COURSE OUTCOMES(COs) MCA ALL SEMESTER		
MCA I Semester		

Course Name with Code	Discrete Structures (CAT-004)	
CO	**CO STATEMENT**	**Bloom's Level**
CAT-004.1	Apply the rules of propositional logic to evaluate the validity of given logical statements and arguments.	Apply
CAT-004.2	Apply principles of lattice theory to the modeling and optimization of communication network structures.	Apply
CAT-004.3	Apply knowledge of algebraic structures to classify the algebraic nature of given mathematical problems.	Apply
CAT-004.4	Identify the graph and tree algorithms to simplify the stated shortest path problems.	Analyze
CAT-004.5	Analyze the time complexity of a given function using the recurrence relation and generating function.	Analyze

Course Name with Code	Data base management system (CAT-005)	
CO	**CO STATEMENT**	**Bloom's Level**
CAT-005.1	Apply generalization, aggregation, and reduction techniques to transform ER diagrams into relational tables.	Apply
CAT-005.2	Apply SQL and relational algebra operations to manipulate and retrieve data from a structured database for a given	Apply
CAT-005.3	Design an efficient real world database solutions using SQL and PL/SQL language.	Apply
CAT-005.4	Apply database normalization techniques to design efficient and well-structured databases schema that match industry	Apply
CAT-005.5	Analyze database transactions and security techniques for reliable data management in multiuser environments.	Analyze

Course Name with Code	Operating System (CAT-006)	
CO	**CO STATEMENT**	**Bloom's Level**
CAT-006.1	Apply process scheduling algorithms to determine the efficiency of CPU utilization	Apply
CAT-006.2	Apply algorithms for process scheduling to solve real-time scheduling problems.	Apply
CAT-006.3	Analyze virtual memory management techniques for effectively managing the execution of process.	Analyze

CAT-006.4	Evaluate deadlock prevention, avoidance, and detection strategies to resolve deadlock in shared resources.	Evaluate
CAT-006.5	Design a memory allocation strategy using paging and segmentation techniques.	Apply

Course Name with Code	Computer Organization (CAT-007)	
CO	CO STATEMENT	Bloom's Level
CAT-007.1	Apply number system and computer codes in digital data transmission techniques.	Apply
CAT-007.2	Analyze combinational circuits to identify their functionality and application in digital systems.	Analyze
CAT-007.3	Design digital and sequential logic circuits to produce desired outputs using minimization and state-based design tools.	Apply
CAT-007.4	Develop low-level programs to simulate ALU operations using addressing modes and CPU organization	Apply
CAT-007.5	Analyze memory system organization to assess its impact on overall system performance.	Analyze

Course Name with Code	Technical Communication Skills (AHT- 303)	
CO	CO STATEMENT	Bloom's Level
AHT- 303.1	Apply the technical skills to design a well-structured report for a given problem statement effectively.	Apply
AHT- 303.2	Develop effective communication skills to present the idea with the team members.	Apply
AHT- 303.3	Select the appropriate communication technology to create useful contents on social media platforms.	Analyze
AHT- 303.4	Identify the effective listening and visual approach that promotes the competencies of public speaking	Analyze
AHT- 303.5	Develop knowledge of grammar rules to enhance understanding of writing letters, research papers, proposals,	Apply

Course Name with Code	Python Programming (CAT-008)	
CO	CO STATEMENT	Bloom's Level
CAT-008.1	Identify appropriate data types to solve the given problem.	Analyze
CAT-008.2	Analyze object-oriented programming principles to identify appropriate structures for a given problem.	Analyze

CAT-008.3	Analyze basic searching and sorting algorithms to efficiently retrieve and organize data in Python.	Analyze
CAT-008.4	Implement real-world applications using OOPs with file handling and exception handling techniques.	Apply
CAT-008.5	Design a GUI-based Python application using Tkinter and Turtle.	Create

Course Name with Code	Data base management system Lab (CAP-001)	
CO	CO STATEMENT	Bloom's Level
CAP-001.1	Implement a database schema for a given problem-domain using SQL.	Apply
CAP-001.2	Implement robust database applications using PL/SQL and exception handling for efficient operations.	Apply
CAP-001.3	Analyze database management techniques to efficiently create, manipulate the database table for a given scenario.	Analyze
CAP-001.4	Implement the database-driven applications for real-world systems using DBMS morden tools.	Apply
CAP-001.5	Demonstrate professional ethics and project management skills by creating well-structured and comprehensive	Apply

Course Name with Code	Operating System Lab (CAP-002)	
CO	CO STATEMENT	Bloom's Level
CAP-002.1	Apply the basic commands and utilities in Linux/UNIX systems to navigate the file system.	Apply
CAP-002.2	Analyze and Implement the CPU scheduling algorithms using c programming in Linux environment.	Analyze
CAP-002.3	Develop algorithm for deadlock avoidance, detection and file allocation strategies using c programming in Linux	Apply
CAP-002.4	Apply the UNIX-Shell Scripts and AWK to efficiently customized and automate the works environment.	Apply
CAP-002.5	Apply the Linux/UNIX administrative commands to manage and control the work environment of the organization.	Apply

Course Name with Code	Computer Organization Lab (CAP-003)	
CO	CO STATEMENT	Bloom's Level
CAP-003.1	Select digital components to design efficient circuits under lab constraints.	Evaluate

CAP-003.2	Design digital logic circuits on breadboards using circuit diagram to demonstrate the functionality.	Apply
CAP-003.3	Analyze circuit outputs under testing conditions to match expected logical behavior.	Analyze
CAP-003.4	Implement Digital Display using sequential circuits on breadboard.	Apply
CAP-003.5	Document circuit design and results using structured lab reports for clarity and accuracy.	Apply

Course Name with Code	Technical Communication Skills (AHP-303)	
CO	CO STATEMENT	Bloom's Level
AHP-303.1	Apply correct pronunciation of words to communicate effectively with peer member through phonetics.	Apply
AHP-303.2	Develop effective communication skills to present the idea among society.	Apply
AHP-303.3	Identify the appropriate communication technology to create useful contents on social media platforms.	Analyze
AHP-303.4	Identify the effective listening and visual approach to promote the competencies of public speaking.	Analyze
AHP-303.5	Apply grammar rules to demonstrate the skill for writing letters, research papers, proposals and thesis.	Apply

MCA II Semester

Course Name with Code	Computer based numerical and statistical techniques (CAT-009)	
CO	CO STATEMENT	Bloom's Level
CAT-009.1	Apply iterative methods to find the roots of equations and their convergence behavior.	Apply
CAT-009.2	Analyze interpolation techniques to estimate intermediate values and approximate functions over unequal intervals.	Analyze
CAT-009.3	Apply the given Numerical Differentiation and Integration method to solve linear differential equations.	Apply
CAT-009.4	Apply statistical modeling techniques to interpret complex data-driven problems.	Apply
CAT-009.5	Evaluate forecast time series data using statistical and quality control techniques to predict future data trends.	Evaluate

Course Name with Code	Data Structures and analysis of algorithm (CAT-010)	
CO	CO STATEMENT	Bloom's Level
CAT-010.1	Implement the ADT operation on the given data structure using c programming.	Apply
CAT-010.2	Identify appropriate data structures to optimize the solution of given problem definition.	Analyze
CAT-010.3	Identify the searching and sorting technique to reduce the time complexity for a given problem.	Analyze
CAT-010.4	Design the advanced data structure using Non-Linear data structure to solve real world problems.	Apply
CAT-010.5	Analyze the efficiency of a given algorithm in terms of Time and Space complexity.	Analyze

Course Name with Code	Object oriented programming with Java (CAT-011)	
CO	CO STATEMENT	Bloom's Level
CAT-011.1	Apply Object Oriented Programming principles of encapsulation, inheritance and polymorphism to design	Apply
CAT-011.2	Develop solution for a given problem using user define data types and exception handling.	Apply
CAT-011.3	Apply exception handling, file-handling and multithreading technique to design robust application.	Apply
CAT-011.4	Design GUI based JAVA enterprise applications using event driven programming.	Create
CAT-011.5	Implement Java applications using JDBC for seamless data connectivity and efficient data management.	Apply

Course Name with Code	Computer Network (CAT-012)	
CO	CO STATEMENT	Bloom's Level
CAT-012.1	Apply the OSI reference model to identify layered communication functions in a network.	Apply
CAT-012.2	Analyze error detection and correction strategies in sliding window data link protocols.	Analyze
CAT-012.3	Apply ALOHA protocol and IEEE LAN standards in the design of MAC sublayer protocols.	Apply
CAT-012.4	Analyze the performance of data transmission protocol in real world data transmission applications.	Analyze
CAT-012.5	Evaluate TCP/IP stack components in point-to-point and internetwork scenarios.	Evaluate

Course Name with Code	Artificial intelligence (CAT-013)	
CO	CO STATEMENT	Bloom's Level
CAT-013.1	Apply principles of production systems and advanced logical reasoning techniques to address the problem-solving scenarios	Apply
CAT-013.2	Apply propositional and predicate logic techniques to solve logical reasoning problems	Apply
CAT-013.3	Develop intelligent algorithms for constraint satisfaction problems and intelligent systems for Game Playing.	Create
CAT-013.4	Apply probabilistic reasoning and certainty factor techniques to solve medical diagnosis problems.	Apply
CAT-013.5	Analyze heuristic search strategies and logic programming techniques to improve decision-making efficiency in AI	Analyze

Course Name with Code	Accounting and Financial Management (AHT -306)	
CO	CO STATEMENT	Bloom's Level
AHT -304.1	Analyze organizational structures, organizing principles, and departmentation to enhance managerial effectiveness in	Analyze
AHT -304.2	Apply accounting principles to prepare journal entries, ledgers, and final accounts.	Apply
AHT -304.3	Evaluate financial statements using budgeting, capital budgeting, and working capital techniques to support strategic	Evaluate
AHT -304.4	Assess costing methods and marginal costing for managerial decision-making.	Analyze
AHT -304.5	Interpret financial reports through ratio analysis, cash flow and funds flow statements.	Analyze

Course Name with Code	Data Structures and analysis of algorithm (CAP-004)	
CO	CO STATEMENT	Bloom's Level
CAP-004.1	Apply mathematical techniques of sorting and searching algorithms for solving a given problem.	Apply
CAP-004.2	Implement linear and nonlinear data structures for a given application domain using C programming languages.	Apply
CAP-004.3	Design algorithms for given applications using non-linear data structures.	Apply
CAP-004.4	Analyze the result in terms of time and space complexity for given algorithms.	Analyze

CAP-004.5	Document lab work comprehensively by applying professional ethics.	Apply

Course Name with Code	Object oriented programming with Java (CAP-005)	
CO	**CO STATEMENT**	**Bloom's Level**
CAP-005.1	Apply OOP fundamentals of inheritance, polymorphism and abstraction to create scalable and maintainable Java	Apply
CAP-005.2	Implement exception handling and thread synchronization for a given application domain using java programming language.	Apply
CAP-005.3	Implement a basic client-server application using Remote Method Invocation (RMI) to facilitate remote communication	Apply
CAP-005.4	Design visually appealing and user-friendly GUI applications using Swing/AWT.	Create
CAP-005.5	Apply comprehensive exception handling techniques to implement input validating robust application.	Apply

Course Name with Code	Computer networks Lab (CAP-006)	
CO	**CO STATEMENT**	**Bloom's Level**
CAP-006.1	Apply the network standard tools to configure network interface cards for testing end-to-end host connectivity.	Apply
CAP-006.2	Implement basic network configuration in a simulated or real environment.	Apply
CAP-006.3	Implement the routing algorithms and protocols to manage data flow in networks.	Apply
CAP-006.4	Implement the network topologies using tools to identify network performance metrics.	Apply
CAP-006.5	Evaluate and document IEEE standard implementations in enterprise network environments.	Evaluate

Course Name with Code	Artificial intelligence Lab (CAP-007)	
CO	**CO STATEMENT**	**Bloom's Level**
CAP-007.1	Apply AI search techniques to solve pathfinding and decision-making problems.	Apply
CAP-007.2	Analyze heuristic methods to evaluate performance in optimization problems.	Analyze
CAP-007.3	Design an expert system for real-world problem using forward chaining with Python libraries.	Apply

CAP-007.4	Create NLP applications using NLTK for text preprocessing (stop-word removal, stemming, lemmatization).	Create
CAP-007.5	Design intelligent Games applications using Game Logic, AI Models and python libraries.	Create

MCA III Semester

Course Name with Code	Graph Theory (CAT-014)	
CO	**CO STATEMENT**	**Bloom's Level**
CAT-014.1	Apply basic mathematical terminology to represent graphs and subgraphs accurately for a given problem or dataset.	Apply
CAT-014.2	Apply Euler's formula and Kuratowski's theorem to determine the connectivity, separability, and planarity of graphs.	Apply
CAT-014.3	Apply concepts of graph theory to solve real-world problems in the domains of circuit design and network construction.	Apply
CAT-014.4	Select appropriate graph or tree algorithms to optimize the shortest path for a given network scenario.	Evaluate
CAT-014.5	Select appropriate graph coloring and partitioning techniques to identify distinct paths for real-world path-covering	Evaluate

Course Name with Code	Software Engineering (CAT-015)	
CO	**CO STATEMENT**	**Bloom's Level**
CAT-015.1	Apply appropriate software architecture models to carry out high level design of a system.	Apply
CAT-015.2	Design Software Requirement Specifications (SRS) and related documentation using structured analysis techniques for	Apply
CAT-015.3	Design a software system that meets specified requirements using industry standard modern computing tools.	Apply
CAT-015.4	Select the software testing strategies to validate the functionality, reliability and performance for a given software.	Evaluate
CAT-015.5	Analyze project management techniques, cost estimation models, and resource utilization strategies for a given software	Analyze

Course Name with Code	Big Data Analysis (CAT-16)	
CO	**CO STATEMENT**	**Bloom's Level**

CAT-16.1	Identify the core concepts and technologies of data science by using its basic parameters.	Analyze
CAT-16.2	Apply appropriate frameworks for big data analytics to solve real-world problems.	Apply
CAT-16.3	Identify the clustering methods to solve the problems of structure and unstructured data base.	Analyze
CAT-16.4	Design the framework to streaming data models for efficient big data processing.	Apply
CAT-16.5	Design the graph of data sets by using NoSQL tools.	Apply

Course Name with Code	Internet of Things (CAT-18)	
CO	CO STATEMENT	Bloom's Level
CAT-18.1	Identify the key challenges associated with IoT applications in smart cyber-physical system domains.	Analyze
CAT-18.2	Develop M2M architectural solutions for IoT to manage connectivity for multiple sensors and devices based on	Apply
CAT-18.3	Analyze the IoT Architecture and Ecosystem Design in facilitating autonomous interactions among IoT devices.	Analyze
CAT-18.4	Implement basic IoT applications on embedded platform using modern tools.	Apply
CAT-18.5	Identify the privacy and security in IoT data platforms for building secure IoT environments in Smart Cities.	Analyze

Course Name with Code	Principal of Management (AHT 313)	
CO	CO STATEMENT	Bloom's Level
AHT313 .1	Demonstrate a positive attitude towards collaborative planning, fair job evaluation and respect for organizational	Apply
AHT313 .2	Apply MIS in practical organizational scenarios to enhance decision-making effectiveness.	Apply
AHT313 .3	Develop effective management strategies by integrating planning and decision makings strategies for real-world	Apply
AHT313 .4	Analyze the leadership styles and motivation techniques to improve team performance and employee engagement in IT	Analyze
AHT313 .5	Analyze coordination and control techniques to enhance the efficiency and effectiveness of organizational operations	Analyze

Course Name with Code	Universal Human Values (AHT-310)	

CO	CO STATEMENT	Bloom's Level
AHT-310.1	Apply the significance of Universal Human Values in aspects of life and society.	Apply
AHT-310.2	Examine the innate desires and goals common to all people in context to the societal, environment and economic.	Analyze
AHT-310.3	Identify the strategies to promote and integrate Universal Human Values in Personals and professional life.	Analyze
AHT-310.4	Analyze harmony in nature and existence and work out their mutually fulfilling participation in the nature.	Analyze
AHT-310.5	Create a compressive view on implication of adopting a holistic view on ethical human conduct.	Apply

Course Name with Code	Software Engineering Lab (CAP-008)	
CO	CO STATEMENT	Bloom's Level
CAP-008.1	Apply appropriate software development methodologies and tools to efficiently manage the given project.	Apply
CAP-008.2	Analyze software requirement specifications (SRS) and related documentation for the given software.	Analyze
CAP-008.3	Design an architecture of given software using appropriate techniques and modern computing tools.	Apply
CAP-008.4	Analy the software development plan including timeline and cost estimation for developing project.	Analyze
CAP-008.5	Apply suitable testing techniques to resolve defects and ensure software quality.	Apply

Course Name with Code	Seminar (CAP-009)	
CO	CO STATEMENT	Bloom's Level
CAP-009.1	Apply knowledge of computing systems design to address challenges encountered in real-world environments.	Apply
CAP-009.2	Analyze contemporary research literature to identify emerging trends and key challenges in the field of computing science.	Analyze
CAP-009.3	Synthesize knowledge from multiple peer-reviewed research works in computing systems to propose innovative solutions.	Analyze
CAP-009.4	Demonstrate commitment to ethical and professional conduct during seminar presentations and collaborative activities.	Apply
CAP-009.5	Apply the professional ethics and project management skills to write and present well-structured report in a team.	Apply

Course Name with Code	Minor Project (CAP-010)	
CO	CO STATEMENT	Bloom's Level
CAP-010.1	Analyze a real-world problem by reviewing relevant research literature and industry trends to define clear and achievable	Analyze
CAP-010.2	Design an effective solution using appropriate tools and technologies relevant to the chosen project domain.	Create
CAP-010.3	Develop innovative solutions using project management principles and advanced programming techniques.	Create
CAP-010.4	Analyze project outcomes based on cost estimation, resource utilization, and predefined standards to validate performance	Analyze
CAP-010.5	Apply the professional ethics and project management skills to write and present well-structured report in a team.	Apply

MCA IV Semester

Course Name with Code	Network Security (CAT-022)	
CO	CO STATEMENT	Bloom's Level
CAT-022.1	Apply mathematical foundations of cryptography to protect information systems from cyber threats.	Apply
CAT-022.2	Apply the modern cryptography to secure the digital communication.	Apply
CAT-022.3	Evaluate the secure and authentic solution for a given scenario using cryptographic techniques.	Evaluate
CAT-022.4	Select appropriate security tools and technologies for protecting network assets.	Analyze
CAT-022.5	Evaluate the effectiveness of IPSec protocols to secure network communications.	Evaluate

Course Name with Code	Self Employment and Entrepreneurship Development (AHT 412)	
CO	CO STATEMENT	Bloom's Level
AHT 412.1	Identify the promotional schemes and rules for establishment of new micro, small, and medium enterprises (MSMEs).	Analyze
AHT 412.2	Apply key concepts of project resource planning to effectively plan and optimize new enterprise setups.	Apply
AHT 412.3	Formulate a project proposal using marketing strategies, financial planning, and market analysis.	Analyze

| AHT 412.4 | Analyze the successes and failures of entrepreneurs and self-employed individuals to draw and integrate positive | Analyze |
| AHT 412.5 | Assess risks associated with entrepreneurship using decision-making strategies and risk management methods. | Analyze |

Course Name with Code	Self Employment and Entrepreneurship Development Lab (AHT 412)	
CO	CO STATEMENT	Bloom's Level
AHT 412.1	Identify the promotional schemes and rules for establishment of new micro, small, and medium enterprises (MSMEs).	Analyze
AHT 412.2	Apply resource planning tools and techniques to design operational plans for a proposed entrepreneurial venture.	Apply

AHT 412.3	Prepare and present a detailed project proposal incorporating marketing, financial, and market analysis strategies.	Apply
AHT 412.4	Conduct case studies of entrepreneurs to evaluate factors contributing to their success or failure.	Evaluate
AHT 412.5	Develop a risk management plan for a startup by applying appropriate decision-making and risk assessment methods	Apply

Course Name with Code	Machine Learning (CAT-027)	
CO	CO STATEMENT	Bloom's Level
CAT-027.1	Analyze the mathematical and statistical fundamentals to select appropriate learning models for diverse datasets.	Analyze
CAT-027.2	Develop neural networks architectures using principles of activation functions.	Apply
CAT-027.3	Design advanced deep learning solutions using Recurrent Neural Networks for decision-making tasks.	Create
CAT-027.4	Evaluate the performance of machine learning algorithms in practical application scenarios.	Evaluate
CAT-027.5	Apply machine learning techniques to solve practical problems and interpret their results.	Apply

Course Name with Code	Software Testing & Quality Assurance (CAT-030)	
CO	CO STATEMENT	Bloom's Level
CAT-030.1	Develop an appropriate plan for software quality management and its significance in software development.	Apply
CAT-030.2	Apply the principles of software quality and software testing techniques to assess and improve the efficiency of software	Apply
CAT-030.3	Examine appropriate international standard for real life software project for controlling and managing the quality of	Analyze
CAT-030.4	Apply the software management principles and techniques to solve software quality challenges.	Apply
CAT-030.5	Identify software testing tools to ensure functionality, reliability, and performance of given application software.	Analyze

Course Name with Code	Network Security Lab (CAP-011)	
CO	CO STATEMENT	Bloom's Level
CAP-011.1	Apply the security protocols to secure network communications and protect data integrity.	Apply

CAP-011.2	Analyze captured network traffic to identify potential security threats.	Analyze
CAP-011.3	Implement a secure authentication mechanism for given application requirements.	Analyze
CAP-011.4	Design secure network communication standards at different layers of TCP/IP model to establish secure channels for data	Apply
CAP-011.5	Develop a secure solution for real-world applications using cryptographic primitives and key management techniques.	Apply

Course Name with Code	Digital Marketing (AHT-411)	
CO	CO STATEMENT	Bloom's Level
AHT-411.1	Apply SEO strategies to optimize website rankings using analytics metrics.	Apply
AHT-411.2	Apply Google Ads campaigns strategies using Google Keyword Planner to optimize ROI for lead generation.	Apply
AHT-411.3	Implement automated e-mail marketing methods to optimize open rates on budget campaigns.	Apply
AHT-411.4	Analyze digital marketing case studies and competitive strategies for business scalability.	Analyze
AHT-411.5	Analyze social media data to refine content and ad creatives using platforms Hootsuite.	Analyze

Course Name with Code	Digital Marketing Lab (CAP-012)	
CO	CO STATEMENT	Bloom's Level
CAP-012.1	Apply SWOT analysis technique to create effective marketing strategies for a business.	Apply
CAP-012.2	Design responsive web pages for digital marketing using WordPress.	Apply
CAP-012.3	Implement SEO technique to enhance website visibility using google search console.	Apply
CAP-012.4	Analyze website performance using Google Analytics to track traffic and user behavior.	Analyze
CAP-012.5	Design segmented Email campaigns to expand business using Mailchimp.	Apply

Course Name with Code	Major Project (CAP-013)	
CO	CO STATEMENT	Bloom's Level

CAP-013.1	Identify a problem for managing risks and opportunities related to environmental, social, and governance criteria and	Analyze
CAP-013.2	Design an effective solution using appropriate tools, technologies, and methodologies relevant to the project	Create
CAP-013.3	Formulate the innovative project solutions using project management skills and advance programming techniques.	Create
CAP-013.4	Analyze the results with cost estimation, resource utilizations and specified standard to validate the performance and	Analyze
CAP-013.5	Apply the professional ethics to present and document project work comprehensively with detail methodologies and result as	Apply