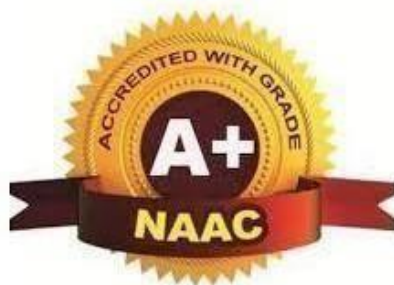




TULSIRAMJI GAIKWAD-PATIL
College of Engineering & Technology

Mohgaon, Wardha Road, Nagpur - 441 108

An Autonomous Institute



DEPARTMENT OF MASTER IN COMPUTER APPLICATION

Semester - I

Teaching Scheme & Syllabus

Considering

**National Education
Policy 2020**

From

Academic Year 2026 – 27

Vision of Institute

To emerge as a learning Center of Excellence in the National Ethos in domains of Science, Technology and Management.

Mission of Institute

M1- To strive for rearing standard and stature of the students by practicing high standards of professional ethics, transparency and accountability.

M2- To provide facilities and services to meet the challenges of Industry and Society

M3- To facilitate socially responsive research, innovation and entrepreneurship

M4- To ascertain holistic development of the students and staff members by inculcating knowledge and profession as work practices.

Vision of the Department

The department of Master in Computer Applications aims to generate groomed, technically competent and skilled intellectual professionals specifically from the rural area to meet the current challenges of the modern computing industry.

Mission of the Department

- To stimulate students to learn effectively and apply the knowledge in the field of Engineering and Technology.
- To undertake industry academic collaboration to enhance competency in graduates.
- To foster innovative ideas amongst students for becoming leaders.
- To create an environment of research culture.
- To impart social and ethical values for inculcating the culture of lifelong learning.

Program Educational Objectives (PEO)

- Providing a strong theoretical and practical background across the computer science discipline with an emphasis on software development.
- To provide technical solutions in the field of information technology to the local society.
- To provide need-based quality training in the field of information technology.
- Empowering the youth in rural communities with computer education.
- To provide students with the tools to become productive, participating global citizens and life-long learners.

Program Outcomes (PO)

- 1. PO1 (Foundation Knowledge):** Apply knowledge of mathematics, programming logic and coding fundamentals for solution architecture and problem solving.
- 2. PO2 (Problem Analysis):** Identify, review, formulate and analyse problems for primarily focussing on customer requirements using critical thinking frameworks.
- 3. PO3 (Development of Solutions):** Design, develop and investigate problems with as an innovative approach for solutions incorporating ESG/SDG goals.
- 4. PO4 (Modern Tool Usage):** Select, adapt and apply modern computational tools such as development of algorithms with an understanding of the limitations including human biases.
- 5. PO5 (Individual and Teamwork):** Function and communicate effectively as an individual or a team leader in diverse and multidisciplinary groups. Use methodologies such as agile.
- 6. PO6 (Project Management and Finance):** Use the principles of project management such as scheduling, work breakdown structure and be conversant with the principles of Finance for profitable project management.
- 7. PO7 (Ethics):** Commit to professional ethics in managing software projects with financial aspects. Learn to use new technologies for cyber security and insulate customers from malware
- 8. PO8 (Life-long learning):** Change management skills and the ability to learn, keep up with contemporary technologies and ways of working.



Palsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

(An Autonomous Institution Affiliated to RTM Nagpur University, Nagpur)

SCHEME OF INSTRUCTION & SYLLABI

Programme: Master in Computer Application

Scheme of Instructions: First Year Master in Computer Application (As Per NEP 2020)

Semester – I

Sr.	Course Category	CourseCode	Course Title	L	P	Contact Hrs / week	Credits	Exam Scheme				
								CT - 1	CT - 2	TA / CA	ESE	TOTAL
1.	PCC	MCA41101	Object Oriented Programming Using Java	3	-	3	3	15	15	10	60	100
2.	PCC	MCA41102	Advance DBMS	3	-	3	3	15	15	10	60	100
3.	PCC	MCA41103	Artificial Intelligence	3	-	3	3	15	15	10	60	100
4.	PCC	MCA41104	Computer Network	3	-	3	3	15	15	10	60	100
5.	PEC	MCA41105-08*	Professional Elective – I	3	-	3	3	15	15	10	60	100
6.	PCC	MCA41109	OOP programming Lab using Java language	-	4	4	2	-	-	25	25	50
7.	PCC	MCA41110	Database Administration Lab	-	4	4	2	-	-	25	25	50
8.	PCC	MCA41111	Artificial Intelligence Lab	-	2	2	1	-	-	25	25	50
9.	VSE	MCA41112-15*	Vocational Skill Enhancement – I (Lab)	-	4	4	2	-	-	25	25	50
Total				15	14	29	22	75	75	150	400	700

*Indicates out of the four course codes each student has to select any one PEC & VSE from the list provided at the end of structure.

Course Category	PCC	PEC	VSE	Project	CC
Credits	17	3	2	-	-
Cumulative Summary	17	3	2	-	-

Total Credit: 22

				June, 2026	2.00	Applicable for AY 2026-27
Chairperson	Vice Principal / Director Academics	Director Administration	Principal	Date of Release	Version	

	Tulsiramji Gaikwad-Patil College of Engineering and Technology Wardha Road, Nagpur-441 108 NAAC Accredited (A+ Grade) An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur					
Program: Master in Computer Application						
Semester	Course Code	Name of Course	L	T	P	Credits
I	MCA41101	Object Oriented Programming Using Java	3	-	-	3
Pre-Requisites: Basic concepts of C Programming						
Course Objectives:						
1.	Learn the fundamental principles of class, object.					
2.	To become adept at using various methods of inheritance, Polymorphism.					
3.	To become expert in using java classes, interfaces, Exception handling, Multithreading.					
4.	To analyze Collection Framework & Swing controls					
5.	Utilize Object oriented concepts to develop swing handling applications.					
Course Contents						
Unit I	Java and Internet, Features of java: security, portability, multithreading, etc , Data types, variables, command line argument, super keyword, Basic Concept of OOP: Concept of a class, Access control of members of a class, new operator, instantiating a class, static and non-static members, Keyboard input. Garbage Collection, finalize()).					
Unit II	Constructor:Empty Constructor, Parameterized constructor, Constructor overloading. Inheritance: Single, multiple, multi level, hierarchical, hybrid inheritance. Polymorphism: Function overloading, Function overriding. Packages and Interfaces.					
Unit III	Exception handling: Overview, try -catch block, multiple catch, nested try, throw, throws finally, bulit-in and user-defined exception. Multithreading: Life Cycle, Thread class and Runnable Interface, start(), run(), isAlive() join(), Thread Priorities, sleep(), wait(), notify(), notifyAll(), deadlock(), synchronization.					

Unit IV	Collection Framework: List, ArrayList, LinkedList, Vector, Iterator. Set, HashSet, TreeSet. Map, HashTable, Enumeration, Assertion, Autoboxing. Swing handling: Overview, JFrame, JLabel, JButton, JCheckBox, JRadioButton, JComboBox, JTextField.
Unit V	Swing Controls: JMenuBar, JMenu, JMenuItem, JTable, JTree. Event Handling: ActionListener, ItemListener, KeyListener, MouseListener.
Text Books	
1	Programming With Java: A Primer- E Balgurusamy 3rd Edition, Tata McGraw Hill
2	The Complete Reference of Java Herbert Schildt, 7th Edition, Tata McGraw Hill Publication
3	Effective JAVA, 3rd Edition Joshua Bloch, Addison-Wesley publication
Reference Books	
1	An Introduction to Object Oriented Programming with JAVA - Thomas Wu, 5 th Edition, McGraw Hill
2	Programming with Java , C Muthu , 2 nd Edition McGraw Hill
3	Programming in Java, Dr. S. B. Kishor 1st Edition, published by Das Ganu Prakashan
Useful Links	
1	https://nptel.ac.in/courses/106/105/106105153/
2	https://nptel.ac.in/courses/106/105/106105191/

	Course Outcomes	CL	Class Sessions
MCA41101.1	Apply object oriented concepts to get the clarity in class implementation.	3	9
MCA41101.2	Classify inheritance, polymorphism to develop Object Oriented applications.	4	9
MCA41101.3	Evaluate Exception handling, Threading concepts to create.	5	9
MCA41101.4	Analyze Collection Framework, swing handling concepts to create window based GUI applications.	4	9
MCA41101.5	Analyze event handling to develop interactive swing applications.	4	9

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Program: Master in Computer Application						
Semester	Course Code	Name of Course	L	T	P	Credits
I	MCA41102	Advanced DBMS	3	-	-	3
Pre-Requisites: Basic of Database Management Systems, Normalization's, Database concepts, Data models and Relational model.						
Course Contents						
Unit I	Relational Database design: Functional dependencies and Normalization Normal forms 1NF, 2NF, 3NF, BCNF, 4NF based on primary keys and dependency preserving decomposition Query Processing: Query Processing Stages, Query Interpretation, Equivalence of Expressions, Query Resource Utilization, Query Execution Plan, Estimation of Query Processing Cost, Multiple Index Access, Index on Multiple Key,Methods for Joining Tables (Nested Loop, Multiple Join) Structure of a Query Optimizer.					
Unit II	Transaction Processing Concepts & Concurrency Control Techniques: Introduction Transaction Processing, ACID properties, Serializability, Prioritization, states of transaction, Types of failure, desirable properties of transaction schedules and recoverability, serial usability of schedules, levels of transaction consistency, deadlocks, long duration transactions, transaction performance. Crash Recovery: failure classification, recovery concepts, database backup, recovery concepts based on deferred update and on immediate update. Shadow paging, check points, crash recovery techniques.					
Unit III	Oracle SQL and PL/SQL Basic SQL and PL/SQL concepts terminology and programming, Enhancements SQL, Enhancement to Globalization, writing queries, Using procedure builders, Data Manipulation language (DML), Data definition language (DDL), Multi table query join, sub queries and query expression.					
Unit IV	Oracle Database Architecture and Administration: Oracle database architecture, Design, Creation, Management of Oracle Databases and related database schemes, Data Dictionary views and standard package Maintaining the control, Redo Log files, Managing Table spaces and Data Files, Storage structure and relationships, managing rollback segment, Indexes, Managing data Integrity, Managing password security and resources, Managing users, Privileges, roles. Oracle Backup and Recovery Strategies: Backup and recovery considerations, Oracle recovery structure and processes, Oracle backup and recovery configuration, Physical backup, Complete recovery of an Oracle database, Oracle Export / Import utilities, Oracle standby database.					

Unit V	Oracle Tuning and Troubleshooting: Oracle performance tuning methodology, Oracle alert and trace files, Tuning the shared pool, Buffer Cache, Redo Log buffer, Database configuration and I/O issues, Using Oracle Blocks efficiently, optimizing sort operations, Rollback segment tuning, Monitoring and detecting lock contention, SQL issues and tuning considerations for different application. Integrity, Security: Need for Database Integrity, Integrity Constraints, Introduction to Database, Security issues.
Text Books	
1	Fundamental of Database Systems, R. ElmasriS. Navathe Benjamin Cummings, 2 nd Edition
2	Database system concept, Henry Korth, 7 th Edition
3	Oracle 9i Performance Tuning, Joseph C. Johnson, 2 nd Edition
Reference Books	
1	DBA Handbook oracle press, Loney, 2 nd Edition.
2	The Complete Reference SQL - Groff Weinberg (Tata McGraw Hill Publication), 2 nd Edition.
3	Oracle (SQL and PL/SQL Programming), Dr. S. B. Kishor 2 nd Edition, Das Ganu Prakashan
Useful Links	
1	https://nptel.ac.in/courses/106/105/106105175/
2	https://nptel.ac.in/courses/106/106/106106093/

	Course Outcomes	CL	Class Sessions	Lab Sessions
MCA41102.1	Apply the knowledge of Normal forms and Query processing for handling multiple types of data.	3	9	2
MCA41102.2	Apply query processing techniques and analyze query execution plans, equivalence rules, indexing methods, and join strategies to optimize database queries and resource utilization.	3	9	2
MCA41102.3	Apply and write SQL and PL SQL queries for Data Manipulation and Data Definition languages.	3	9	6
MCA41102.4	Analyze the internal data structure and analyze backup and recovery procedures.	4	9	4
MCA41102.5	Analyze deep visualization of realistic data into physical structure	4	9	4



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Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
I	MCA41103	Artificial Intelligence	3	-	-	3

Pre-Requisites: Computer science, Natural language processing, Python Prog., Basic Math

Course Objectives:

1. The goal is to acquire knowledge on intelligent systems and agents, formalization of knowledge, reasoning with and without uncertainty, machine learning and applications at a basic level.
2. The purpose of machine learning is to discover patterns in your data and then make predictions based on often complex patterns to answer business questions, detect and analyze trends and help solve problems.
3. A strong foundation of fundamental concepts in Artificial Intelligence
4. To investigate probabilistic reasoning under uncertain and incomplete information
5. To explore the current scope, potential, limitations, and implications of intelligent systems

Course Contents

Unit I	Introduction: History and Definition of AI, Foundations Intelligent Agents - Agents and Environments- Good behavior- the nature of environments, Structure of agents-Problem Solving agents, Example problems-Searching for solutions.
Unit II	Searching Techniques: Informed search and exploration- Informed search strategies, greedy best-first, A* Algorithm, Memory-bounded heuristic search, heuristic functions, Local search algorithms, and optimization problems, searching in continuous space, CSP – backtracking search for CSPs, Backtracking search for CSPs, Local search for CSP-structure of problems.
Unit III	Knowledge: Representation Introduction to Logic, Syntax and semantics of first order logic, Using first order logic, assertions and queries in first-order logic, kinship domain, Wumpus world problem, Knowledge engineering in first order logic, Inference in first order logic- Propositional vs. first-order inference, Unification and lifting, Storage and retrieval, Forward chaining, Backward chaining, Resolution
Unit IV	Reasoning Under Uncertainty: Handling Uncertain Knowledge, Random Variables, Prior and Posterior Probability, Inference using Full Joint Distribution, Bayes' Rule and its use, Bayesian Belief Networks, Reasoning in Belief Networks.

Unit V	Planning and Learning: The planning problem, Partial order planning, total order planning, Learning in AI, Learning Agent, Concepts of Supervised, Unsupervised, Semi - Supervised Learning, Reinforcement Learning, Ensemble Learning, Expert Systems, Components of Expert System: Knowledge base, Inference engine, user interface, working memory, Development of Expert Systems.		
Text Books			
T.1	Stewart Russell and Peter Norvig. " Artificial Intelligence-A Modern Approach ", 2nd Edition, Pearson Education/ Prentice Hall of India, 2004		
Reference Books			
R.1	Elaine Rich and Kevin Knight, “Artificial Intelligence”, 2nd Edition, Tata McGraw-Hill, 2003		
R.2	George F Luger —Artificial Intelligence Low Price Edition, Pearson Education., Fourth edition.		
Useful Links			
1	https://onlinecourses.nptel.ac.in/noc21		
2	https://nptel.ac.in/courses/106/106/106106126/		
	Course Outcomes	CL	Class Sessions
MCA41103.1	Apply Agents and problems-Searching techniques in applications which involve perception, reasoning and learning.	3	9
MCA41103.2	Analyze the role of agents and how it is related to the environment and the way of evaluating it and how agents can act by establishing goals.	4	9
MCA41103.3	Analyze and design a real-world problem for implementation and understand the dynamic behavior of a system.	4	9
MCA41103.4	Analyze probabilistic models including Bayesian Belief Networks to represent dependencies among variables and perform reasoning under uncertainty.	3	9
MCA41103.5	Apply different learning paradigms such as supervised, unsupervised, semi-supervised, reinforcement, and ensemble learning to solve real-world problems using appropriate models.	3	9

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Program: Master in Computer Application (MCA)						
Semester	Course Code	Name of Course	L	T	P	Credits
I	MCA41104	Computer Network	3	-	-	3
Pre-Requisites: Knowledge of networking, components of computer, Internet						
Course Objectives:						
1.	To identify computer components and network configurations.					
2.	To analyses how data transmit within the network					
3.	To build the structure of network and accessibility					
4.	To learn different application protocols and attacks within security reasons					
5.	To troubleshoot improper activity within network as well as computer system					
Course Contents						
Unit I	Computer Hardware :- Motherboard with hardware components, familiarization with I/O cards, ports, connectors & cable and their identification, Introduction and Installation of Operating System, Dual booting systems Hardware Device Drivers & Application Software, Serial data transmission methods & standards					
Unit II	Internetworking:- OSI model and its benefits, function and benefits of OSI, MAC (Media Access Control), Interconnection devices : Switch and Hub with Ethernet cables, IP addressing and Subnetting, Routers and its principles, Network Protocols, TCP/IP, UDP					
Unit III	Network structure and architectures, Network topologies, client server networks and its OS, planning and Cabling Network, interconnection of LANs; repeaters, bridges, routers, access points, Wireless network					
Unit IV	Security :- Computer Security, Intrusion Detection, Threats and Attacks, Computer Security Technology and Principles, User Identification, Authentication and Access Control, Software Security and Trusted Systems, cryptography					
Unit V	Network Troubleshooting :- Network Troubleshooting techniques: Command-Line Tools, Network Troubleshooting Applications, Hardware Tools, Wireless Issues, Authentication and Association Errors, Internet Configuration, Check Firewall Settings					
Text Books						
T.1	Dieter Gollman, “Computer Security”, 3rd edition, 2011					
Reference Books						
R.1	William Stallings, Lawrie Brown, "Computer Security: Principles and Practice", Prentice Hall, 3rd edition					

R.2	Fundamental of Computer Systems, R. ElmasriS. Navathe Benjamin Cummings, 2nd Edition		
Useful Links			
1			
2			
	Course Outcomes	CL	Class Sessions
MCA41104.1	Construct the terminology of communication network and network functionality	3	9
MCA41104.2	Classify wired and wireless technology implementation for data communication	4	9
MCA41104.3	Differentiate Communication network model data flow and its protocol	5	9
MCA41104.4	Analyze the network security management and various methodology	4	9
MCA41104.5	Evaluate the application management of communication channels and hacking technology and security	4	9



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Program: Master in Computer Application (MCA)

Semester	Course Code	Name of Course	L	T	P	Credits
I	MCA41105	Internet of Things (IoT)	3	-	-	3

Pre-Requisites: Knowledge of networking, Application programming using C / Python, Data Analytics

Course Objectives:

1.	To understand the concepts of IoT and IoT based application architectures
2.	To learn about the IoT devices and different communication protocols
3.	To comprehend the programming environment and skills to implement IoT based applications
4.	To learn different application protocols and databases used in IoT and analytics of IoT data
5.	To study real life applications of IoT

Course Contents

Unit I	Introduction: Definition of Internet of Things (IoT), Motivation and benefit of IoT applications, Technologies behind IoT: Cloud Computing, Fog Computing, Edge Computing. IoT Devices: Sensors and Actuators. IoT architecture: Simplified IoT Architecture, Core Functional IoT stack, Sensors and Actuators Layer, Communications Network Layer, Applications and Analytics Layer. IoT Challenges: Reliability, safety and security, and performance issues.
Unit II	IoT Hardware and Connectivity Technologies: Type of IoT Sensors and Actuators. Sensor Networks, UAV Networks, Machine-to-Machine Communication, Interoperability in Internet of Things. IoT Gateways, IoT Transport and Data protocols: IEEE 802.15.4, Zigbee, LoRa, MQTT, BLE, Wi-fi, LPWAN, WebSocket, CoAP, etc. Connectivity protocols: 6-Lowpan, BacNet, ModBus, etc.
Unit III	IoT Application Layer Protocols - Generic Web Based Protocols vs IoT application protocols – Constrained Application Protocol, Message Queue Telemetry Transport, IoT Data Management and Compute Stack: Hierarchy of Fog, Edge and Cloud Data - An Introduction to Data Analytics for IoT - Edge Streaming Analytics.
Unit IV	Programming in IoT: Introduction to Arduino Board, Raspberry Pi, Programming Environment for Arduino Boards and Raspberry Pi. Interfacing Sensors and Actuators. C - Programming using Arduino. Python programming for Raspberry Pi. Sample programs to get values from sensors. Sample program to activate actuators.
Unit V	Case Studies: Application in Agriculture, Healthcare, Connected vehicles, Smart Homes, Smart Grid, etc.

Text Books

T.1	Introduction to IoT: S. Misra, A. Mukherjee, and A. Roy, 2020. Cambridge University Press.
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Reference Books

R.1	INTERNET OF THINGS(IoT): Technologies, Applications, Challenges, and Solutions, B. K. Tripathy, J. Anuradha, CRC Press
R.2	Internet-of-Things (IoT) Systems Architectures, Algorithms, Methodologies -Dimitrios Serpanos, Marilyn Wolf, Springer International Publishing, 2018

Useful Links

1			
2			
	Course Outcomes	CL	Class Sessions
MCA41105.1	Understand the concept and the layered architecture of IoT. Benefits and challenges of IoT based applications.	3	9
MCA41105.2	Analyse various communication technologies and application protocols for IoT.	4	9
MCA41105.3	Understand IoT programming environment. Understand data acquisition and action using programs using different sensors and actuators	5	9
MCA41105.4	Understand different IoT databases. Learn to analyse the sensor data using various data analytics methods	4	9
MCA41105.5	Study of IoT based solutions for simple real world problems.	4	9

	<p style="text-align: center;">Tulsiramji Gaikwad-Patil College of Engineering and Technology Wardha Road, Nagpur-441 108 NAAC Accredited (A+ Grade) (An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)</p>					
Program: Master in Computer Application						
Semester	Course Code	Name of Course	L	T	P	Credits
I	MCA41106	Big Data Analytics	3	0	-	3
Pre-Requisites: Database Management System, Distributed Database Management System, Relational model of Database						
Course Contents						
Unit I	Overview of Big Data: What is Big Data, History of Data management, Structuring Big data, Elements of Big data, Big data Analytics, Advantages of Big data Analytics Exploring The Use of Big data. Understanding Hadoop Ecosystem: Physical organization of Compute Nodes, Large scale File System Organization, Limitations of existing distributing systems, Hadoop Approach, Internals of Hadoop, Hadoop Architecture: Core Components, Ecosystem, HDFS and GPFS, Hadoop Limitations, Yarn, Spark.					
Unit II	Big Data Technology Foundation: Exploring The Big data Stack, Data Source Layer, Ingestion Layer, Storage Layer, Physical Infrastructure Layer, Platform Management Layer, Security Layer, Monitoring Layer, Visualization Layer, Big Data Applications, Virtualization and Big Data, Virtualization Approaches Storing Data In Data Bases and Data Warehouses: RDBMS and Big Data, CAP Theorem, Issues with Relational Model, on-Relational Database, Issues with Non-Relational Model, Integrating Big Data with Traditional Data Warehouses.					
Unit III	Exploring R: Exploring Basic Features of Statistical Features, Packages, Graphical User Interfaces, R Console, Developing a Program, Exploring R Studio, Basic Arithmetic invariables and Functions in R, Handling Data in R Workspace Reading Data Sets and Exporting Data from R: Using c() Command, Using scan() Command, Reading Multiple Data values from Large Files, Reading Data from R Studio, Exporting Data from R.					
Unit IV	Manipulating and Processing Data in R: Creating Data Subsets, Merging Data Sets in R, Sorting Data, Managing Data in R using Matrices, Managing Data in R using Data Frames. Data Visualization: Ways of Representing Visual Data, Techniques, Types, Applications, Visualizing Big Data, Tools used in Data Visualization					
Unit V	Social Media Analytics and Text Mining: Introducing Social Media, Introducing Text Mining, Understanding Text Mining Processes, Sentiment Analysis Mobile Analytics: Introducing Mobile Analytics, Define Mobile Analytics, Introducing Mobile Analytics Tools, Performing Mobile Analytics, Challenges of Mobile Analytics.					

Text Books			
T.1	Big Data (Covers Hadoop 2, MapReduce,Hive,YARN,Pig,R and Data Visualization)		
T.2	Black Book, DT Editorial Services, Dreamtech Press.		
T.3	Data Science & Big Data Analytics Discovering, Analyzing, Visualizing and PresentingData EMC Education Services, WILEY Publication		
Reference Books			
R.1	Data Analytics, Maheshwari, McGraw		
R.2	Hands-On Programming with R by Grolemund and Garrett		
Useful Links			
1	https://nptel.ac.in/courses/106/104/106104189/		
2	https://nptel.ac.in/courses/124/144/372604123/		
3	https://nptel.ac.in/courses/125/128/139837364/		
	Course Outcomes	CL	Class Sessions
MCA41106.1	The use of terminology of data cycle and its functionality using Hadoop platform	3	9
MCA41106.2	Examine data warehouse and its mechanism with corresponding database	4	9
MCA41106.3	Design various statistical vide for analyzing basic database that creates logical practice.	5	9
MCA41106.4	Creating and exploring the basic database which is use to design virtualization of the database.	5	9
MCA41106.5	Justification about social media and mobile analytics which creates various data structures.	5	9



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Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
I	MCA41107	Computer Ethics	3	-	-	3

Pre-Requisites: Programming Skills, Probability and Statistics

Course Objectives:

1.	Understand the key ethical issues in computing and technology
2.	Evaluate the impact of computing on society, business, and individuals.
3.	Develop the ability to reason ethically and apply these concepts to real-world computing scenarios.
4.	Recognize the legal and regulatory aspects of computing.
5.	Discuss the moral responsibilities of computer professionals.

Course Contents

Unit I	Computer Ethics:- Fundamental of Ethics in Computing, Importance of Ethics for Computer Professionals, Key Ethical Frameworks (Utilitarianism, Deontology, Virtue Ethics), Understanding Privacy: What is private and what is public?, Data Protection Laws (GDPR, CCPA, etc.), Ethical Challenges in Data Collection, Storage and Usage, Overview of Intellectual Property (Copyright, Patent, Trademark), Fair Use and Software Piracy, Ethical Issues in Open-Source vs. Proprietary Software
Unit II	Intellectual Property and Piracy:- Overview of Intellectual Property (Copyright, Patent, Trademark), Fair Use and Software Piracy, Ethical Issues in Open-Source vs. Proprietary Software, Understanding Cyber Security Threats (Hacking, Phishing, Malware), Ethical Implications of Cyber attacks, Legal Aspects of Cybercrime, Ethical Challenges of AI and Automation, Bias in AI Algorithms, Implications for Employment and Society
Unit III	Social Media Ethics:- Freedom of Speech vs. Hate Speech, Ethical Responsibilities of Social Media Platforms, Fake News and Misinformation, The Role of the Software Engineer in Ethical Decision Making, Software Failures and Their Consequences, Government and Corporate Surveillance, Ethical Boundaries of Data Collection and Monitoring, Location Tracking and User Consent, Case Study: Edward Snowden and the NSA Surveillance Leak
Unit IV	Professional Ethics for Computing Professionals:- Code of Ethics in Computing (ACM, IEEE), Professional Responsibility and Accountability, Ethical Issues in Consulting and Client-Server Relationships, Ethical Considerations in Developing Countries, Technology's Role in Global Problems (e.g., climate change, health crises), Ethics of Global Software Development Outsourcing, Key Legislation Affecting Technology (Copyright, Cybercrime Laws, Data Privacy)
Unit V	The Future of Technology and Ethics:- Emerging Technologies and Ethical Implications, The Impact of Quantum Computing, Block chain, and Biotech on Ethics, Sustainability and Ethics in Tech Development Case Study: The Ethics of Space Exploration and Colonization

Text Books

1	Ethics for the Information Age by Michael J. Quinn
Reference Books	

1	Scott Smallwood. "Arts Professor at New School U. Resigns after Admitting Plagiarism." Chronicle of Higher Education, September 20, 2004
2	Katie Hafner. "Lessons in Internet Plagiarism." New York Times, June 28, 2001

Useful Links

1	https://onlinecourses.nptel.ac.in/noc23_cs44/preview		
	Course Outcomes	CL	Class Sessions
MCA41107.1	Construct the disciplinary activity for computer functionality	3	9
MCA41107.2	Classify and explore things of computer technology implementation for data communication	4	9
MCA41107.3	Differentiate Communication network model data flow and its protocol	5	9
MCA41107.4	Analyze the global data security management and various methodology	4	9
MCA41107.5	Evaluate the application management of communication channels and hacking technology and security	4	9



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Program: Master in Computer Application

Semester	Course Code	Name of Course	T	P	Credits
I	MCA41108	Parallel Programming	-	-	3

Pre-Requisites: Students are expected to know the C language, algorithms and data structures, and know basics on computer architecture.

Course Objectives:

1. To identify the scope for parallelism in a program.
2. Understand the various parallel programming models and the challenges involved in parallel programming.
3. Learn the basics of Open MP and MPI and programming with Parallel Programming.
4. Learn the programming of heterogeneous systems using CUDA and Open CL.

Course Contents

Unit I	FUNDAMENTALS OF PARALLEL COMPUTING Need for Parallel Computing, Parallel Computer Models, ILP, TLP and Data Parallelism, Parallel Programming Overview, Processes, Tasks and Threads, Parallel Programming Models, Shared Memory Programming, Message Passing Paradigm, Interaction and Communication, Interconnection Networks.
Unit II	CHALLENGES OF PARALLEL PROGRAMMING Identifying Potential Parallelism, Techniques for Parallelizing Programs, Issues, Cache Coherence issues, Memory Consistency Models, Maintaining Memory Consistency, Synchronization Issues, and Performance Considerations.
Unit III	SHARED MEMORY MODELS AND OPENMP PROGRAMMING OpenMP Execution Model, Memory Model and Consistency, Open MP Directives, Run Time Library Routines, Handling Data and Functional Parallelism, Performance Considerations.
Unit IV	MPI PROGRAMMING The MPI Programming Model, MPI Basics, Circuit Satisfiability, Global Operations, Asynchronous Communication, Collective Communication, Other MPI Features, Performance Issues, Combining OpenMP and MPI.
Unit V	PROGRAMMING HETEROGENEOUS PROCESSORS GPU Architecture, Basics of CUDA, CUDA Threads, CUDA Memories, Synchronization Handling, Performance Issues, Application Development. Introduction to OpenCL.

Text Books

1	John L. Hennessey and David A. Patterson, “Computer Architecture – A quantitative approach”, Morgan Kaufmann / Elsevier Publishers, 5th. Edition, 2012.
2	Peter S. Pacheco, “An Introduction to Parallel Programming”, Morgan Kaufmann, 2 nd Edition, 2011.

Reference Books

1	Michael J Quinn, “Parallel programming in C with MPI and OpenMP”, Tata McGraw Hill, 6 th Edition, 2003.
2	David B. Kirk and Wen-mei W. Hwu, “Programming Massively Parallel Processors”, Morgan Kaufmann, 2 nd Edition, 2010.

Useful Links

1	https://nptel.ac.in/courses/106/102/106102114/
2	https://nptel.ac.in/courses/106/102/106102163/

	Course Outcomes	CL	Class Sessions
MCA41108.1	Apply the fundamental of Parallel computing for shared memory and interconnection networks.	3	9
MCA41108.2	Analyze the challenges of Parallel Programming in support of memory consistency.	4	9
MCA41108.3	Analyze to shared memory models and OPENMP programming.	4	9
MCA41108.4	Evaluate the MPI programming and features of performance issues.	5	9
MCA41108.5	Apply for programming heterogeneous processors for performance issues.	3	9



Tulsiramji Gaikwad-Patil College of Engineering and Technology

Wardha Road, Nagpur-441 108

NAAC Accredited (A+ Grade)

**An Autonomous Institute Affiliated to RTM Nagpur University,
Nagpur**



Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
I	MCA41109	OOP'S programming based on Java language Lab	-	-	4	2

Pre-Requisites: C Language

Course Objectives:

1. Learn the fundamental principles of class, object.
2. To become adept at using various methods of inheritance, Polymorphism.
3. To become expert in using java classes, interfaces, Exception handling, Multithreading.
4. To analyze Collection Framework & Swing controls
5. Utilize Object oriented concepts to develop swing handling applications.

Sr. No.	List of Experiment	CO Mapping
1	Develop application by using class & object concept	CO1
2	Develop application by using this, super keywords.	CO1
3	Study and Implement application by using constructor overloading.	CO2
4	Develop application by using inheritance.	CO2
5	Study and Implement application by using multiple catches	CO3
6	Develop application by using thread concept.	CO3
7	Develop application by using collection framework class.	CO4
8	Develop application by using JFrame, JLabel, JTextField, JButton.	CO4
9	Develop application by using JFrame, JMenuBar, JMenu, JMenuItem.	CO5
10	Develop application by using JFrame, JTree Control for displaying nodes.	CO5

Text Books

1	The Complete Reference of Java Herbert Schildt, 7 th Edition, Tata McGraw Hill Publication
2	Effective JAVA, 3 rd Edition Joshua Bloch

Reference Books

1	Java 6 Black Book Steven Holzner 2 nd Edition Coriolis Group
2	PROGRAMMING IN JAVA, Dr. S. B. Kishor 1st Edition, published by Das GanuPrakashan

Useful Links				
1	https://nptel.ac.in/courses/106/105/106105153/			
2	https://nptel.ac.in/courses/106/105/106105191/			
	Course Outcomes	CL	Lab Sessions	
MCA41109.1	Apply object oriented concepts to get the clarity in class implementation.	3	9	
MCA41109.2	Classify inheritance, polymorphism to develop Object Oriented applications.	4	9	
MCA41109.3	Evaluate Exception handling, Threading concepts to create.	5	9	
MCA41109.4	Analyze Collection Framework, swing handling concepts to create window based GUI applications.	4	9	
MCA41109.5	Analyze event handling to develop interactive swing applications.	4	9	

		Tulsiramji Gaikwad-Patil College of Engineering and Technology Wardha Road, Nagpur-441 108 NAAC Accredited (A+ Grade)					
Program: Master in Computer Application							
Teaching Scheme:-Lectures- 06			Tutorial-00			Total Credit- 03	
Semester	Course Code	Name of Course	L	T	P	Credits	
I	MCA41110	DBA Lab using ORACLE	-	-	3	2	
Pre-Requisites: Basic of Database Management Systems, Normalization's, Database concepts, Data models and Relational model.							
Course Objectives:							
1.	Students will learn a strong foundation in advanced database concepts from an industry perspective.						
2.	To learn query processing and transaction management concepts for Database Management System.						
3.	To utilize SQL and PLSQL queries for industry perspective.						
4.	To analyses the database system architecture, database recovery techniques, database security and authorization						
5.	To analyze Oracle Backup and recovery strategies.						
6	To analyzeoracle performance tuning and security of database.						
Course Contents						CO	
Sr. No.	List of Experiment						
1	Implement the Normalization (1NF, 2NF, 3NF)						CO1
2	Implementation of Nested loop and recovery of transaction.						CO1, CO2
3	SQL: DDL, DML, set operation, sub queries.						CO3
4	Intermediate SQL: Joins, Views, Abstract Data type, Advanced SQL: Functions,Procedures, PL-SQL.						CO1, CO3
5	SQL: Backup and Recovery, Indexes						CO3, CO4
6	SQL Tunning, rollback database, lock contention.						CO3, CO5
Text Books							
1	Fundamental of Database Systems, R. ElmasriS. Navathe Benjamin Cummings, 2 nd Edition						
2	Database system concept, Henry Korth, 7 th Edition						
Reference Books							
1	DBA Handbook oracle press, Loney, 2 nd Edition.						
2	The Complete Reference SQL - Groff Weinberg (Tata McGraw Hill Publication), 2 nd Edition.						
Useful Links							
1	https://nptel.ac.in/courses/106/105/106105175/						
2	https://nptel.ac.in/courses/106/106/106106093/						
Course Outcomes			CL	Class Sessions	Lab Sessions		

MCA41110.1	Apply the knowledge of Normal forms and Query processing for handling multiple types of data.	3	9	2
MCA41110.2	Identify and understand a detailed view of handling parallel and distributed database.	3	9	3
MCA41110.3	To apply and write SQL and PL SQL queries for Data Manipulation and Data Definition languages.	4	9	4
MCA41110.4	Evaluate the internal data structure and demonstrate backup and recovery procedures.	5	9	4
MCA41110.5	Develop deep visualization of realistic data into physical structure	6	9	4

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Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
I	MCA41111	Artificial Intelligence Lab Using Python	-	-	4	2

Pre-Requisites: Python Programming, Subject Knowledge of AI and Machine Learning

Course Objectives:

1. To learn and apply the basic programming concepts and Data Structures in Python.
2. To implement AI search methods like Depth First and Breadth First Search using Python. Implement the A* algorithm of heuristic search.
3. Learn and apply Min-Max Algorithm for two agents and the Backtracking method on CSP networks to find the optimal solution.
4. To learn and apply ML tools and methods for data sampling, visualization, and comparison of different ML-supervised models with sample data.
5. To apply different un-supervised learning models using sample data for different applications

Sr. No.	List of Experiment	CO Mapping
1	Basic Python Programming: A) Demonstration of Branching and Looping statements in Python B) Demonstration of functions to manipulate Strings C) Demonstration of functions to manipulate Array	CO1
2	Python Data Structures, and Standard I/O: A) Demonstration of using List, Set, and Dictionary data structures B) Demonstrate standard modules in Python (collections, OS, etc.)	CO1
3	Implement Depth First and Breadth First Search for the given data.	CO2
4	Implement A* Algorithm to find the shortest path between the source and the destination for the given network of cities.	CO2
5	Implement Mini-Max Algorithm for two agents	CO3
6	Build a network with given constraints and apply the backtracking algorithm to find the optimum solution.	CO3

MCA41111.5	To apply different un-supervised learning models using sample data for different applications	6	9
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Program: Master in Computer Application							
Semester	Course Code	Name of Course	L	T	P	Credits	
I	MCA41112	PHP Lab(Vocational Skill Enhancement I LAB)	-	-	4	2	
Pre-Requisites:HTML, CSS							
Sr. No.	List of Experiment						CO
1	Write a program in PHP to find factorial of a number.						CO1
2	Write a program in PHP to check whether entered number is prime or Not using class & object.						CO1
3	Write a program in PHP to give demo of any 5 String function						CO2
4	Write a program in PHP to find amstrong number.						CO2
5	Write a program in PHP to give demo of get request.						CO3
6	Write a program in PHP to find sum of 1 st n even numbers.						CO3
7	Write a program in PHP to find biggest of 3 numbers.						CO4
8	Write a program in PHP to create & use cookie.						CO4
9	Write a program in PHP to create session.						CO5
10	Write a program in PHP to insert record in MYSQL database table.						CO5
Text Books							
1	PHP5 for beginners, Evan Bayross and Sharman Shah, SPD Publications						
2	Programming PHP, Rasmus Lerdorf and Kevin Tatroe, Orilly Publications						
Reference Books							
1	Head First PHP &MySQL ,Lynn Beighley& Michael Morrison						
Useful Links							
1	http://www.nptelvideos.com/php/php_video_tutorials.php						
2	https://nptel.ac.in/courses/106/105/106105084/						

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Program: Master in Computer Application						
Semester	Course Code	Name of Course	L	T	P	Credits
I	MCA41113	Angular Lab	-	-	4	2
Pre-Requisites: HTML, CSS, Basic Concepts of JavaScript,OOPs Concepts						
Course Objectives:						
1.	To learn Angular expressions					
2.	To learn the application of filters, controllers, modules and directives					
3.	To learn how to useforms and event handling					
4.	To learn how to use \$http service and create custom filter					
5.	To learn animations and SPA (Single page application)					
Sr. No.	List of Experiment					CO
1	Using Angular Expressions: Create an Angular Expression for Amount = (Qty * Rate). Display the value of the expression on the page for different values of ‘Qty’ and ‘Rate’					CO1
2	Using Angular Filters: (Built-in Filters and Custom Filters) Demonstrate the use of the following filters with appropriate examples: <ul style="list-style-type: none">• Uppercase and Lowercase Filters• Currency filter• Number Formatting Filters,• OrderBy Filter• Date Filter• JSON Filter					CO2
3	Using Controllers and Modules: Create a module bythe name " myApp ". Create a controller ng-controller="myCtrl" as an AngularJS directive. Define the myCtrl function as a JavaScript function, which creates two properties (variables) in the scope firstName and lastName .Invoke the controller with a \$scope object and display the values. Explain how the input fields are moved to the controller properties firstName and lastName .					CO2
4	Using Directives: Demonstrate the use of following directives in a web page. The ng-app directive: to initialize an AngularJS application. The ng-init directive: to initialize application data. The ng-model directive: to bind the value of HTML controls (input, select, textarea) to application data.					CO2

5	Using Angular Forms: Create a form for student data with the following controls and bind them to a model <ul style="list-style-type: none">input elements (Student Name)select elements (Branch)button elements (Submit and Reset)textarea elements (Remarks)checkbox and (Hobbies: Sports, Writing, Reading)Radio buttons (Type: UG, PG)	CO3
6	Handling Events: Demonstrate handling the following mouse events on a hyperlink element using <u>event listeners</u> . <ul style="list-style-type: none">ng-mouseover, ng-mouseenter, ng-mousemove, ng-mouseleave Or when a mouse button is clicked on a text element, in this order: <ul style="list-style-type: none">ng-mousedown, ng-mouseup, ng-click	CO3
7	Using Services: Demonstrate using \$http Service for reading data from a remote server. (You can choose any simple website). Use the(.get) method to read the following information from the response received from the website. <ul style="list-style-type: none">.data a string, or an object, carrying the response from the server..headers to get header information..status a number defining the HTTP status..statusText is a string defining the HTTP status.	CO4
8	Custom Filter: Create a custom filter called "myFormat", which will uppercase every other character of a given string.Demonstrate using this filter on a page. For example: Input: 'Monday' Output: 'MoNdAy'	CO4
9	Animations (CSS Transforms and Transitions): <ul style="list-style-type: none">Include the AngularJS animate libraryWrite “Hello” inside a div tagHide and Show the div on selecting a check box	CO5
10	Single Page Application(SPA): Create a single page application.Develop a shopping cart to add and remove items from a shopping list to the cart. Do error handling for exception cases.	CO5
Text Books		
1	Angular: Up and Running, <i>Learning Angular, Step by Step- Shyam Seshadri</i> , O-Reilly Publication, 2018	
2	<i>Angular in Action</i> , JEREMY WILKEN, Manning publication, 2018	
Reference Books		
1	Angular 5 Projects, Mark Clow, Apress, 2018	
Useful Links		
1		
2		

	Course Outcomes	PO/PSO	CL	Lab Sessions
MCA41113.1	Will learn to apply Angular expressions		3	2
MCA41113.2	Will learn the application of filters, controllers, modules, and directives		4	3
MCA41113.3	Will learn how to use forms and event handling		5	4
MCA41113.4	Will learn how to use services and create a custom filter		4	4
MCA41113.5	Will learn animations and developing a SPA (Single page application)		6	6



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Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
I	MCA41114	Computer Architecture & Organisation	-	-	3	2

Pre-Requisites: : Computer hardware Interfacing, Digital communication & networking, Software Engineering

Course Objectives:

1. Knowledge in computer hardware and peripherals for installation, PC assembly.
2. A basic knowledge of TCP/IP networks work group, internet and intranet.
3. To examine the Networking is the field of computer application that allows computers to exchange data or information.
4. To examines the interaction between information and methods of communication technology.
5. Students will exhibit proficiency with software applications and demonstrate knowledge of computer technology and components to aide in their understanding of data and information.

Course Contents

Sr. No.	List of Experiment	CO Mapping
1	Analyzed different types of Network cables and Practically implement the cross-wired cable and straight through cable using crimping tool.	CO1
2	Make case study on OS and installation OS into the computer system using modern tool(Virtual box/VMware)	CO1
3	Analyzed Network Devices in Detail.	CO2
4	Demonstrate network IP.	CO2
5	Connect the computers in Local Area Network.	CO3
6	Observer basic network command and Network configuration commands.	CO3
7	Configuration of IP addresses, Subnet Mask and Default Gateway.	CO4
8	Installation and introduction to CCNA student version 6.0.1	CO4
9	Detecting Network Attacks to Network Analysis Using CCNA student version 6.0.1	CO5
10	To Calculate the message digest of a text using the SHA-1 algorithm	CO5

Text Books

1. Inside the IBM PC Peter Norton, 3rd Edition
2. Data communication and Network by Forouzan, 2nd Edition, Tata McGraw Hill Publication

Reference Books

1	Network Security and Essentials: Application and standards, 3 rd Edition, William Stallings, Pearson
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Useful Links

1	https://nptel.ac.in/courses/106/105/106105167
2	https://nptel.ac.in/courses/106/104/106104182

	Course Outcomes	CL	Lab Sessions
MCA41114.1	construct the terminology of communication network and network functionality	3	9
MCA41114.2	Practice on Wired and wireless technology implementation for data communication	3	9
MCA41114.3	Differentiate Communication network model data flow and its protocol	4	9
MCA41114.4	Analyze the network security management and various methodology using algorithms	4	9
MCA41114.5	Evaluate the Application management of communication channels and hacking technology	5	9

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Program: Master in Computer Application						
Semester	Course Code	Name of Course	L	T	P	Credits
I	MCA41115	JavaScript Lab	-	-	4	2
Pre-Requisites: DOM Concepts, Functioning of a Browser, OOPs Programming Concepts,HTML						
Course Objectives:						
1.	To understand Browser components and the function of the JavaScript Engine. Learn JavaScript data types, statements, and operators. Apply the knowledge to develop programs using an IDE					
2.	To understand JS objects and JS functions. Learn to manipulate JS objects and DoM objects using JavaScript					
3.	To learn Java events programming to manipulate DOM and JavaScript Objects using event handlers					
4.	To understand and apply the built-in HTML Web APIs on a browser					
5.	To understand and apply JavaScript advanced features like closure, promises, error handling, and creation of SVG using JavaScript.					
Sr. No.	List of Experiment					CO
1	<u>Basic JavaScript Programming:</u> a) Build an HTML page with an input for text and a submit button. Write a JavaScript to find if the input is a Number or a String. Use an external JavaScript file.					CO1
2	<u>Basic JavaScript Programming:</u> a) Write a JavaScript to find the Min, the Max element of an Array of 10 integers. Display the original array and the Min and Max values on an HTML page that internally refers to JavaScript. Use a button to display the results. DataArray = [10, 5, 27, 45, 77, 78, 3, 5, 21, 53] b) Sort the array and display the sorted array on the HTML page.					CO1

3	<p>Understanding DOM (Access DoM attributes):</p> <p>a) Build an HTML page for registration with inputs 'UserId', 'Password', and Confirm Password. It should also have a 'Submit' button and a 'Reset' button. Verify the following for UserId, Password, and Confirm Password and display the messages accordingly using JavaScript.</p> <ul style="list-style-type: none"> • Wrong UserId – “UserId/Password is wrong” • Wrong Password – “UserId/Password is wrong” • UserId is blank – “UserId is required.” • Password is blank – “Password is required.” • Password should have at least 8-characters, The First character should not be numeric, there should be at least one special character, there should be at least one numeric, and there should be at least one uppercase and one lowercase – else the message should be “Invalid password.” • Confirm Password: Both Password and Confirm Password should be the same – else “Confirm password does not match with the entered password” 	CO2
4	<p>Understanding JavaScript Objects:</p> <ul style="list-style-type: none"> • Given a JSON object of student data, find the number of students and count of students in different departments, using different functions of JS to manipulate Objects. Given JSON Object as “Student”: [{name:“A”, dept:”MCA”}, {name:”B”, dept:”MCA”}, {name:”C”, dept:”MBA”}] 	CO2
5	<p>Event ProgrammingTo Manipulate Style:</p> <p>a) Build an HTML page with a small paragraph of Text (any) and the following buttons.</p> <ol style="list-style-type: none"> A 'Red' button – On-clicking should change the style of the paragraph to 'Red' A 'Blue' button – On-clicking should change the style of the paragraph to 'Blue' A 'Green' button – On-clicking should change the style of the paragraph to 'Green' 	CO3
6	<p>Event Programming to Perform Logic:</p> <ul style="list-style-type: none"> • Build an HTML page with Textbox (Multiline). Users can enter up to 100 characters. On the keypress event calculate the number of characters. Display the number of characters below the textbox. Disable typing except 'backspace' when it is greater than 100 characters and display an alert message (Number of characters > 100) in Red. 	CO3

7	Using Built-in JavaScript Web APIs: <ul style="list-style-type: none"> Demonstrate Geolocation web API to find out the current Latitude and Longitude of the Device. Display Latitude and Longitude values. Build a web page. Use a web worker, that increments a counter every 30 sec. Find the value of the web worker on clicking a button on the page labeled “Get Counter Value.”. 	CO4
8	Using Built-in JavaScript Web APIs: <ul style="list-style-type: none"> Build a web page using client-side storage API (sessionStorage and localStorage). Keep the value of “Number of times the web page is accessed” in localStorage and UserIDEntered in a Login page in sessionStorage). Display the values on loading the web page. Create a board of 4 x 4 squares. The values in the first row are (W1, W2, W3, W4) and those in the last row are (B1, B2, B3, B4). Demonstrate drag-and-drop web API using these values. 	CO4
9	Advanced features of JavaScript: Demonstration of Promises, Closure, and Error handling. <ol style="list-style-type: none"> Write javaScript to demonstrate Error handling Write javaScript to demonstrate Promises Write javaScript to demonstrate Closure 	CO5
10	Advanced Features of JavaScript: <ul style="list-style-type: none"> Demonstration of JS Graphics (SVG), Create different shapes of SVG graphics using JavaScript and display them on the web page. Change their attributes (style, size, etc) by clicking respective buttons alongside the graphics. 	CO5

Text Books

1	JavaScript: JavaScript Programming for Absolute Beginner's:Ultimate Guide to JavaScript Coding,JavaScript Programs and JavaScriptLanguage, William Sullivan, 2017, Pragmatic Solutions
2	Rediscovering JavaScript, Venkat Subramaniam, The Pragmatic Bookshelf, 2018

Reference Books

1	JavaScript: The Definitive Guide:David Flanagan, O`Reilly Publications
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Useful Links

1	W3Schools.com/javascript			
2	www.geeksforgeeks.org			
	Course Outcomes	PO/PSO	CL	Lab Sessions
MCA41115.1	To understand and apply the knowledge to develop JS programs.		3	2
MCA41115.2	To understand and apply manipulating JS objects and JS functions using JavaScript		4	2
MCA41115.3	To learn JavaScript events programming to manipulate DOM and JavaScript Objects using event handlers		5	4
MCA41115.4	To understand and apply the built-in HTML Web APIs on a browser		4	4
MCA41115.5	To understand and apply JavaScript advanced features like closure, promises, error handling, and creation of SVG using JavaScript.		6	6