LATE BHAUSAHEB HIRAY S. S. TRUST'S
INSTITUTE OF COMPUTER APPLICATION

ISO 9001:2015 CERTIFIED

S. No. 341, Next to New English School, Govt. Colony, Bandra (East), Mumbai 400 051.
Tel. 91-22-2657 0986 / 892 Telefax : 91-22-2657 3181 Website : www.hiray.edu.in E-mail : director@hiray.org.in

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2.6.1 Programme Outcomes (POs) and Course Outcomes (COs) for all Programmes offered by the institution are stated and displayed on website.

Sr. No	Name of the Document
1.	**Programme Outcomes**
2.	**Course Outcomes** a) **MCA (2 Years)** b) **MCA (3 Years)**

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2 Years MCA Program Course Outcomes

Subject Name	Course Outcome
	Semester I
MCA11 - Mathematic al Foundation for Computer Science 1	CO1: Apply different statistical measures on various types of data
	CO2: Evaluate using regression analysis.
	CO3: Analyze different types of Probability and their fundamental applications and random variable.
	CO4: Apply probability distribution to real world problems
	CO5: Formulate and test the hypothesis for business problem using various methods
MCA12 - Advanced Java	CO1: Demonstrate use of data structure and data manipulation concept using Java Collection Framework and Lambda expressions.
	CO2: Create JSP using standard actions, custom tags, Introduction to JSP Standard Tag Library (JSTL) and JSTL Tags.
	CO3: Understand and develop applications using Spring Framework, Lightweight Container and Dependency Injection with Spring.
	CO4: Develop applications using Aspect Oriented Programming with Spring.
	CO5: Apply JDBC Data Access with Spring and demonstrate Data access operations with Jdbc Template and Spring.
	CO6: Create Spring Boot Web Application and Spring Boot RESTful WebServices.
MCA13 - Advanced Database Management System	CO1: Demonstrate complex database systems like parallel, distributed & object oriented databases
	CO2: Model data warehouse with ETL process and dimensional modeling and data analysis using OLAP operations.
	CO3: Discover association among items using Association rule mining.
	CO4: Evaluate different data mining techniques like classification, prediction, clustering, web and text mining to solve real world problems.
MCA14 - Software Project Management	CO1: Define the key concepts of Software Project Management.
	CO2: Demonstrate understanding of the requirements Analysis and Application of UML Models.
	CO3: Make use of estimation logic for estimation of software size as well as cost of software
	CO4: Examine the need of change management during software development as well as application of quality tools.
	CO5: Assess various factors influencing project management, quality assurance and risk assessment
	CO6: Develop process for successful quality project delivery.
MCAL11 - Data Structures Lab using C/C++	CO1: Implement searching and sorting algorithms.
	CO2: Implement linear and non-linear data structures
	CO3: Choose the appropriate data structures to solve complex real life problems

	CO4: Analyze hashing techniques for data storage and retrievalfundamental applications.
MCAL12 - Advanced Java Lab	CO1: Demonstrate use of data structure and data manipulation concept using Java Collection Framework and Lambda expressions.
	CO2: Build JSP web application using standard actions, custom tags and JSTL Tags.
	CO3: Develop application using Spring Framework, Lightweight Containers and Dependency Injection with Spring.
	CO4: Develop applications using Aspect Oriented Programming with Spring.
	CO5: Build JDBC application with Spring using JdbcTemplate.
	CO6: Develop Spring Boot Web Application and Spring Boot RESTful web services.
MCAL13 - Advanced Database Management System Lab	CO1: Demonstrate distributed and ORDBMS concepts
	CO2: Perform ETL operations used in the building data warehouse.
	CO3: Demonstrate and analysis various OLAP operations
	CO4: Implement and evaluate different data mining techniques like classification, prediction, clustering and association rule mining in R
MCAL14 - Web Technologies	CO1: Build simple websites making use of various Node.js features
	CO2: Design a dynamic web application enabled with database connectivity
	CO3: Use the fundamentals of Angular.js Filters, Directives and Controllers to build applications
	CO4: Develop Forms and Single page applications (SPA)
MCAP1 11 - Mini Project – 1 A	CO1: Demonstrate the ability to produce a technical document.
	CO2: Apply software project management skills during project work.
	CO3: Build small groups to work effectively in team on medium scale computing projects.
	CO4: Design and evaluate solutions for complex problems.
Semester II	
MCA21 - Mathematical Foundation for Computer Science 2	CO1: Formulate mathematical model for a broad range of problems in business and industry.
	CO2: Apply mathematics and mathematical modeling to forecast implications of various choices in real world problems
	CO3: Think strategically and decide the optimum alternative from various available options
	CO4: Evaluate performance parameters of a real system using various methods
MCA22 - Artificial Intelligence And Machine Learning	CO1: Interpret Artificial Intelligence concepts intelligence concepts
	CO2: Apply Artificial intelligence techniques for problem solving
	CO3: Analyze the fundamentals of machine learning, the learning algorithms and the paradigms of supervised and un-supervised learning
	CO4: Identify methods to improve machine learning results for better predictive performance
MCA23 - Information	CO1: Discuss the requirement of information security , private and public key algorithms and to examine the mathematics of cryptography

Security	CO2: Analyze authentication and integrity techniques available
	CO3: Interpret the importance of firewalls and intrusion detection systems and signatures.
	CO4: Relate to the security issues and technologies used in the web, internet, database and operating system
MCAE241 - Image Processing	CO1: Explain the fundamental concepts of a digital image processing System
	CO2: Apply techniques for enhancing digital images
	CO3: Examine the use of Fourier transforms for image processing in the frequency domain
	CO4: Compare various Image compression standards and morphological Operation
	CO4: Identify various Applications of Image Processing
MCAE242 - Internet of Thing	CO1: Compare M2M and IoT; discuss applicability of IoT enabling technologies, characteristics of IoT systems and IoT levels.
	CO2: Explain different state of art IoT reference models and architectures as well as Architecture Reference Model (ARM) for IoT
	CO3: Analyze various protocols for IoT, IoT security aspects and generic design methodology
	CO4: Develop cloud based and web based IoT Model for specific domains.
MCAE243 - Robotic Process Automation	CO1: Define the key concepts of Robotic Process Automation and evolution.
	CO2: Demonstrate development of BOT with specific tools
	CO3: Apply RPA implementation cycle considering security and scaling
	CO4: Examine specifications of RPA tools and justify applications of appropriate tool for problem.
	CO5: Assess performance of BOTs in context of intelligent automation
MCAE244 - Computer Vision	CO1: Explain Concepts and Applications of Computer Vision
	CO2: Apply image processing techniques to design Computer Vision applications
	CO3: Implement algorithms of face recognition and motion detection
	CO4: Provide solutions to real world computer vision problems
MCAE245 - Embedded Systems	CO1: Explain hardware and software design requirements of Embedded Systems
	CO2: Discuss the architecture of 8051 processor
	CO3: Describe 8051 Processor Addressing modes and instruction sets
	CO4: Use Embedded C for writing basic programs for embedded systems
	CO5: Examine the use of various Embedded C programming constructs for writing programs for embedded systems.
MCAE251 - Natural Language Processing	CO1: Understand the computational properties of natural languages and the commonly used algorithms for processing linguistic information.
	CO2: Understand the information retrieval techniques using NLP

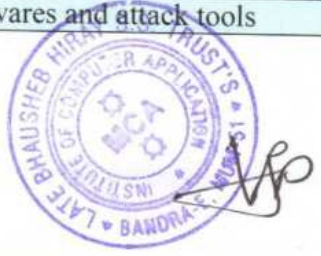
	CO3: Apply mathematical techniques that are required to develop NLP applications.
	CO4: Analyze various NLP algorithms and text mining NLP applications
	CO5: Design real world NLP applications such as machine translation, text categorization, text summarization, information extraction by applying NLP techniques.
MCAE252 - Geographic Information System	CO1: Define the key concept of Geographic Information System
	CO2: Examine the various aspects of vector data model by survey and discover of concepts.
	CO3: Elaborate and estimate raster data model by designing and developing effective plan.
	CO4: Demonstrate understanding of the Terrain Mapping, View shade and Watershed Analysis in contrast by explaining main ideas.
	CO5: Experiment of Geocoding and Dynamic Segmentation by applying facts and techniques.
	CO6: Present and explain importance of remote sensing by evaluating recommended set of criteria
MCAE253 - Design and Analysis of Algorithm	CO1: Analyze the time and space complexity of various algorithms.
	CO2: Analyze divide and conquer, greedy and dynamic programming strategies.
	CO3: Analyze backtracking, branch and bound and string matching algorithm.
	CO4: Explain NP hard NP complete problem.
MCAE254 - Digital Marketing and Business Analytics	CO1: Understand the role of Digital Marketing
	CO2: Demonstrate use of various Digital Marketing Tools.
	CO3: Discuss key element of Digital Marketing Strategy.
	CO4: Understand use of Digital Marketing Tools for Digital Marketing Campaigns
	CO5: Assess / Measure the effectiveness of the Digital Marketing Campaigns.
	CO6: Demonstrate practical skills using common digital marketing tools like SEO, SEM, Content Marketing…
MCAE255 - Research Methodology	CO1: Demonstrate knowledge of research concepts and processes
	CO2: Perform literature reviews, prepare the key elements of a research proposal
	CO3: Compare and contrast quantitative and qualitative research
	CO4: Define and develop a possible research interest area using specific research design
	CO5: Explain the rationale for research ethics, and its importance
	CO6: Demonstrate enhanced writing skills
MCAL21 - Artificial Intelligence & Machine Learning	CO1: Apply the basic concepts of artificial intelligence and its applications.
	CO2: Experiment with basic and ensemble the machine learning algorithms and its applications.
	CO3: Analyze dimensionality reduction techniques for feature extraction and selection.
	CO4: Develop models using appropriate machine learning algorithms for real world problems.

MCAL22 - Soft Skills Development Lab	CO1: Develop interpersonal skills that help in communication, teamwork, leadership and decision making.
	CO2: Methodically study, formulate and interpret different facets of organizational behavior.
	CO3: Develop holistic leaders and technocrats helping in individual and organizational growth.
MCALE231 - Image Processing Lab	CO1: Understand different image file formats and their structure
	CO2: Explain how Digital images are manipulated using various image enhancement techniques
	CO3: Learn the signal processing algorithms and techniques in image enhancement and image restoration.
	CO4: Implement digital transforms
	CO5: Be able to understand and implement certain image compression techniques.
MCALE232 - Internet of Things Lab	CO1: Identify basic electronic components and make use of arduino software/hardware and arduino simulator.
	CO2: Experiment with various I/O devices and sensors with Arduino.
	CO3: Build IoT application using Cloud.
	CO4: Develop IoT based projects.
MCALE233 - Robotic Process Automation	CO1: Define the key concepts of Robotic Process Automation and evolution.
	CO2: Demonstrate development of BOT with specific tools
	CO3: Apply RPA commands to automate atsks
	CO4: Summarize this tool as a summation of Robotic Process Automation, Cognitive Analytics, and Workforce Analytics
MCALE234 - Computer Vision Lab	CO1: Understand Open CV Framework
	CO2: Develop applications using basic image processing techniques used in Computer Vision
	CO3: Design Applications to Detect Motion and Face in an image
	CO4: Create a Applications using CNN
MCALE235 - Embedded Systems Lab	CO1: Understand the programming environment of the 8051microcontroller
	CO2: Explain how microcontrollers can be programmed using embedded C programming
	CO3: Learn execution of Embedded C programming using simulators
	CO4: Implement some basic hardware interfacing programs for 8051 / ARM / Raspberry Pi / Arduino
MCAL24 - Advanced Web Technologies	CO1: Develop Web applications using various controls and programming techniques.
	CO2: Implement Data Binding applications using ADO.NET
	CO3: Solve identity management problems in web Applications application using session management and AJAX concepts.
	CO4: Create modern web applications using Web Services and MVC5
MCAL25 - User Interface Lab	CO1: Interpret user needs and context of User Interface design Specification
	CO2: Demonstrate the tools and techniques for designing informing

	models
	CO3: Develop high fidelity prototype for end to end solution.
	CO4: Apply best practices for evaluating user experience.
MCAL26 - Networking with Linux	CO1: Demonstrate installation and configuration of Network simulator
	CO2: Construct network topologies using Network Simulator
	CO3: Analyze network traffic using network sniffing software
	CO4: Design and develop solutions to complex network problems using Network Simulator and Network Software
MCAP2 1 - Mini Project – 1 B	CO1: Demonstrate the ability to produce a technical document.
	CO2: Apply software project management skills during project work.
	CO3: Build small groups to work effectively in team on medium scale computing projects.
	CO4: Design and evaluate solutions for complex problems.
Semester III	
MCA31 - Big Data Analytics and Visualization	CO1: Demonstrate the key issues in big data management and its associated application for business decision
	CO2: Develop problem solving and critical thinking skills in fundamental enabling techniques like Map Reduce , NoSQL, Hadoop Ecosystem
	CO3: Use of RDD and Data Frame to create Application in Spark.
	CO4: Implement exploratory data analysis using visualization
MCA32 - Distributed System and Cloud Computing	CO1: Illustrate principles and communication protocols of Distributed systems
	CO2: Analyze clock synchronization and various algorithms
	CO3: Analyze Distributed shared memory and management concepts.
	CO4: Analyze Cloud computing and cloud models
MCAE331 - Block Chain	CO1: Explain Blockchain technologies and their components.
	CO2: Interpret the uses of cryptographic techniques in Blockchain
	CO3: Demonstrate the use of hyperledger fabric and its components
	CO4: Build the smart contracts in Ethereum
	CO5: Analyze the use of Blockchain technology in various domains
MCAE332 - Deep Learning	CO1: Demonstrate concepts, architectures and algorithms of Neural Networks to solve real world problems.
	CO2: Identify deep feed-forward networks and different regularization techniques used in Deep Learning
	CO3: Identify challenges in Neural Network optimization and different optimization algorithms used in Deep learning models
	CO4: Analyze deep learning algorithms which are more appropriate for various types of learning tasks in various domains
MCAE333 - Game Development	CO1: Demonstrate Principles of Game Development
	CO2: Build applications using various components of Game development
	CO3: Develop multilayered and interactive games
	CO4: Solve Problems in 2D game development
MCAE334 - Ethical	CO1: Recall the networking, sql, and encryption algorithm concepts to further study ethical hacking techniques, threats, tools and

Hacking	prevention against attacks.
	CO2: Understand ethical hacking concepts, cases, ethics and cyberlaws.
	CO3: Apply available hacking tools to find a solution to a given hacking issue.
	CO4: Analyze and classify the real-world hacking cases and situations.
MCAE335 - Quantum Computing	CO1: Understand basic principles and components of Quantum Computing
	CO2: Analyze Quantum Computing algorithms
	CO3: Design programs to perform basic Quantum Computing operations
	CO4: Identify classes of problems that can be solved using Quantum Computing
MCAE341 - Intellectual Property Rights	CO1: Define the key concepts of Intellectual Property and IP Infringements.
	CO2: Understand and acquire knowledge of IPR policy followed in India
	CO3: Demonstrate the know-how required to identify, assess, and apply for IP rights protection under various applicable laws and treaties in force.
	CO4: Analyze the development, registration procedure, protection, compliance, and enforcement of various intellectual property rights.
MCAE342 - Green Computing	CO1: Acquire expertise for improving the energy efficiency for laptops and personal computers by reducing the power consumption requirements
	CO2: Assess enterprise-wide and personal computing and computing energy consumption
	CO3: Recognize the necessity for long-term sustainability in IT
	CO4: Formulate plans for reducing IT heating and cooling requirements
	CO5: Evaluate the regulatory and governance issues surrounding IT
	CO6: Choose the best sustainable hardware for their applications
MCAE343 - Management Information System	CO1: Understand theoretical aspects of Management Information Systems.
	CO2: Know the procedures and practices for handling information system effectively.
	CO3: Acquire knowledge in various Decision Support Systems.
	CO4: Recognize the necessity of IT security and Infrastructure in Management Information Systems.
MCAE344 - Cyber Security and Digital Forensics	CO1: Demonstrate understanding of basic concepts in cyber security
	CO2: Make use of various tools and methods used in cybercrime
	CO3: Adapt fundamental knowledge of digital forensics
	CO4: Determine skills and knowledge for solving digital forensics Problems
MCAE345 - Entrepreneurship Management	CO1: Understand the concepts and fundamentals of Entrepreneurship.
	CO2: Understand the growth and development strategies for venture and Social Responsibilities
	CO3: Identify the Role of Small-Scale Industries (SSI) & Institutions

	Supporting Small Scale Enterprise.
	CO4: Analyse the process of Business Idea generation and converting the idea into a Business Model.
	CO5: Evaluate the effectiveness of different entrepreneurial strategies, policies and measures for promoting small industries.
	CO6: Create presentations and marketing strategies that articulate financial, operational, organizational, market, and sales knowledge for value creation.
MCAL31 - Big Data Analytics and Visualization	CO1: Demonstrate HDFS Commands in Hadoop.
	CO2: Apply Map Reduce Programming Paradigm to solve the algorithmic problems.
	CO3: Build No SQL Database and Query it Using Mongo DB.
	CO4: Analyze the Data Using Hadoop Ecosystem Projects: Hive and Pig
	CO5: Explain RDD and Data Frame Creation in Apache Spark
	CO6: Create various Visualizations using Tableau.
MCAL34 - Distributed System and Cloud Computing Lab	CO1: Develop Remote Process Communication, Remote Procedure Call and Remote Method Invocation concepts.
	CO2: Develop Remote Object Communication programs.
	CO3: Develop mutual exclusion concept using Token ring algorithm.
	CO4: Implementation of Cloud Computing Services.
	CO5: Implementation of Identity Management using Cloud Computing concept.
	CO6: Design Apps using Cloud Computing for windows Azure / Amazon AWS using Windows Azure Platform Training Kit and Visual Studio and Google App Engine by using Eclipse IDE.
MCALE331 - Block chain Lab	CO1: Implement encryption algorithms and hash functions
	CO2: Construct a bitcoin blocks and validating
	CO3: Construct a smart contract in Ethereum.
	CO4: Develop and deploy Dapp in Ethereum
MCALE332 - Deep Learning Lab	CO1: Demonstrate Tensor flow/Keras deep-learning workstations.
	CO2: Choose appropriate data preprocessing techniques to build neural network models.
	CO3: Analyze different regularization and optimization techniques used in deep learning.
	CO4: Build neural network models using deep learning algorithms-CNN and RNN to solve real world problems.
MCALE333 - Game Development Lab	CO1: Build Games using Object Oriented Programming Concepts
	CO2: Simplify Game Development Process using Unity Framework
	CO3: Develop state of art 2D games
	CO4: Plan creation of 3D games and Test them
MCALE334 - Ethical Hacking Lab	CO1: Applying foot printing tools for information gathering issue.
	CO2: Applying tools for scanning networks, enumeration and sniffing.
	CO3: Applying tools for malware attacks, webserver and web applications, sql injection, session hijacking, wireless networking, cloud computing, cryptography.
	CO4: Developing malwares and attack tools



	CO5: Designing pen testing report.
MCALE335 - Quantum Computing Lab	CO1: Understand the various Quantum Logic gates
	CO2: Design QC programs using quantum arithmetic
	CO3: Develop QC applications based on the quantum computing model
	CO4: Compare basic quantum computing algorithms
MCAL34 - Mobile Computing Lab	CO1: Demonstrate their understanding of the fundamental details of android and its components
	CO2: Implement various android applications using different layouts & rich user interactive interfaces
	CO3: Demonstrate their skills of using SQLite database for android application database
	CO4: Demonstrate their ability to develop programs with dart programming and flutter
MCAL35 - Software Testing & Quality Assurance Lab	CO1: Apply manual software testing techniques to test a software application
	CO2: Implement Selenium tool to perform automation testing.
	CO3: Implement TestNg frameworks to test the application.
	CO4: Demonstrate validation checks and regression testing on the application.
MCAP31 - Mini Project – 2 A	CO1: Demonstrate the ability to produce a technical document.
	CO2: Identify problems based on environmental, societal & research needs.
	CO3: Apply Knowledge and skills to analyze and interpret data by applying appropriate research methods to solve societal problems in a group.
	CO4: Design and evaluate solutions for complex problems.
	CO5: Build small groups to work effectively in team on medium scale computing projects.
	CO6: Create value addition for the betterment of the individual and society
Semester IV	
MCAI41 - Internship	CO1: Demonstrate skills to use modern tools, software and equipment to analyze problems.
	CO2: Develop an exposure to real life organizational and environmental situations.
	CO3: Apply SDLC phases in developing software projects and in writing the project document.
	CO4: Create computing solutions for the real life problems as per the requirements of the domain.
	CO5: Adapt professional and interpersonal ethics.
MCAR42-Research Paper	CO1: Show data coherently, effectively and counter-hypothesis.
	CO2: Apply experience in preparation of research material for publication or presentation.
	CO3: Identify relevant previous work that supports their research.
	CO4: Analyze data and synthesize research findings.
	CO5: Create research paper.

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3 Years MCA Program Course Outcomes	
Subject Name	**Course Outcome**
Semester I	
Object Oriented Programming MCA101	**CO1:** Comprehend Object oriented programming concepts and their application
	CO2: To write applications using C++.
	CO3: Implement programming concepts to solve bigger problems.
Software Engineering & Project Management MCA102	**CO1:** Apply knowledge of Software Life Cycle to successfully implement the projects in the corporate world
	CO2: Identify the Inputs, Tools and techniques to get the required Project deliverable and Product deliverable using 10 Knowledge areas of Project Management
	CO3: Implement Project Management Processes to successfully complete project in IT industry.
Computer Organization and Architecture MCA103	**CO1:** Design trade-offs Basic fundamentals in digital logic & structure of a digital computer.
	CO2: Identify performance issues in processor and memory design of a digital computer.
	CO3: To Develop independent learning skills and be able to learn more about different computer architectures and hardware.
	CO4: To articulate design issues in the development of Multiprocessor organization & architecture.
IT in Management MCA104	**CO1**: To use various IT tools used for managing the Industrial operation.
	CO2: To apply the decision for selecting the proper IT tools for Management operation.
	CO3: To design the strategic plan for using Information Technology in Management.
Statistics And Probability MCA105	**CO1:** Distinguish between quantitative and categorical data.
	CO2: Apply different statistical measures on data.
	CO3: Identify, formulate and solve problems.
	CO4: Classify different types of Probability and their fundamental applications.
Lab 1-SEPM and OOP Lab MCAL101	**CO1:** Design and Develop the solution to a problem using Object Oriented Programming Concepts.
	CO2: Demonstrate use of C++ Concepts
	CO3: Develop real time applications.
Lab II Web Technologies and Mini Project-Lab	**CO1:** Acquire knowledge about functionality of world wide web.
	CO2: Develop web based applications using open source

	technology.
	CO3: Design and develop dynamic web sites. .
Semester II	
Data Structures MCA201	**CO1 :** Analyze and compute efficiency of various sorting and searching as well as hashing algorithms.
	CO2 : Discuss how linear data structures (stacks, queues, link represented in memory and used by algorithms and their applications.
	CO3: Apply the concepts of non-linear data structures (trees, graphs) to different applications
	CO4: Determine apprqpriate data structures to solve real-world problems.
Operating System MCA202	**CO1 :** Classify different styles of operating system designs
	CO2 : Analyze process management, I/O management, memory management functions of Operating System
	CO3: Employ process scheduling and disk scheduling algorithms
	CO4: Explore file management and protection and security concepts
Computer Networks MCA203	**CO1 :** Comprehend the basic concepts of computer networks and data communication systems.
	CO2 : Analyze basic networking protocols and their use in network design.
	CO3: Explore various advanced networking concepts.
Financial Accounting and Management MCA204	**CO1 :** To use accounting functions as an information development and communication system that supports economic decision making and provides value to entities
	CO2 : Preparation of financial statements and related information and apply analytical tools in making both business and financial decisions.
	CO3: To analyze the impact of accounting system on several business functions and managers" decision making.
	CO4: To analyze and use financial statements; prepare budgets and investment options; assess risks and the rewards involved in firm"s financial decisions
Decision Making and Mathematical Modelling MCA205	**CO1 :** Develop mathematical and logical thinking

	CO2 : Model situations from variety of settings in generalised mathematical form
	CO3: Solve the real world business problem
Operating System and Computer Networks Lab MCAL201	**CO1 :** Apply various operating system commands
	CO2 : To write a shell script and awk programming
	CO3: Design network for any business requirement.
Data Structure and Web Application Development using Open Source Tools Lab MCAL202	**CO1 :** Effectively select the data structure model to be used for the real world problem
	CO2 : M Develop web based applications using AJAX framework and open source tools
	CO3: Build web application with effective storage mechanism for data.
SEMESTER III	
Database Management systems MCA301	**CO1:** Understand various database concepts and apply them in real life applications.
	CO2: Determine the manner in which data can be stored, organized and manipulated in a database system.
	CO3: Apply various indexing and optimization techniques to process queries.
	CO4: Analyze and design database applications using suitable database techniques.
Java programming MCA302	**CO1:** Solve computational problems using basic constructs.
	CO2: Find a solution for real world problems using Java
	CO3: Develop Web Applications using Server Side Programming
Information Security MCA303	**CO1:** Understand the requirement of information security and a clear understanding of its importance
	CO2: Be familiar with information security threats and countermeasures, and familiar with information security designs using available secure solutions
	CO3: Use the database security mechanisms, intrusion detection systems, formal models of security, cryptography, network ,web

	security
Operation Research MCA304	**CO1:** Apply Operations research methodology to a broad range of problems in business and industry
	CO2: Use mathematics and mathematical modelling using computers to forecast the implications of various choices.
	CO3: Solve optimization problems.
	CO4: Think of new methods for solving optimization problems.
Software Testing and Quality Assurance MCA305	**CO1:** Solve the problems using Software Testing techniques and Approaches.
	CO2: Apply various Software testing Techniques to find bugs in software.
	CO3: Use open source software Testing Tools.
	CO4: Apply various Software Quality Assurance Techniques to ensure the quality in software.
Database Management systems and Software Testing Lab MCAL301	**CO1:** Design database systems using available tools.
	CO2: Develop applications using basic and modern database techniques as per organization requirements
	CO3: Demonstrate software testing tools
	CO4: Create test design documents and test reports
Java Programming and Unified Modelling Language Lab MCAL302	**CO1:** Develop a simple software application using the object oriented approach.
	CO2: Design and develop a Java Web Applications.
	CO3: Apply UML tools for object oriented software modeling.
Mini Project MCAPR 301	**CO1:** Design, implement and evaluate a mini-project
	CO2: Gain project management skills.
	CO3: Work effectively in small groups on medium scale computing projects
	CO4: Demonstrate the ability to produce a technical document
SEMESTER IV	
Data Mining and Business Intelligence MCA401	**CO1:** Use conceptualization of BI techniques
	CO2: Apply data warehouse concepts for data analysis and report generation
	CO3: Develop industry level data mining skills using software tools
	CO4: Make use of relevant theories, concepts and techniques to solve real-world BI problems
Advanced Web Technology MCA402	**CO1:** Create UI applications using C#
	CO2: Design and develop secure web applications using asp.net according to industry standards
	CO3: Define and create custom web services

Computer Graphics MCA403	**CO1:** Demonstrate the algorithms to implement output primitives of Computer Graphics.
	CO2: Apply 2 D transformation techniques.
	CO3: Analyze 3 D transformation techniques.
	CO4: Apply image processing techniques.
Elective 1 Enterprise Resource Planning MCA4043	**CO1:** Conceptualize the basic structure of ERP
	CO2: Identify implementation strategy used for ERP
	CO3: Apply design principles for various business module in ERP
	CO4: Apply different emerging technologies for implementation of ERP
Elective 2 AI and Soft Computing MCA4054	**CO1:** Understand various AI concepts
	CO2: Solve the problems using neural networks techniques.
	CO3: Apply fuzzy logic techniques to find solution of uncertain problems.
	CO4: Analyze the genetic algorithms and their applications
Advanced Web Technology and Data Mining and Business Intelligence MCAL401	**CO1:** Develop Windows forms applications and Web Applications using Dot NET Technologies
	CO2: Apply Data warehousing and mining techniques.
	CO3: Design and implement web enabled BI application for industry.
Computer Graphics and Image Processing MCAL402	**CO1:** Implement the algorithms to draw output primitives of Computer Graphics
	CO2: Implement 2D transformations
	CO3: Implement 3D transformations
	CO4: Implement various image processing techniques.
Soft Skill Development MCAL403 Activity Lab	**CO1:** Develop skills in communication, business correspondence, presentations, group discussions and interviews
	CO2: Apply valuable strategies and interpersonal skills thereby making themselves more productive and better capable to lead others
	CO3: Understand the importance of teamwork and learn to perform to the best of their ability, both individually and as team players
SEMESTER V	
Wireless and Mobile Technology MCA501	**CO1:** Understand the concept of cellular communications, advantages and its limitations
	CO2: Compare the various wireless technologies and its applications

	CO3: Apply the appropriate technology in the applications
Advanced Distributed Computing MCA502	**CO1:** Distinguish between distributed computing and parallel computing
	CO2: Understand concepts of SOA.
	CO3: Demonstrate different cloud technologies
	CO4: Designing security and storage in cloud technologies.
User Experience Design MCA503	**CO1:** Understand and create interest in User Experience Design(UXD)
	CO2: Analyze the framework and methodological approach for user experience design
	CO3: Apply prototyping and problems solving techniques related to user experience design
	CO4: Design real life application with end-to-end understanding of User experience practices.
Multimedia System Design MCADLE5044	**CO1:** Perceive multimedia architecture and its latest applications
	CO2: Implement compression, decompression techniques and different formats for image, audio and video.
	CO3: P an and develop multimedia projects
Research Methodology MCAILE5052	**CO1:** Prepare a preliminary research design for projects in their subject matter areas
	CO2: Accurately collect, analyze and report data
	CO3: Present complex data or situations clearly
	CO4: Review and analyze research findings Get the knowledge of objectives and types of research
Mobile Application and User Experience Design Lab MCAL501	**CO1:** Demonstrate Android activities life cycle
	CO2: Apply proficiency in coding on a mobile programming platform.
	CO3: Design and develop innovative android applications
	CO4: Create real life application with end-to-end understanding of User experience practices.
Open Source System	**CO1:** Design and Develop the solution to a problem using java concepts

for ADC Lab MCAL502	
	CO2: Demonstrate use of java Concepts
	CO3: Explore various advanced distributed concepts.
Mini Project MCAPR501	**CO1:** Design, implement and evaluate a project.
	CO2: Gain project management skills.
	CO3: Work effectively and ethically in a team towards project development
	CO4: Demonstrate the ability to produce a technical document.
SEMESTER VI	
Internship – Project MCAPR601	**CO1:** Attain an exposure to real life organizational and environmental situations
	CO2: Attain technical skills as per the requirements of the domain
	CO3: Adapt professional and interpersonal ethics.
	CO4: Articulate SDLC phases in developing software project and in writing the project document.
Seminar – Research Paper MCA 602	**CO1:** Write a research paper.
	CO2: Present data coherently and effectively, outcome and counter-hypothesis
	CO3: Attain experience in preparation of research materials for publication or presentation.