scheduling Algorithms of OS

**UNIT I  BASIC STRUCTURE AND ARITHMETIC OPERATIONS**

**UNIT II  PROCESSOR AND CONTROL UNIT**
- A Basic MIPS implementation – Building a Datapath – Control Implementation Scheme – Pipelining – Pipelined datapath and control – Handling Data Hazards & Control Hazards – Exceptions.

**UNIT III  MEMORY & I/O SYSTEMS**

**UNIT IV  OPERATING SYSTEMS OVERVIEW**

**UNIT V  PROCESS MANAGEMENT**
- CPU Scheduling – Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Threads Overview– The critical-section problem, Semaphores, Classical problems of synchronization, Critical regions

**TOTAL : 45 PERIODS**
COURSE OUTCOMES:
On Completion of the course, the students should be able to:

- Understand the basics structure of computers, operations and instructions.
- Design arithmetic and logic unit, control unit.
- Understand the various memory systems and I/O communication.
- Understand operating system functions, types, system calls.
- Analyze Process and various scheduling algorithms.

REFERENCES:

BX4004 DATABASE MANAGEMENT SYSTEMS L T P C 3 0 2 4

OBJECTIVES:

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

UNIT I INTRODUCTION 9

UNIT II RELATIONAL MODEL AND QUERY EVALUATION 9
Relational Model Concepts – Relational Algebra – SQL – Basic Queries – Complex SQL Queries – Views – Constraints

UNIT III DATABASE DESIGN & APPLICATION DEVELOPMENT 9

UNIT IV TRANSACTION PROCESSING 9
Query Processing-Transaction Processing – Properties of Transactions - Serializability – Transaction

UNIT V FILES AND INDEXING
File operations – Hashing Techniques – Indexing – Single level and Multi-level Indexes – B+ tree – Static Hashing

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’

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to

- Understand the basic concepts of the database and data models.
- Design a database using ER diagrams and map ER into Relations and normalize the relations
- Acquire the knowledge of query evaluation to monitor the performance of the DBMS.
- Develop a simple database applications using normalization.
- Acquire the knowledge about different special purpose databases and to critique how they differ from traditional database systems.

TOTAL : 75 PERIODS

REFERENCES:

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

UNIT I  LOGIC AND PROOFS

UNIT II  COMBINATORICS

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

UNIT VI  ALGEBRAIC STRUCTURES

UNIT V  LATTICES AND BOOLEAN ALGEBRA

TOTAL : 45 PERIODS

COURSE OUTCOMES:
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.

REFERENCES:

BX4006 BASICS OF COMPUTER NETWORKS

L T P C 3 0 0 3

COURSE OBJECTIVES:
- To understand networking concepts and basic communication model
- To understand network architectures and components required for data communication.
- To analyze the function and design strategy of physical, data link, network layer and transport layer
- To acquire basic knowledge of various application protocol for internet security issues and services

UNIT I NETWORK FUNDAMENTALS

UNIT II DATA LINK LAYER

UNIT III NETWORK LAYER

UNIT IV TRANSPORT LAYER
Transport layer – service – Connection establishment – Flow control – Transmission control protocol – Congestion control and avoidance – User datagram protocol

UNIT V APPLICATIONS AND SECURITY
Applications - DNS- SMTP – WWW –SNMP- Security – threats and services - DES- RSA.

COURSE OUTCOMES:
On Completion of the course, the students should be able to:
- Able to trace the flow of information from one node to another node in the network
- Able to Identify the components required to build different types of networks
- Able to understand the functionalities needed for data communication into layers
- Able to choose the required functionality at each layer for given application
- Able to understand the working principles of various application protocols and fundamentals of security issues and services available

TOTAL : 45 PERIODS
REFERENCES:

AUDIT COURSES

AX4091 ENGLISH FOR RESEARCH PAPER WRITING L T P C
2 0 0 0

COURSE OBJECTIVES:
- Teach how to improve writing skills and level of readability
- Tell about what to write in each section
- Summarize the skills needed when writing a Title
- Infer the skills needed when writing the Conclusion
- Ensure the quality of paper at very first-time submission

UNIT I INTRODUCTION TO RESEARCH PAPER WRITING
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT II PRESENTATION SKILLS

UNIT III TITLE WRITING SKILLS
Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check

UNIT IV RESULT WRITING SKILLS
Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

UNIT V VERIFICATION SKILLS
Useful phrases, checking Plagiarism, how to ensure paper is as good as it could possibly be the first-time submission

TOTAL: 30 PERIODS
COURSE OUTCOMES:
CO1 – Understand that how to improve your writing skills and level of readability
CO2 – Learn about what to write in each section
CO3 – Understand the skills needed when writing a Title
CO4 – Understand the skills needed when writing the Conclusion
CO5 – Ensure the good quality of paper at very first-time submission

REFERENCES:

AX4092                DISASTER MANAGEMENT                         L T P C
                                      2 0 0 0

COURSE OBJECTIVES:
- Summarize basics of disaster
- Explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Develop the strengths and weaknesses of disaster management approaches

UNIT I                  INTRODUCTION                                  6
Disaster: Definition, Factors and Significance; Difference between Hazard And Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT II                 REPERCUSSIONS OF DISASTERS AND HAZARDS                6

UNIT III                DISASTER PRONE AREAS IN INDIA                             6
Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides And Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference To Tsunami; Post-Disaster Diseases and Epidemics

UNIT IV                 DISASTER PREPAREDNESS AND MANAGEMENT                      6
Preparedness: Monitoring Of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.
UNIT V  RISK ASSESSMENT
Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People’s Participation in Risk Assessment. Strategies for Survival

TOTAL : 30 PERIODS

COURSE OUTCOMES:
CO1: Ability to summarize basics of disaster
CO2: Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
CO3: Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
CO4: Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
CO5: Ability to develop the strengths and weaknesses of disaster management approaches

REFERENCES

UNIT I  HISTORY OF MAKING OF THE INDIAN CONSTITUTION
History, Drafting Committee, (Composition & Working)

UNIT II  PHILOSOPHY OF THE INDIAN CONSTITUTION
Preamble, Salient Features

UNIT III  CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES

UNIT IV  ORGANS OF GOVERNANCE
Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive,
President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

UNIT V  LOCAL ADMINISTRATION

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

SUGGESTED READING
1. The Constitution of India,1950(Bare Act),Government Publication.

COURSE OUTCOMES
Students will be able to:
- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- 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.
- Discuss the passage of the Hindu Code Bill of 1956.

AX4094  கல்லூரியை நடத்தும் பொழுதுபோக்கு

UNIT I  கல்லூரியை நடத்தும் பொழுதுபோக்கு
1. கல்லூரியை நடத்தும் பொழுது புரோக்கப்படும் - சொல்லை, நடைமுறை, முழுநோட்டு
2. அக்காலத்தை (82)
   - புரோக்கப்படும் தொலைதொடர் முழுநோட்டு
3. கல்லூரியை பற்றிய முழுநோட்டு
4. புரோக்கப்படும் (95,195)
   - புரோக்க நிறுவன விளக்கப்படுத்து
UNIT II  அறநநறித் தமிழ்  6
1. அறநநறித் திறமைப்படிச்
   - அமர் வெவ்வேறுகள், அட்டகப்படை, பம்பல் அறிகள், வேக, பகுதி
   - போன்ற அக்கி - இனத்தின் பரந்தப்
   - சுற்றி, சிறப்புகளுடன். கிருட்பம், அசாமேரகல் (சமவெளியுள்ள வகுத்தின்)

UNIT III  உருவகக் கருப்பியகங்கள்
6
1. கல்வியுணிப்பு புரட்சி
   - கிலோபொருள் அப்புறாகர் காட்சி
2. சூழ்வாய் துடுப்பெரும் பலி பெறப்படுத்தல்
   - கிலோபொருள் அதிகாரப் பலி பெற்றது

UNIT IV  அறிவியல் தமிழ் 6
1. கையேருநோயிற்பெற்றல்
   - பார்ப் பார்பதுகளின் வட்டங்குத்தி, பொது பொதுகளின்
   பரமை காட்சிகள், அறப்புள் அன்றுகள் நடிக்குத்தி வட்டங்குத்தி
   - அவே பார்ப் புரட்சி
2. காத்திருப்பு
   - அண்டக்லைட்டில் பசல்வர்கள் விளம்பு
3. திட்டமக்கிறு (617, 618)
   - தொடர் தொடர் விளிம்பு
4. குறுக்கலைகளவும் திருச்சுல்லிய குறுக்கலைகளும்
5. புதுப்பார்
   - கையேருநோயிற்பெற்றல்
6. காத்திருப்பு (4) - புரட்சி
   - காத்திருப்பு (11) - தொடர்
   - காத்திருப்பு (11) - பார்ப், புரட்சி
   - காத்திருப்பு 50 (27) - பார்ப்
   - காத்திருப்பு புரட்சி விளிம்பு

UNIT V  நவீன தமிழ் இலக்கியம் 6
1. உருவகக் கருப்பியகங்கள்
   - துடுப்பெரும் ப்பு பொருள்
   - துடுப்பெரும் முனை கிருஷ்ணம்
   - காத்திருப்பு துடுப்பெரும்
   - பலியாக இறங்கும்
   - வேகம்
2. துடுப்பெரும் துடுப்பெரும் ப்பு பொருள் துடுப்பெரும்
3. தொடர் தொடர் ப்பு பொருள் துடுப்பெரும்
4. ப்பு ப்பு ப்பு பொருள் ப்பு பொருள் துடுப்பெரும் ப்பு பொருள் துடுப்பெரும்
5. அறிவியல் கல்லூரி.
6. ஓடுகல்விக்கழகம் கல்லூரி.
7. தமிழ்கல்லுணர்ச்சி கல்லூரிகள் கல்லூரி.

TOTAL: 30 PERIODS

தமிழ் தொடருந்து வல்லிப்பிள்ளை / பராமரிக்கல்
1. தமிழ் டைம்ஸ் வியர்ஸல் கல்விக்கழகம் (Tamil Virtual University) - www.tamilvu.org
2. தமிழ் விக்கிப்பீடியோ (Tamil Wikipedia) - https://ta.wikipedia.org
3. தர்மபுர ஆதின அகன்றப்பு
4. வாழ்க்கை கல்லூரிகள்
   - தமிழ் பல்கலைக்கழகம், குரைமுனை
5. தமிழ்கல்லுணர்ச்சி கல்லூரிகள்
   - தமிழ்கல்லுணர்ச்சி குறைய (thamilvalarchithurai.com)
6. அறிவியல் கல்லூரிகள்
   - தமிழ் பல்கலைக்கழகம், குரைமுனை