CURRICULUM STRUCTURE

and

DETAILED SYLLABUS

for

Two Year PG Programme

M.C.A.
(MASTER OF COMPUTER APPLICATIONS)

(Applicable for batches admitted from 2024-25)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA - 533 003, Andhra Pradesh, India

MCA I Semester

S.No	Course Code	Course Name	Category	L	T	P	C
1	MCA1101	Data Structures	PC	3	0	0	3
2	MCA1102	Computer Organization	PC	3	0	0	3
3	MCA1103	Database Management Systems	PC	3	0	0	3
4	MCA1104	Operating Systems	PC	3	0	0	3
5	MCA1105	Mathematical and Statistical Foundations	BS&H	3	1	0	4
6	MCA1106	Database Management Systems Lab	PC	0	0	3	1.5
7	MCA1107	Data Structures using C Lab	PC	0	0	4	2
8	MCA1108	Operating Systems and Linux Lab	PC	0	0	3	1.5
			Total	15	1	10	21

MCA II Semester

S.No	Course Code	Course Name	Category	L	T	P	C
1	MCA1201	Computer Networks	PC	3	0	0	3
2	MCA1202	Network Security and Cyber Security	PC	3	0	0	3
3	MCA1203	Object Oriented Programming Using JAVA	PC	3	0	0	3
4	MCA1204	Software Engineering	PC	3	0	0	3
5	MCA1205	Artificial Intelligence	PC	3	0	0	3
6	MCA1206	**Program Elective-1** 1. Design and Analysis of Algorithms 2. Advanced Unix Programming 3. Data Warehousing and Data mining 4. MOOCS-1(NPTEL /SWAYAM) (Recommended 12 week course with 3 credits)	PC/ PE	3	0	0	3
7	MCA1207	Object Oriented Programming Using JAVA Lab	PC	0	0	3	1.5
8	MCA1208	Networks and Security Lab	PC	0	0	3	1.5
9	MCA1209	Employability Skills-1$	AC	1	0	0	0
			Total	19	0	6	21

*This will be conducted in Zero Hour.
$Internal Evaluation

III Semester

S.No	Course Code	Course Name	Category	L	T	P	C
1	MCA2101	Machine Learning using Python	PC	3	0	0	3
2	MCA2102	Full Stack Development	PC	3	0	0	3
3	MCA2103	Big Data Technologies	PC	3	0	0	3
4	MCA2104	**Program Elective-2** 1. Cloud Computing 2. Image Processing 3. Internet of Things 4. MOOCS-2(NPTEL /SWAYAM) (Recommended 12 week course with 3 credits)	PE	3	0	0	3
5	MCA2105	Human Resource Management	BS&H	3	0	0	3
6	MCA2106	Full Stack Development Lab	PC	0	0	3	1.5
7	MCA2107	Machine Learning with Python Lab	PC	0	0	4	2
8	MCA2108	Big Data Technologies Lab	PC	0	0	3	1.5
9	MCA2109	Employability Skills–2$	AC	1	0	0	0
10	MCA2110	Internship/Industry Oriented Mini Project#	MC	0	0	0	2
			Total				22

$Internal Evaluation
#This can be done during *semester break* and evaluated at the end of 3rd Sem.

IV Semester

S.No	Course Code	Course Name	Category	L	T	P	C
1	MCA2201	**Program Elective-3** 1.Unified Modeling Language 2.Blockchain Technologies 3.Advanced UNIX Programming 4.MOOCs-3 NPTEL/SWAYAM) Recommended 12 week course with 3 credits	PE	3	0	0	3
2	MCA2202	**Program Elective-4** 1. Mobile Adhoc Networks 2. Quantum Computing 3. Agile Methodologies 4. MOOCs-4 (NPTEL/SWAYAM) Recommended 12 week course with 3 credits	PE	3	0	0	3
3		Project Work/Dissertation		0	0	0	10
			Total	6	0	0	16

*Students going for Industrial Project/ Thesis will complete these courses through MOOCs (or even in earlier semester)

II Year – I Sem	MACHINE LEARNING USING PYTHON	L	T	P	C
		3	0	0	3

Course Objectives:

From the course the student will

- Learn patterns and concepts from data without being explicitly programmed in various IOT nodes.
- Design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
- Explore supervised and unsupervised learning paradigms of machine learning.
- Explore Deep learning technique and various feature extraction strategies.

UNIT-I:

Introduction to Machine Learning with Python: Introduction to Machine Learning, basic terminology, Types of Machine Learning and Applications, Using Python for Machine Learning: Installing Python and packages from the Python Package Index, Introduction to NumPy, SciPy, matplotlib and scikit-learn, Tiny application of Machine Learning.

UNIT-II:

Supervised Learning: Types of Supervised Learning, Supervised Machine Learning Algorithms: k-Nearest Neighbors, Linear Models, Naive Bayes Classifiers, Decision Trees, Ensembles of Decision Trees, Kernelized Support Vector Machines, Uncertainty Estimates from Classifiers.

UNIT-III:

Unsupervised Learning: Types of Unsupervised Learning, challenges, Preprocessing and scaling, Dimensionality Reduction, Feature Extraction, Manifold Learning, Clustering: K-Means Clustering, Agglomerative Clustering, DBSCAN, Comparing and Evaluating Clustering Algorithms.

UNIT-IV:

Representing Data and Engineering Features: Categorical Variables, Binning, Discretization, Linear Models, Trees, Interactions and Polynomials, Univariate Nonlinear Transformations, Automatic Feature Selection. Parameter Selection with Preprocessing, Building Pipelines, The General Pipeline Interface

UNIT-V:

Working with Text Data (Data Visualization) : Types of Data Represented as Strings, Example Application: Sentiment Analysis of Movie Reviews, Representing Text Data as a Bag

of Words, Stop Words, Rescaling the Data with tf-idf, Investigating Model Coefficients, Approaching a Machine Learning Problem, Testing Production Systems, Ranking, Recommender Systems and Other kinds of Learning.

Text Books:
1. Introduction to Machine Learning with Python: A Guide for Data Scientists, Andreas C. Muller & Sarah Guido, Orielly Publications, 2019.
2. Python Machine Learning, Sebastian Raschka & Vahid Mirjalili, 3rd Edition, 2019.
3. Building Machine Learning Systems with Python, Luis Pedro Coelho, Willi Richert, 2nd Edition, 2015.

Reference Books:
1. Machine Learning, Tom M. Mitchell, Mc Graw-Hill Publication, 2017

II Year – I Sem	FULL STACK DEVELOPMENT	L	T	P	C
		3	0	0	3

Course objectives:
The main objective of the course is to provide understanding on the essential javascript, bootstrap, ReactJS concepts for web development and to store and model data in a no sql database.

UNIT I:
Basic JavaScript Instructions, Statements, Comments, Variables, Data Types, Arrays, Strings, Functions, Methods & Objects, Decisions & Loops.
Text Book 1: Chapter 2, 3, 4

UNIT II:
Document Object Model: DOM Manipulation, Selecting Elements, Working with DOM Nodes, Updating Element Content & Attributes, Events, Different Types of Events, How to Bind an Event to an Element, Event Delegation, Event Listeners.
Text Book 1: Chapter: 5, 6, 13

UNIT III:
Form enhancement and validation. Introduction to MERN: MERN components, Server less Hello world. React Components: Issue Tracker, React Classes, Composing Components, Passing Data Using Properties, Passing Data Using Children, Dynamic Composition.
Text Book 2: Chapter 1, 2, 3

UNIT IV:
React State: Initial State, Async State Initialization, Updating State, Lifting State Up, Event Handling, Stateless Components, Designing Components, State vs. Props, Component Hierarchy, Communication, Stateless Components. Express, REST API, GraphQL, Field Specification, Graph Based, Single Endpoint, Strongly Typed, Introspection, Libraries, The About API GraphQL Schema File, The List API, List API Integration, Custom Scalar types, The Create API, Create API Integration, Query Variables, Input Validations, Displaying Errors.
Text Book 2: Chapter 4, 5

UNIT V;
MongoDB: Basics, Documents, Collections, Databases, Query Language, Installation, The Mongo Shell, MongoDB CRUD Operations, Create, Read, Projection, Update, Delete, Aggregate, MongoDB Node.js Driver, Schema Initialization, Reading from MongoDB, Writing to MongoDB. Modularization and Webpack ,Back-End Modules Front-End Modules and Webpack Transform and Bundle, Libraries Bundle ,Hot Module Replacement, Debugging

Define Plugin: Build Configuration, Production Optimization.
Text Book 2: Chapter 6, 7

Text Books:
1. Jon Duckett, "JavaScript & jQuery: Interactive Front-End Web Development", Wiley, 2014.
2. Vasan Subramanian, Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node. Apress, 2019.

e-Resources:
● https://github.com/vasansr/pro-mern-stack
● https://nptel.ac.in/courses/106106156
● https://archive.nptel.ac.in/courses/106/105/106105084/

II Year – I Sem	BIG DATA TECHNOLOGIES	L	T	P	C
		3	0	0	3

Course objectives:

The main objective of this course is to implement Map Reduce programs for processing big data, realize storage and processing of big data using MongoDB, Pig, Hive and Spark and analyze big data using machine learning techniques.

UNIT I:

Classification of data, Characteristics, Evolution and definition of Big data, What is Big data, Why Big data, Traditional Business Intelligence Vs Big Data, Typical data warehouse and Hadoop environment. Big Data Analytics: What is Big data Analytics, Classification of Analytics, Importance of Big Data Analytics, Technologies used in Big data Environments, Few Top Analytical Tools , NoSQL, Hadoop.
TB1: Ch 1: 1.1, Ch2: 2.1-2.5,2.7,2.9-2.11, Ch3: 3.2,3.5,3.8,3.12, Ch4: 4.1,4.2

UNIT II:

Introduction to Hadoop: Introducing hadoop, Why hadoop, Why not RDBMS, RDBMS Vs Hadoop, History of Hadoop, Hadoop overview, Use case of Hadoop, HDFS (Hadoop Distributed File System), Processing data with Hadoop, Managing resources and applications with Hadoop YARN(Yet Another Resource Negotiator). Introduction to Map Reduce Programming: Introduction, Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression.
TB1: Ch 5: 5.1-,5.8, 5.10-5.12, Ch 8: 8.1 - 8.8

UNIT III:

Introduction to MongoDB: What is MongoDB, Why MongoDB, Terms used in RDBMS and MongoDB, Data Types in MongoDB, MongoDB Query Language.
TB1: Ch 6: 6.1-6.5

UNIT IV:

Introduction to Hive: What is Hive, Hive Architecture, Hive data types, Hive file formats, Hive Query Language (HQL), RC File implementation, User Defined Function (UDF). Introduction to Pig: What is Pig, Anatomy of Pig, Pig on Hadoop, Pig Philosophy, Use case for Pig, Pig Latin Overview, Data types in Pig, Running Pig, Execution Modes of Pig, HDFS Commands, Relational Operators, Eval Function, Complex Data Types, Piggy Bank, User Defined Function, Pig Vs Hive.
TB1: Ch 9: 9.1-9.6,9.8, Ch 10: 10.1 - 10.15, 10.22

UNIT V:

Spark and Big Data Analytics: Spark, Introduction to Data Analysis with Spark. Text, Web

Content and Link Analytics: Introduction, Text Mining, Web Mining, Web Content and Web Usage Analytics, Page Rank, Structure of Web and Analyzing a Web Graph.
TB2: Ch5: 5.2,5.3, Ch 9: 9.1-9.4

Text Books:
1. Seema Acharya, Subhashini Chellappan "Big data and Analytics" Wiley India Publishers, 2nd Edition, 2019.
2. Rajkamal, Preeti Saxena, "Big Data Analytics, Introduction to Hadoop, Spark and Machine Learning" , McGraw Hill Publication, 2019

Reference Books:
1. Adam Shook and Donald Mine, "MapReduce Design Patterns: Building Effective Algorithms and Analytics for Hadoop and Other Systems" - O'Reilly 2012
2. Tom White, "Hadoop: The Definitive Guide" 4th Edition, O'reilly Media, 2015.
3. Thomas Erl, Wajid Khattak, and Paul Buhler, Big Data Fundamentals: Concepts, Drivers & Techniques, Pearson India Education Service Pvt. Ltd., 1st Edition, 2016
4. John D. Kelleher, Brian Mac Namee, Aoife D'Arcy -Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, MIT Press 2020, 2nd Edition

e-Resources:
- https://www.kaggle.com/datasets/grouplens/movielens-20m-dataset
- https://www.youtube.com/watch?v=bAyrObl7TYE&list=PLEiEAq2VkUUJqp1k-g5W1mo37urJQOdCZ
- https://www.youtube.com/watch?v=VmO0QgPCbZY&list=PLEiEAq2VkUUJqp1kg5W1mo37urJQOdCZ&in dex=4
- https://www.youtube.com/watch?v=GG-VRm6XnNk
- https://www.youtube.com/watch?v=JglO2Nv_92A

II Year – I Sem	CLOUD COMPUTING (PROGRAM ELECTIVE-2)	L	T	P	C
		3	0	0	3

Course Objectives:

- To explain the evolving computer model caned cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.
- To motivate students to do programming and experiment with the various cloud computing environments.

UNIT–I:

Systems modeling, Clustering and virtualization: Scalable Computing over the Internet, Technologies for Network based systems, System models for Distributed and Cloud Computing, Software environments for distributed systems and clouds, Performance, Security And Energy Efficiency.

UNIT–II:

Virtual Machines and Virtualization of Clusters and Data Centers: Implementation Levels of Virtualization, Virtualization Structures/ Tools and mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data Centre Automation.

UNIT–III:

Cloud Platform Architecture: Cloud Computing and service Models, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, Inter Cloud Resource Management, Cloud Security and Trust Management. Service Oriented Architecture, Message Oriented Middleware.

UNIT–IV:

Cloud Programming and Software Environments: Features of Cloud and Grid Platforms, Parallel & Distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments.
Storage Systems: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system., Apache Hadoop, BigTable, Megastore, Amazon Simple Storage Service(S3).

UNIT-V:

Cloud Resource Management and Scheduling : Policies and Mechanisms for Resource Management Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two

Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Coordination of Specialized Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds, Fair Queuing, Start Time Fair Queuing, Borrowed Virtual Time, Cloud Scheduling Subject to Deadlines, Scheduling MapReduce Applications Subject to Deadlines.

Text Books:
1. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
2. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.
3. Cloud Computing, A Hands on approach, Arshadeep Bahga, Vijay Madisetti, University Press

Reference Books:
1. Cloud Computing: A Practical Approach. Anthony T.Velte. Toby J.VeFte, Robert Elsenpeter. Tata McGraw Hill. rp2Oll.
2. Enterprise Cloud Computing Gautam Shroif, Cambridge University Press. 2010.
3. Cloud Computing: Implementation, Management and Security, John W. Rittinouse, James F Ransome. CRC Press, rp2012.
4. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud. George Reese, O'Really SPD, rp2Oll.
5. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Ktriaraswamy, Shahed Latif, O'Redç SPD, rp2Oll.

II Year – I Sem	IMAGE PROCESSING (PROGRAM ELECTIVE-2)	L	T	P	C
		3	0	0	3

Course Objectives:
- To comprehend the relation between human visual system and machine perception and processing of digital images.
- To provide a detailed approach towards image processing applications like enhancement, segmentation, and compression.

UNIT – I:
Image Formation and Coordinate Transformations Camera Matrix, Motion, Stereo Pin-hole model, Human eye, cognitive aspects of colour, 3D space; illumination; Sampling and Quantization Coordinate transformations and camera parameters

UNIT – II:
Image Processing - Noise Removal, Blurring, Edge Detection: Canny, Gaussian, Gabor, Texture Edges, Curvature, Corner Detection.

UNIT – III:
Segmentation - Concept of Figure vs. Ground, Watershed, Change Detection, Background Subtraction, Texture Segmentation, Gaussian Mixture Models, Applications in Color, Motion based Image Segmentation, Background Modeling and Shape Clustering

UNIT – IV:
Machine Learning techniques in Vision, Bayesian Classification, Maximum Likelihood Methods, Neural Networks; Non-parametric models; Manifold estimation Support Vector Machines ; Temporal sequence learning.

UNIT – V:
Introduction to Object Tracking, Exhaustive vs. Stochastic Search Shapes, Contours, Appearance Models. Mean-shift tracking; Contour-based models, Object Modeling and Recognition Fundamental matrix, Epipolar geometry Adaboost approaches: Face Detection, Recognition Large Datasets; Attention models.

Text Books:
1. David Forsyth and Jean Ponce, Computer Vision: A modern Approach, PHI.
2. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2008.

Reference Books:
1. E.R. Davies, Machine Vision, Theory Algorithms Practicalities, Elsevier 2005

2. Milan Sonka, Vaclav Hlavac, Roger Boyle, Image Processing, Analysis, and Machine Vision. Brooks, Cole, Thomson 1999

3. Russell, Norvig: AI: A modern Approach, Prentice Hall 2000.

4. Richard Hartley, Andrew Zisserman, Multiple View Geometry in Computer Vision, Cambridge Univ Press 2000

5. Richard O. Duda, Peter E. Hart, David G. Stork, Pattern Classification, 2nd ed., Wiley Asia, 2002

II Year – I Sem	INTERNET OF THINGS (PROGRAM ELECTIVE-2)	L	T	P	C
		3	0	0	3

Course Objectives:

- Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
- Formalize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).
- Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports.

UNIT I:
The Internet of Things: An Overview of Internet of things, Internet of Things Technology, behind Io Ts Sources of the Io Ts, M2M Communication, Examples of IoTs, Design Principles For Connected Devices Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

UNIT II:
Business Models for Business Processes in the Internet of Things, IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems, ETSI M2M domains and High-level capabilities, Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

UNIT III:
Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

UNIT IV:
Data Acquiring, Organizing and Analytics in IoT/M2M, Applications /Services / Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

UNIT V:
Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively

(Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World.

Text Books:
1. Internet of Things: Architecture, Design Principles and Applications, 1st ed, Rajkamal, McGraw Hill Higher Education, 2017.
2. Internet of Things, 1st ed, A.Bahgya and V.Madisetti, Univesity Press, 2014

Reference Books:
1. Designing the Internet of Things, 1st ed, Adrian McEwen and Hakim Cassimally, Wiley, 2013.
2. Getting Started with the Internet of Things, 1st ed, CunoPfister, Oreilly, 2011.

II Year – I Sem	HUMAN RESOURCE MANAGEMENT	L	T	P	C
		3	0	0	3

Course Objectives:

- Contribute to the development, implementation, and evaluation of employee recruitment, selection, and retention plans and processes.
- Administer and contribute to the design and evaluation of the performance management program.
- Develop, implement, and evaluate employee orientation, training, and development programs.
- Facilitate and support effective employee and labour relations in both non-union and union environments.

UNIT I:
HRM: Significance, Definition and Functions, evolution of HRM, Principles, Ethical Aspects of HRM, HR policies, Strategies to increase firm performance, Role and position of HR department, aligning HR strategy with organizational strategy, HRM at global perspective challenges, cross-cultural problems, emerging trends in HRM.

UNIT II:
Investment perspectives of HRM: HR Planning, Demand and Supply forecasting, Recruitment and Selection, Sources of recruitment, Tests and Interview Techniques, Training and Development, Methods and techniques, Training evaluation, retention, Job Analysis, job description and specifications, Management development, HRD concepts.

UNIT III:
Wage and Salary Administration: Concept, Wage Structure, Wage and Salary Policies, Legal Frame Work, Determinants of Payment of Wages, Wage Differentials, Job design and Evaluation, Incentive Payment Systems. Welfare management: Nature and concepts, statutory and non-statutory welfare measures, incentive mechanisms.

UNIT IV:
Performance Evaluation: Importance, Methods, Traditional and Modern methods, Latest trends in performance appraisal, Career Development and Counseling- Compensation, Concepts and Principles, Influencing Factors, Current Trends in Compensation, Methods of Payments, compensation mechanisms at international level.

UNIT V:
Managing Industrial Relations: Trade Unions, Employee Participation Schemes, Collective Bargaining, Grievances and disputes resolution mechanisms, Safety at work, nature and

importance, work hazards, safety mechanisms, Managing work place stress.

Text Books:

1. K Aswathappa: "Human Resource and Personnel Management", Tata McGraw Hill, New Delhi, 2013

2. N.Sambasiva Rao and Dr. Nirmal Kumar: "Human Resource Management and Industrial Relations", Himalaya Publishing House, Mumbai

3. Mathis, Jackson,Tripathy:"Human Resource Management: Asouth-Asin Perspective", Cengage Learning, New Delhi, 2013

4. Subba Rao P: "Personnel and Human Resource Management-Text and Cases", Himalaya Publications, Mumbai, 2013.

5. Madhurima Lall, Sakina Qasim Zasidi: "Human Resource Management", Excel Books, New Delhi, 2010

II Year – I Sem	FULL STACK DEVELOPMENT LAB	L	T	P	C
		0	0	3	1.5

Course objectives:

- To understand the essential javascript concepts for web development.
- To style Web applications using bootstrap.
- To utilize React JS to build front end User Interface.
- To understand the usage of API's to create web applications using Express JS.
- To store and model data in a no sql database.

List of Experiments:

1. a. Write a script that Logs "Hello, World!" to the console. Create a script that calculates the sum of two numbers and displays the result in an alert box.
    b. Create an array of 5 cities and perform the following operations:
    Log the total number of cities. Add a new city at the end. Remove the first city. Find and log the index of a specific city.

2. a. Read a string from the user, Find its length. Extract the word "JavaScript" using substring() or slice(). Replace one word with another word and log the new string. Write a function isPalindrome(str) that checks if a given string is a palindrome (reads the same backward).

3. Create an object student with properties: name (string), grade (number), subjects (array), displayInfo() (method to log the student's details)
    Write a script to dynamically add a passed property to the student object, with a value of true or false based on their grade. Create a loop to log all keys and values of the student object.

4. Create a button in your HTML with the text "Click Me". Add an event listener to log "Button clicked!" to the console when the button is clicked. Select an image and add a mouseover event listener to change its border color. Add an event listener to the document that logs the key pressed by the user.

5. Build a React application to track issues. Display a list of issues (use static data). Each issue should have a title, description, and status (e.g., Open/Closed). Render the list using a functional component.

6. Create a component Counter with A state variable count initialized to 0. Create Buttons to increment and decrement the count. Simulate fetching initial data for the Counter component using use Effect (functional component) or component Did Mount (class component). Extend the Counter component to Double the count value when a button is clicked. Reset the count to 0 using another button.

7. Install Express (npm install express).
    Set up a basic server that responds with "Hello, Express!" at the root endpoint (GET /).
    Create a REST API. Implement endpoints for a Product resource: GET : Returns a list of products. POST: Adds a new product. GET /:id: Returns details of a specific product. PUT /:id: Updates an existing product. DELETE /:id: Deletes a product. Add middleware to log requests to the console. Use express.json() to parse incoming JSON payloads.

8. Install the MongoDB driver for Node.js. Create a Node.js script to connect to the shop database. Implement insert, find, update, and delete operations using the Node.js MongoDB driver. Define a product schema using Mongoose. Insert data into the products collection using Mongoose. Create an Express API with a /products endpoint to fetch all products. Use fetch in React to call the /products endpoint and display the list of products. Add a POST /products endpoint in Express to insert a new product. Update the Product List, After adding a product, update the list of products displayed in React.

II Year – I Sem	MACHINE LEARNING WITH PYTHON LAB	L	T	P	C
		0	0	4	2

Course Objectives:
- Make use of Data sets in implementing the machine learning algorithms
- Implement the machine learning concepts and algorithms in any suitable language of choice.
- Design Python programs for various Learning algorithms.

Experiment 1:
Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .csv file

Experiment 2:
For a given set of training data examples stored in a .csv file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples

Experiment 3:
Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

Experiment 4:
Write a Python program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.

Experiment 5:
Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.

Experiment 6:
Write a program to implement the naive Bayesian classifier for a sample training data set stored as a .csv file. Compute the accuracy of the classifier, considering few test data sets.

Experiment 7:
Write a Python program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.

Experiment 8:

Assuming a set of documents that need to be classified, use the naive Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision and recall for your data set.

Experiment 9:

Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering using Python Programming.

Experiment 10:

Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

II Year – I Sem	BIG DATA TECHNOLOGIES LAB	L	T	P	C
		0	0	3	1.5

Course objectives:

1. To implement Map Reduce programs for processing big data.
2. To realize storage and processing of big data using MongoDB, Pig, Hive and Spark.
3. To analyze big data using machine learning techniques.

List of Experiments:

1. Install Hadoop and Implement the following file management tasks in Hadoop: Adding files and directories Retrieving files Deleting files and directories. Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.

2. Develop a Map Reduce program to implement Matrix Multiplication

3. Develop a Map Reduce program that mines weather data and displays appropriate messages indicating the weather conditions of the day.

4. Develop a Map Reduce program to find the tags associated with each movie by analyzing movie lens data.

5. Implement Functions: Count – Sort – Limit – Skip – Aggregate using MongoDB

6. Write Pig Latin scripts to sort, group, join, project, and filter the data.

7. Use Hive to create, alter, and drop databases, tables, views, functions, and indexes.

8. Implement a word count program in Hadoop and Spark.

9. Use CDH (Cloudera Distribution for Hadoop) and HUE (Hadoop User Interface) to analyze data and generate reports for sample datasets

II Year – I Sem	EMPLOYABILITY SKILLS–2	L	T	P	C
		1	0	0	0

Course Objectives:

The main objective of the course is to to develop a range of skills and attributes essential for success in the workplace

UNIT I :

Numerical ability l: Number system, HCF & LCM, Average, Simplification, Problems on numbers

Numerical ability II: Ratio & Proportion, Partnership, Percentages, Profit & Loss

UNIT II :

Arithmetical ability l: Problems on ages, Time & Work, Pipes & Cistern, Chain Rule.

Arithmetical ability ll: Time & Distance, Problems on boats &Steams, Problems on Trains

UNIT III

Arithmetical ability lll: Allegation, Simple interest and compound interest, Races & Games of skills, Calendar and Clock,

Logical ability: Permutations and Combination and Probability.

UNIT IV

Mensuration: Geometry, Areas, Volumes,

UNIT V

Data interpretation: Tabulation, Bar graphs, Pie charts, line graphs

Text books:

1. R. S. Aggarwal "Quantitative Aptitude", Revised ed., S Chand publication, 2017 ISBN:8121924987

E-resources:

1. https://blog.feedspot.com/aptitude_youtube_channels/
2. https://www.tutorialspoint.com/quantitative_aptitude/
3. https://www.careerbless.com/aptitude/qa/home.php

II Year – II Sem	UNIFIED MODELING LANGUAGE (PROGRAM ELECTIVE-3)	L	T	P	C
		3	0	0	3

Course Objectives:

- To understand the Object-based view of Systems
- To develop robust object-based models for Systems
- To explain necessary skills to handle complexity in software design

UNIT- I:

Introduction to UML: The meaning of Object-Orientation, object identity, encapsulation, information hiding, polymorphism, importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture.

UNIT-II:

Basic structural Modeling: Classes, relationships, common mechanisms, diagrams, **Advanced structural modeling:** advanced relationships, interfaces, types & roles, packages, instances, **Class & object diagrams**: Terms, concepts, examples, modeling techniques, class & Object diagrams.

UNIT-III:

Collaboration diagrams: Terms, Concepts, depicting a message, polymorphism in collaboration diagrams, iterated messages, use of self in messages, **Sequence diagrams:** Terms, concepts, differences between collaboration and sequence diagrams, depicting synchronous messages with/without priority call back mechanism broadcast message.

UNIT- IV:

Behavioral Modeling: Interactions, use cases, use case diagrams, activity diagrams, **Advanced Behavioral Modeling**: Events and signals, state machines, processes & threads, time and space, state chart diagrams.

UNIT–V:

Architectural Modeling: Terms, concepts, examples, modeling techniques for component diagrams and deployment diagrams.

Text Books:

1. The Unified Modeling Language User Guide, 2ⁿᵈ Edition, Grady Booch, Rambaugh, Ivar Jacobson, PEA, 2005
2. Fundamentals of Object Oriented Design in UML, 1ˢᵗ Edition, Meilir Page Jones, Addison

Wesley,2000

Reference Books:
1. Head First Object Oriented Analysis & Design, 1st Edition, Mclaughlin, SPD O'Reilly, 2006
2. Object oriented Analysis & Design Using UML, 1st Edition, Mahesh, PHI, 2008
3. The Unified Modeling Language Reference Manual, 2nd Edition, Rambaugh, Grady Booch, etc., PEA, 2004

II Year – II Sem	BLOCKCHAIN TECHNOLOGIES (PROGRAM ELECTIVE-3)	L	T	P	C
		3	0	0	3

Course Objectives: The objectives of the course are to
1. Learn the fundamentals of Block Chain and various types of block chain and consensus mechanism.
2. Understand public block chain system, Private block chain system and consortium block chain.
3. Know the security issues of blockchain technology.

UNIT – I:
Fundamentals of Blockchain: Introduction, Origin of Blockchain, Blockchain Solution, Components of Blockchain, Block in a Blockchain, The Technology and the Future.
Blockchain Types and Consensus Mechanism: Introduction, Decentralization and Distribution, Types of Blockchain, Consensus Protocol.
Cryptocurrency: Bitcoin, Altcoin and Token: Introduction, Bitcoin and the Cryptocurrency, Cryptocurrency Basics, Types of Cryptocurrencies, Cryptocurrency Usage.

UNIT – II:
Public Blockchain System: Introduction, Public Blockchain, Popular Public Blockchains, The Bitcoin Blockchain, Ethereum Blockchain.
Smart Contracts: Introduction, Smart Contract, Characteristics of a Smart Contract, Types of Smart Contracts, Types of Oracles, Smart Contracts in Ethereum, Smart Contracts in Industry.

UNIT – III:
Private Blockchain System: Introduction, Key Characteristics of Private Blockchain, Private Blockchain, Private Blockchain Examples, Private Blockchain and Open Source, E- commerce Site Example, Various Commands (Instructions) in E-commerce Blockchain, Smart Contract in Private Environment, State Machine, Different Algorithms of Permissioned Blockchain, Byzantine Fault, Multichain.
Consortium Blockchain: Introduction, Key Characteristics of Consortium Blockchain, Need of Consortium Blockchain, Hyperledger Platform, Overview of Ripple, Overview of Corda.
Initial Coin Offering: Introduction, Blockchain Fundraising Methods, Launching an ICO, Investing in an ICO, Pros and Cons of Initial Coin Offering, Successful Initial Coin Offerings, Evolution of ICO, ICO Platforms.

UNIT – IV:
Security in Blockchain: Introduction, Security Aspects in Bitcoin, Security and Privacy Challenges of Blockchain in General, Performance and Scalability, Identity Management and Authentication, Regulatory Compliance and Assurance, Safeguarding Blockchain Smart

Contract (DApp), Security Aspects in Hyperledger Fabric.

Applications of Blockchain: Introduction, Blockchain in Banking and Finance, Blockchain in Education, Blockchain in Energy, Blockchain in Healthcare, Blockchain in Real-estate, Blockchain in Supply Chain, The Blockchain and IoT. Limitations and Challenges of Blockchain.

UNIT – V:

Blockchain Case Studies:

Case Study 1 – Retail,

Case Study 2 – Banking and Financial Services,

Case Study 3 – Healthcare,

Case Study 4 – Energy and Utilities.

Blockchain Platform using Python: Introduction, Learn How to Use Python Online Editor, Basic Programming Using Python, Python Packages for Blockchain.

Blockchain platform using Hyperledger Fabric: Introduction, Components of Hyperledger Fabric Network, Chain codes from Developer.ibm.com, Blockchain Application Using Fabric Java SDK.

Text book:

1. "Blockchain Technology", Chandramouli Subramanian, Asha A.George, Abhilasj K A, MeenaKarthikeyan , Universities Press.

Reference Books:

1. Blockchain Blue print for Economy, Melanie Swan, SPDOreilly.
2. Blockchain for Business, Jai Singh Arun, Jerry Cuomo, Nitin Gauar, Pearson Addition Wesley

II Year – II Sem	ADVANCED UNIX PROGRAMMING (PROGRAM ELECTIVE-3)	L	T	P	C
		3	0	0	3

Course Objectives:

- To understand the fundamental design of the unix Programming
- To become fluent with the systems calls provided in the unix environment
- To be able to design and build an application/service over the unix operating system

UNIT-I

Overview of Unix Utilities and Shell Programming: -File handling utilities, security by file permissions, process utilities, disk utilities, networking commands, backup utilities, text processing utilities. **Shell Programming:** shell, shell responsibilities, pipes and input redirection, output redirection, here documents, the shell as a programming language, shell meta characters, shell variables, shell commands, the environment, control structures, shell script examples.

UNIT-II

Unix Files: Unix file structure, directories, files and devices, System calls, library functions, low level file access, usage of open, create, read, write, close, lseek, stat, fstat, octl, umask, dup, dup2, Differences between system call and library functions. File and directory maintenance: chmod, chown, unlink, link, symlink, mkdir, rmdir, chdir, getcwd. **Directory handling system calls:** opendir, readdir, closedir, rewinddir, seekdir,telldir

UNIT-III

Unix Process: Threads and Signals: process, process structure, starting new process, waiting for a process, zombie process, orphan process, process control, process identifiers, system call interface for process management, -fork, vfork, exit, wait, waitpid, exec, system. **Signals**: Signal functions, unreliable signals, interrupted system calls, kill and raise functions, alarm, pause functions, abort, sleep functions.

UNIT-IV

Inter process Communication: Introduction to IPC, IPC between processes on a single computer system, IPC between processes on different systems, pipes, FIFOs, message queues, semaphores and shared memory. Differences between pipes and FIFOs. Implementing client server program using pipes and FIFOs. **Message Queues-**: IPC, permission issues, Access permission modes, message structure, working with message queues, client/server example. **Semaphores:** Creating semaphore sets, Unix kernel support for semaphores, Unix APIs for semaphores, file locking using semaphores.

UNIT-V
Shared Memory: Working with a shared memory segments, Unix kernel support for shared memory, client/server example. **Sockets:** Berkeley sockets, socket structure, socket system calls for connection oriented protocol and connectionless protocol, implementing client server programs using TCP and UDP sockets.

Text Books:
1. Advanced programming in the unix environment, w- Richard Stevens 2nd Edition Pearson education
2. Unix Concepts and Applications, 3/e, Sumitabha Das, TMH

Reference books:
1. Unix and shell Programming, Sumitabha Das,TMH
2. A Beginner's Guide to Unix, N.P.Gopalan, B.Sivaselva,PHI
3. Unix Shell Programming, Stephen G.Kochan, Patrick Wood, 3/e,Pearson
4. Unix Shell Programming, Lowell Jay Arthus & Ted Burns,3/e,GalGotia

II Year – II Sem	MOBILE ADHOC NETWORKS (PROGRAM ELECTIVE-4)	L	T	P	C
		3	0	0	3

Course Objectives:

From the course the student will learn

- Architect sensor networks for various application setups.
- Devise appropriate data dissemination protocols and model links cost.
- Understanding of the fundamental concepts of wireless sensor networks and has a basic knowledge of the various protocols at various layers.
- Evaluate the performance of sensor networks and identify bottlenecks.

UNIT I: Introduction to Ad Hoc Wireless Networks- Cellular and Ad Hoc Wireless Networks, Characteristics of MANETs, Applications of MANETs, Issues and Challenges of MANETs, Ad Hoc Wireless Internet, MAC protocols for Ad hoc Wireless Networks-Issues, Design Goals and Classifications of the MAC Protocols.

UNIT II: Routing Protocols for Ad Hoc Wireless Networks- Issues in Designing a Routing Protocol, Classifications of Routing Protocols, Topology-based versus Position-based Approaches, Issues and design goals of a Transport layer protocol, Classification of Transport layer solutions, TCP over Ad hoc Wireless Networks, Solutions for TCP over Ad Hoc Wireless Networks, Other Transport layer protocols.

UNIT III: Security protocols for Ad hoc Wireless Networks- Security in Ad hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad hoc Wireless Networks, Cooperation in MANETs, Intrusion Detection Systems.

UNIT IV: Basics of Wireless Sensors and Applications- The Mica Mote, Sensing and Communication Range, Design Issues, Energy Consumption, Clustering of Sensors, Applications, Data Retrieval in Sensor Networks-Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

UNIT V: Security in WSNs- Security in WSNs, Key Management in WSNs, Secure Data Aggregation in WSNs, Sensor Network Hardware-Components of Sensor Mote, Sensor Network Operating Systems–TinyOS, LA-TinyOS, SOS, RETOS, Imperative Language-nesC, **Dataflow Style Language-**TinyGALS, Node-Level Simulators, NS-2 and its sensor network extension, TOSSIM.

Text Books:

1. Ad Hoc Wireless Networks – Architectures and Protocols, 1st edition, *C. Siva Ram Murthy, B. S. Murthy*, Pearson Education, 2004
2. Wireless Sensor Networks - A Modern approach, *Garimella Rama Murthy*, 1st edition, Universities Publishers, 2025
3. Ad Hoc and Sensor Networks – Theory and Applications, 2nd edition *Carlos Corderio Dharma P.Aggarwal,* World Scientific Publications / Cambridge University Press, 2006

Reference Books:

1. Wireless Sensor Networks: An Information Processing Approach, 1st edition*, Feng Zhao, Leonidas Guibas*, Elsevier Science imprint, Morgan Kauffman Publishers, 2005, rp2009
2. Wireless Ad hoc Mobile Wireless Networks – Principles, Protocols and Applications, 1st edition*,* Subir Kumar Sarkar, et al., Auerbach Publications, Taylor & Francis Group, 2008
3. Ad hoc Networking, 1st edition*,Charles E.Perkins*, Pearson Education, 2001
4. Wireless Ad hoc Networking, 1st edition*, Shih-Lin Wu, Yu-Chee Tseng,* Auerbach Publications, Taylor & Francis Group, 2007
5. Wireless Sensor Networks – Principles and Practice, 1st edition, Fei Hu, Xiaojun Cao, An Auerbach book, CRC Press, Taylor & Francis Group, 2010

II Year – II Sem	QUANTUM COMPUTING (PROGRAM ELECTIVE-4)	L	T	P	C
		3	0	0	3

Course Objectives:
To introduce the fundamentals of quantum computing, the problem-solving approach using finite dimensional mathematics

UNIT - I
History of Quantum Computing: Importance of Mathematics, Physics and Biology. Introduction to Quantum Computing: Bits Vs Qubits, Classical Vs Quantum logical operations

UNIT - II
Background Mathematics: Basics of Linear Algebra, Hilbert space, Probabilities and measurements.
Background Physics: Paul's exclusion Principle, Superposition, Entanglement and super-symmetry, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis. Background Biology: Basic concepts of Genomics and Proteomics (Central Dogma)

UNIT - III
Qubit: Physical implementations of Qubit. Qubit as a quantum unit of information. The Bloch sphere Quantum Circuits: single qubit gates, multiple qubit gates, designing the quantum circuits. Bell states.

UNIT - IV
Quantum Algorithms: Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor's factorization algorithm, Grover's search algorithm.

UNIT - V
Noise and error correction: Graph states and codes, Quantum error correction, fault-tolerant computation. Quantum Information and Cryptography: Comparison between classical and quantum information theory. Quantum Cryptography, Quantum teleportation

Text Books:
1. Quantum Computation and Quantum Information, Nielsen M. A., Cambridge
2. Programming Quantum Computers, Essential Algorithms and Code Samples, Eric R Johnson, NicHarrigan, Mercedes Ginemo, Segovia, Oreilly

Reference Books:

1. Quantum Computing for Computer Scientists, Noson S. Yanofsk, Mirco A. Mannucci
2. Principles of Quantum Computation and Information,Benenti G., Casati G. and Strini G., Vol.I: Basic Concepts, Vol II
3. Basic Tools and Special Topics, World Scientific. Pittenger A. O., An Introduction to Quantum Computing Algorithms

II Year – II Sem	AGILE METHODOLOGIES (PROGRAM ELECTIVE-4)	L	T	P	C
		3	0	0	3

Course Objectives:

The main objectives of this course are to
- Introduce the important concepts of Agile software development Process
- Emphasize the role of stand-up meetings in software collaboration
- Impart the knowledge on values and principles in understanding agility

UNIT I :

Learning Agile: Agile, Getting Agile into your brain, Understanding Agile values, No Silver Bullet, Agile to the Rescue. A fractured perspective, The Agile Manifesto, Understanding the Elephant, Where to Start with a New Methodology.

UNIT II :

The Agile Principles: The 12 Principles of Agile Software, The Customer Is Always Right, Delivering the Project, Better Project Delivery for the Ebook Reader Project. Communicating and Working Together, Project Execution—Moving the Project Along, Constantly Improving the Project and the Team. The Agile Project: Bringing All the Principles Together

UNIT III :

SCRUM and Self-Organizing Teams: The Rules of Scrum, Act I: I Can Haz Scrum, Everyone on a Scrum Team owns the Project, Status Updates Are for Social Networks!, The Whole Team Uses the Daily Scrum, Feedback and the Visibility-Inspection-Adaptation Cycle, The Last Responsible Moment, Sprinting into a Wall, Sprints, Planning, and Retrospectives.

Scrum Planning And Collective Commitment: Not Quite Expecting the Unexpected, User Stories, Velocity, and Generally Accepted Scrum Practices, Victory Lap, Scrum Values Revisited.

UNIT IV :

XP And Embracing Change: Going into Overtime, The Primary Practices of XP, The Game Plan Changed, but We're Still Losing, The XP Values Help the Team Change Their Mindset, An Effective Mindset Starts with the XP Values, The Momentum Shifts, Understanding the XP Principles Helps You Embrace Change.

XP, Simplicity, and Incremental Design: Code and Design, Make Code and Design Decisions at the Last Responsible Moment, Final Score.

UNIT V:

Lean, Eliminating Waste, and Seeing the whole: Lean Thinking, Creating Heroes and Magical

Thinking. Eliminate Waste, Gain a Deeper Understanding of the Product, Deliver As Fast As Possible.

Kanban, Flow, and Constantly Improving: The Principles of Kanban, Improving Your Process with Kanban, Measure and Manage Flow, Emergent Behavior with Kanban.

The Agile Coach: Coaches Understand Why People Don't Always Want to Change. The Principles of Coaching.

Text Books :
1. Andrew Stellman, Jill Alison Hart, Learning Agile, O'Reilly, 2015.

   Reference Books:
1. Andrew Stellman, Jennifer Green, Head first Agile, O'Reilly, 2017.
2. Rubin K , Essential Scrum : A Practical Guide To The Most Popular Agile Process, Addison-Wesley, 2013