Lakshmi Narain College of Technology (MCA), Bhopal

COURSE OUTCOMES	
MCA-101 Programming in C and Data Structure	
CO-101.1	Enhance skills on problem solving and C Programming basics.
CO-101.2	Assess suitability of programming concepts in C like Arrays, functions, Dynamic memory allocation, file handling for solving specific problems.
CO-101.3	Illustrate the underlying principles, theories and applications of data structures.
CO-101.4	Evaluate the efficiency and performance of different linked list structures, such as singly linked list circular linked list, doubly linked lists in terms of specific operations.
CO-101.5	Illustrate primitive operations on different types of trees and their applications.
MCA-102 Statistical Mathematics	
CO-102.1	Illustrate mathematical concepts of matrix and problem solving of simultaneous equations
CO-102.2	Illustrate limit, continuity, partial derivatives, maxima and minima of functions
CO-102.3	Analyze the behavior of the hypothesis test on different data sample space
CO-102.4	Examine mathematical concepts of probability and probability distribution on various data
CO-102.5	Analyze the properties and characteristics of graphs, trees, and other discrete structures.
MCA-103 Operating System and Architecture	
CO-103.1	Design simple processing unit using the concepts of ALU and control logic.
CO-103.2	Analyze the functioning of various operating systems, concepts of process and their scheduling algorithms.
CO-103.3	Analyze different memory management schemes.
CO-103.4	Evaluate mutual exclusion, synchronization, deadlock, starvation and analysis of concurrency.
CO-103.5	Analyze different techniques for managing I/O system, Disk and File system.
MCA-104 Information Technology	
CO-104.1	Explain the fundamental concepts of modern communication technologies, GIS, and their applications.
CO-104.2	Analyze information security concepts, cryptographic techniques, and mobile commerce applications.
CO-104.3	Apply artificial intelligence concepts and techniques, including machine learning, neural networks, and expert systems.
CO-104.4	Develop IoT-based applications, virtual reality solutions, and embedded system applications for industry and society.
CO-104.5	Evaluate distributed and cloud computing models, service architectures, and deployment strategies.
MCA-105 Communication Skills	
CO-105.1	Illustrate the concept of listening
CO-105.2	Develop the writing skills of reports and paragraphs
CO-105.3	Appraise modes of Communication
CO-105.4	Enhance decision and group dynamic skills
CO-105.5	Assess Interview styles
	MCA-106 C and DS Lab

CO-106.1	Create programs using concepts like control statements, arrays, structures, functions and pointers.
CO-106.2	Solve real time problem using file handling techniques.
CO-106.3	Develop program using linear and non-linear data structure for solving problem.
CO-106.4	Compare efficiency of various data structure for solving a particular problem.
CO-106.5	Select combination of data structure for problem solving.
	MCA-107 Operating System Lab
CO-107.1	Demonstrate programs using different types of process scheduling algorithms.
CO-107.2	Identify the performance of various page replacement algorithms.
CO-107.3	Simulate Banker's algorithm for deadlock avoidance.
CO-107.4	Simulate producer-consumer problem using semaphores
CO-107.5	Implement the different input output and file management schemes.
MCA-201 DBMS	
CO-201.1	Outline the basic concepts and terminology of Database Management System using the applications of ER model
CO-201.2	Design the database applications using Relational Algebra & SQL
CO-201.3	Demonstrate the database Schema, Data Modeling and Normalization Process.
CO-201.4	Identify the issues of transaction processing and concurrency control.
CO-201.5	Explore the basic concepts of emerging fields and storage structure in Database Management System
. **MCA-202 Computer Networks**	
CO-202.1	Analyze various communication models, transmission media and application layer protocols.
CO-202.2	Evaluate different error detection correction algorithms and flow control methods.
CO-202.3	Analyze various LAN technologies and networking device.
CO-202.4	Evaluate routing algorithms and TCP/IP model and protocol suit.
CO-202.5	Illustrate wireless broadband networks technology, platforms and standards.
MCA-203 Software Engineering and UML	
CO-203.1	Explain software engineering paradigms, software development models, and requirement engineering techniques.
CO-203.2	Analyze software design principles, modularity, cohesion, coupling, and data flow-oriented design.
CO-203.3	Apply software metrics, software quality assurance techniques, and risk management principles.
CO-203.4	Develop software testing strategies, maintenance methodologies, and regression testing techniques.
CO-203.5	Design UML-based software models, including use case diagrams, class diagrams, and state diagrams.
MCA-204 Algorithm Design	
CO-204.1	Specify operations and applications of linear data structures like stacks, queues, linked lists and their types.
CO-204.2	Summarize tree, its types, tree algorithms, sorting, searching and

	hashing techniques.
CO-204.3	Illustrate graph traversal algorithms and its applications.
CO-204.4	Analyse various Algorithm design techniques for solving problems
CO-204.5	Infer basic computational concepts and the complexity classes P, NP, and NP-Complete.
MCA-205 Object Oriented Programming with JAVA	
CO-205.1	Implement Object Oriented Programming concepts in Java.
CO-205.2	Illustrate the concepts of Exception handling and Applets to develop efficient and error free codes.
CO-205.3	Develop database application using JDBC.
CO-205.4	Develop GUI in Java using AWT and Swings
CO-205.5	Design static and dynamic web pages using HTML, XML and JSP technology.
MCA 206 Java and OOPS lab	
CO-206.1	Implement concepts of OOPs using Java.
CO-206.2	Implement Threads, Exception Handling in Java.
CO-206.3	Create database application with JDBC
CO-206.4	Implement AWT fundamentals and swings in Java.
CO-206.5	Develop E-commerce website using JSP and Servlets.
MCA 207 DBMS lab	
CO-207.1	Create Databases, tables and query a database using SQL DML/DDL commands.
CO-207.2	Demonstrate the use of constraints, set operators, join and grouping
CO-207.3	Develop PL/SQL programs using control statements and loops.
CO-207.4	Create query using SQL commands as solution to a broad range of query and data update problems.
CO-207.5	Create procedure, trigger and cursor for a given problem.
MCA-301 Data Mining	
CO-301.1	Brief data mining concepts, methods and techniques
CO-301.2	Discuss Data Warehouse and OLAP Technology
CO-301.3	Describe Data Preprocessing and Data Mining Primitives
CO-301.4	Generate Association Rules for specific real life problems.
CO-301.5	Apply classification, prediction methods and clustering techniques on certain domains.
MCA-302 Artificial Intelligence	
CO-302.1	Interpret Artificial Intelligence techniques to be applied on problems of different AI domains
CO-302.2	Analyze and implement heuristic search techniques for a given AI domain problem.
CO-302.3	Deduce new statement given the information for a particular database using FOPL
CO-302.4	Design and present the feasible solution for game playing and planning
CO-302.5	Design and implement expert systems using learning techniques to solve real life problems.
MCA-303 E-I (1) Python	
CO-303[E-I(1)].1	Outline the fundamentals of Python programming language
CO-303[E-I(1)].2	Create Python programs with conditionals and loops
CO-303[E-I(1)].3	Analyze the core data structures like lists, dictionaries and tuples in

	Python to store, process and sort the data
CO-303[E-I(1)].4	Develop applications using Object-Oriented Programming concepts such as encapsulation, inheritance and polymorphism
CO-303[E-I(1)].5	Design programs using file operations and exceptions handling
MCA-303 E-I (3) Introduction to Data Science and Big Data	
CO-303[E-I(3)].1	Illustrate the basics in data science in terms and proficiency with statistical analysis of data.
CO-303[E-I(3)].2	Analyze the use of R for Big Data analytics, computing theory, mathematical and statistical models
CO-303[E-I(3)].3	Demonstrate Machine Learning Techniques using R and Distributed Database (sql, mongo db)
CO-303[E-I(3)].4	Enhance the knowledge of recent research trends related to Hadoop File System and Hadoop Eco System, MapReduce and Google File System
CO-303[E-I(3)].5	Outline Stream Data Model and Architecture
MCA-304 E-II (2) Soft Computing	
CO-304[E-II(2)].1	Describe the importance of different Soft Computing techniques and their use to solve real life problems
CO-304[E-II(2)].2	Discuss the artificial neural network based mathematical model base of soft computing techniques and its application
CO-304[E-II(2)].3	Demonstrate soft computing techniques like neural networks and computational mapping to solve the problems
CO-304[E-II(2)].4	Illustrate various algorithms under Fuzzy Logic and neural networks
CO-304[E-II(2)].5	Analysis of Convergence Genetic Algorithm and its applications.
MCA-304 E-II (3) Internet of Things	
CO-304[E-II(3)].1	Describe the fundamentals of IoT, including architecture, characteristics, and applications.
CO-304[E-II(3)].2	Analyze IoT communication protocols, including web and message communication techniques.
CO-304[E-II(3)].3	Apply sensor technologies, RFID, and wireless sensor networks in IoT-based systems.
CO-304[E-II(3)].4	Develop IoT-based applications using appropriate design methodologies, ensuring security and privacy.
CO-304[E-II(3)].5	Evaluate real-world IoT case studies and propose solutions for smart systems like smart cities.
MCA-305 E-III (2) Advanced Databases	
CO-305[E-III(2)].1	Analyze the background processes involved in queries and transactions, assess and apply database query optimization.
CO-305[E-III(2)].2	Demonstrate the essential concepts of DBMS such as: database security, integrity, concurrency, distributed database and Client/Server (Database Server)
CO-305[E-III(2)].3	Illustrate the concepts of transaction processing for safe and secure transactions in different scenarios
CO-305[E-III(2)].4	Select data manipulation language to query, update, and manage a database
CO-305[E-III(2)].5	Assess the concepts of physical and logical database designs, database modeling, relational, hierarchical, network models and Data Structures for real world problems
MCA-305 E-III (3) Distributed Systems	
CO-305[E-III(3)].1	Describe the goals, architecture, and communication mechanisms of

	distributed systems.
CO-305[E-III(3)].2	Analyze process synchronization, distributed transactions, and mutual exclusion techniques.
CO-305[E-III(3)].3	Apply consistency models, fault tolerance strategies, and security mechanisms in distributed systems.
CO-305[E-III(3)].4	Develop distributed file systems and distributed object-based systems using appropriate frameworks.
CO-305[E-III(3)].5	Evaluate distributed shared memory, coordination models, and real-world implementations like Java RMI and CORBA.
MCA-306 Minor Project	
CO-306.1	Identify and formulate the problem and prepare the proposed solutions.
CO-306.2	Analyze and design the feasible solution.
CO-306.3	Create modules and databases for the proposed solution.
CO-306.4	Implement and test the solution on various parameters.
CO-306.5	Deploy and analyze the project wrt society and environment.
MCA-307 Elective-1 Lab	
CO-307.1	Implement expressions, variables and basic Math operations.
CO-307.2	Implement programs using Control Statements and Functions.
CO-307.3	Demonstrate Lists, Tuples, Strings and Dictionaries.
CO-307.4	Implement object- oriented programming techniques.
CO-307.5	Execute programs using file handling and Exception Handling.
MCA-401 E-IV (1) Advanced Python	
CO-401[E-IV(1)].1	Create, run and manipulate Python Programs Using Lists, Dictionaries and Tuples.
CO-401[E-IV(1)].2	Analyze the concepts of Object-Oriented Programming as used in Python.
CO-401[E-IV(1)].3	Develop Robust code with Error Handling Technique.
CO-401[E-IV(1)].4	Create Database and GUI Applications.
CO-401[E-IV(1)].5	Resolve the Machine Learning Concept from Python's inbuilt library.
MCA-402 E-V (2) Cloud Computing Technologies	
CO-402[E-V(2)].1	Analyze cloud computing fundamentals, evolution, business models, and security architecture
CO-402[E-V(2)].2	Select different cloud models for implementing solutions
CO-402[E-V(2)].3	Outline different types of cloud services and providers for developing cloud-based solutions
CO-402[E-V(2)].4	Evaluate virtualization tools and mechanisms for implementing virtualization in a data center environment
CO-402[E-V(2)].5	Evaluate security architectures and mechanisms for implementing security solutions in different types of cloud environments.
MCA-403 E-VI (1) Information Security	
CO-403[E-VI(1)].1	Describe the fundamentals of information security, security models, and system development life cycle in security.
CO-403[E-VI(1)].2	Analyze security threats, attacks, legal and ethical issues, and access control mechanisms.
CO-403[E-VI(1)].3	Apply risk management techniques, access control mechanisms, and information flow security policies.
CO-403[E-VI(1)].4	Develop security policies, security architecture, and continuity planning models.
CO-403[E-VI(1)].5	Evaluate cryptographic techniques, intrusion detection systems

	(IDS), and security technologies.
MCA-403 E-VI (3) Mobile Computing	
CO-403[E-VI(3)].1	Explain wireless Communication computing system networks area, protocols and its applications in communication system
CO-403[E-VI(3)].2	Outline telecommunication systems technologies in terms of Global System for Mobile Communication hardware, software, and architecture
CO-403[E-VI(3)].3	Demonstrate basic skills for protocol, Standards & Architecture
CO-403[E-VI(3)].4	Demonstrate the Mobile Adhoc networks concepts and its routing protocol
CO-403[E-VI(3)].5	Select mobile operating systems in developing mobile applications
MCA-404 Major Project	
CO-404.1	Identify and formulate the problem using the standard tools of software development process and prepare the proposed solutions.
CO-404.2	Analyze and design the feasible solution using the appropriate model.
CO-404.3	Create modules and databases for the proposed solution.
CO-404.4	Implement and test the solution on various parameters.
CO-404.5	Deploy and analyze the project wrt society and environment.
MCA-405 Lab of Elective-IV, V, VI	
CO-405.1	Develop Python Application with database
CO-405.2	Implement Machine Learning algorithms using Python
CO-405.3	Simulate cellular networks design techniques
CO-405.4	Implement the virtualization in cloud computing
CO-405.5	Implement security mechanism in cloud computing