



AVANTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

(Approved by A.I.C.T.E., New Delhi & Permanently Affiliated to JNTU-GV, Vizianagaram)

NAAC “A+” Accredited Institute

Cherukupally (Village), Near Tagarapuvalasa Bridge, Vizianagaram (Dist), AP, Pin-531162.

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R20 I SEMESTER

MCA1101-Business Communication

S. No.	CO No.	Course Outcome
1	MCA1101.1	Understand the fundamentals of Communication Process, Listening Skills, Personality Development.
2	MCA1101.2	Analyze Organizational, Interpersonal & Intrapersonal Communication.
3	MCA1101.3	Apply appropriate verbal and Non-verbal Communication, Body Language, Business Etiquette.
4	MCA1101.4	Develop effective Written Communication, Reports, Business Letters, Resume Writing.
5	MCA1101.5	Demonstrate Presentation Skills, Group Discussion, Interview Techniques.

MCA1102- Mathematical and Statistical Foundations

S. No.	CO No.	Course Outcome
1	MCA1102.1	Apply probability distributions and Bayes' theorem to compute expectations and solve computing problems.
2	MCA1102.2	Analyze sample distributions, parameters, and maximum likelihood estimation based on statistical inference.
3	MCA1102.3	Formulate and test statistical hypotheses using large/small sample tests and Chi-Square goodness of fit.
4	MCA1102.4	Apply algebraic systems, modular arithmetic, and number theory fundamentals to computational systems.
5	MCA1102.5	Utilize graph theory, spanning trees, and matrix representations to model network routing problems.

MCA1103- Computer Organization & Operating Systems

S. No.	CO No.	Course Outcome
1	MCA1103.1	Understand basic computer organization, instruction formats, addressing modes, and CPU control design.
2	MCA1103.2	Analyze processor organization, register transfers, micro-operations, and memory hierarchy operations.
3	MCA1103.3	Examine operating system structures, system calls, process state management, and CPU scheduling algorithms.
4	MCA1103.4	Solve process synchronization issues, semaphores, monitors, and deadlock detection/prevention strategies.
5	MCA1103.5	Evaluate memory management (paging/segmentation), virtual memory replacement policies, and file systems.

MCA1104- Data Structures

S. No.	CO No.	Course Outcome
1	MCA1104.1	Apply C programming constructs, functions, pointers, and file operations to solve problems.
2	MCA1104.2	Analyze asymptotic complexity and implement linear data structures using linked lists.
3	MCA1104.3	Design and evaluate stack and queue structures for computational applications.



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4	MCA1104.4	Apply hashing techniques and collision resolution methods for efficient storage retrieval.
5	MCA1104.5	Implement and analyze non-linear search trees, tree traversals, and sorting algorithms.

MCA1105- Object Oriented Programming with JAVA-

S. No.	CO No.	Course Outcome
1	MCA1105.1	Understand object-oriented concepts, class hierarchies, constructors, and core Java syntax.
2	MCA1105.2	Apply inheritance, runtime polymorphism, abstract classes, interfaces, and packages.
3	MCA1105.3	Implement structured exception handling routines and multithreaded synchronization applications.
4	MCA1105.4	Design event-driven graphical interfaces using AWT components and event delegation models.
5	MCA1105.5	Construct rich user-interface desktop applications using Java Swing components and MVC patterns.

MCA1106- Operating Systems and Linux Lab

S. No.	CO No.	Course Outcome
1	MCA1106.1	Execute Linux utility commands, shell scripts, and process control system calls (fork, exec).
2	MCA1106.2	Simulate CPU scheduling, memory allocation strategies, and Banker's deadlock avoidance.
3	MCA1106.3	Implement page replacement algorithms, file allocation methods, and text parsing scripts.

MCA1107- Data Structures Lab

S. No.	CO No.	Course Outcome
1	MCA1107.1	Implement and debug modular C programs using pointers, recursion, matrices, and text files.
2	MCA1107.2	Construct operations on linear data structures including linked lists, stacks, and queues.
3	MCA1107.3	Develop tree traversals, search algorithms, collision-free hashing, and sorting routines.

MCA1108- JAVA Programming Lab

S. No.	CO No.	Course Outcome
1	MCA1108.1	Apply core OOP concepts, polymorphism, class packaging, and file I/O operations in Java.
2	MCA1108.2	Implement multithreaded synchronization workflows and custom user-defined exception handlers.
3	MCA1108.3	Develop interactive GUI applications with event listeners using Java AWT and Swing frameworks.

MCA1109- Socially Relevant Project using Design Thinking

S. No.	CO No.	Course Outcome
1	MCA1109.1	Identify societal and community problems by conducting user empathy interviews and field studies.



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2	MCA1109.2	Ideate and engineer human-centered prototypes addressing technical or environmental challenges.
3	MCA1109.3	Test and iterate physical/digital solutions based on peer feedback, compiling formal project reports.

R20 II SEMESTER

MCA2101 -Database Management Systems

S. No.	CO No.	Course Outcome
1	MCA2101.1	Understand database architectures, data models, schema instances, and data independence.
2	MCA2101.2	Apply ER modeling and relational integrity constraints to design logical schemas.
3	MCA2101.3	Formulate queries using relational algebra and structured query language (SQL).
4	MCA2101.4	Design relational schemas using normalization principles (1NF to 5NF, BCNF).
5	MCA2101.5	Evaluate ACID properties, concurrency control mechanisms, and database recovery protocols.

MCA2102- Computer Networks

S. No.	CO No.	Course Outcome
1	MCA2102.1	Understand network architectures, OSI and TCP/IP layered reference models, and physical media.
2	MCA2102.2	Analyze data link layer framing, error control codes, flow control, and sliding window protocols.
3	MCA2102.3	Examine MAC sublayer protocols, CSMA, Ethernet standards, and IEEE 802.11 Wireless LANs.
4	MCA2102.4	Evaluate routing algorithms, congestion control techniques, IPv4/IPv6 addressing, and subnets.
5	MCA2102.5	Analyze transport layer services (TCP/UDP) and application protocols (HTTP, FTP, DNS).

MCA2103 Software Engineering and Design Patterns

S. No.	CO No.	Course Outcome
1	MCA2103.1	Understand software life cycle models including Waterfall, Iterative, and Agile/Scrum.
2	MCA2103.2	Prepare Software Requirements Specifications (SRS), use-case models, and effort estimations.
3	MCA2103.3	Analyze software architecture views, component-connector styles, and testing techniques.
4	MCA2103.4	Apply Creational design patterns (Abstract Factory, Builder, Factory Method, Singleton).
5	MCA2103.5	Evaluate Structural and Behavioral design patterns to produce modular object-oriented software.

MCA2104 Data Warehousing and Mining

S. No.	CO No.	Course Outcome
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1	MCA2104.1	Understand data warehouse architecture, OLAP operations, and data preprocessing techniques.
2	MCA2104.2	Apply classification algorithms (Decision Trees, Naive Bayes, k-NN, SVM) and evaluate models.
3	MCA2104.3	Analyze association rule mining using Apriori and FP-Growth algorithms on large datasets.
4	MCA2104.4	Evaluate clustering algorithms (K-means, Hierarchical, DBSCAN) using cluster validity metrics.
5	MCA2104.5	Examine Web mining techniques (content, structure, usage) and search engine architectures.

MCA2105 Elective-I: No SQL Databases

S. No.	CO No.	Course Outcome
1	MCA2105.1	Understand architectural models of NoSQL stores: Key-Value, Document, Columnar, and Graph.
2	MCA2105.2	Perform CRUD operations and query data across NoSQL databases using language bindings.
3	MCA2105.3	Analyze internal storage architectures, distributed tables (HBase), and key-value stores (Redis).
4	MCA2105.4	Apply NoSQL data modeling using atomic aggregates and denormalization to optimize queries.
5	MCA2105.5	Evaluate indexing, ordering, and data partitioning mechanisms in MongoDB and Cassandra.

MCA2105 Elective-I: Design and Analysis of Algorithms

S. No.	CO No.	Course Outcome
1	MCA2105.1	Analyze algorithm complexity using asymptotic notations (Big-O, Omega, Theta) and disjoint sets.
2	MCA2105.2	Apply Divide and Conquer strategies to binary search, sorting algorithms, and matrix multiplication.
3	MCA2105.3	Design Greedy algorithms for job sequencing, knapsack problems, spanning trees, and shortest paths.
4	MCA2105.4	Solve optimization problems using Dynamic Programming (Matrix Chain, OBST, 0/1 Knapsack, TSP).
5	MCA2105.5	Evaluate Backtracking and Branch & Bound methods, and examine NP-Completeness and Cook's theorem.

MCA2106 DBMS Lab

S. No.	CO No.	Course Outcome
1	MCA2106.1	Execute SQL DDL, DML, DCL commands, complex queries, built-in functions, and views.
2	MCA2106.2	Develop PL/SQL programs utilizing control structures, cursor manipulation, and exception handling.
3	MCA2106.3	Design stored procedures, functions, packages, and database triggers for business transactions.

MCA2107 Computer Networks Lab

S. No.	CO No.	Course Outcome
1	MCA2107.1	Implement framing techniques (bit/character stuffing) and error-detecting CRC polynomials.
2	MCA2107.2	Implement Dijkstra's shortest path routing, distance vector routing, and broadcast tree simulations.



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3	MCA2107.3	Develop client-server socket programs using TCP and UDP, and implement IPC mechanisms.
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MCA2107 Computer Networks Lab

S. No.	CO No.	Course Outcome
1	MCA2107.1	Implement framing techniques (bit/character stuffing) and error-detecting CRC polynomials.
2	MCA2107.2	Implement Dijkstra's shortest path routing, distance vector routing, and broadcast tree simulations.
3	MCA2107.3	Develop client-server socket programs using TCP and UDP, and implement IPC mechanisms.

MCA2108 Software Engineering and Design Patterns Lab

S. No.	CO No.	Course Outcome
1	MCA2108.1	Prepare SRS documents, COCOMO/FP effort estimation, RMMM risk plans, and PERT/CPM schedules.
2	MCA2108.2	Model systems using ER diagrams, DFDs, structured charts, and design functional test suites.
3	MCA2108.3	Implement Creational, Structural, and Behavioral design patterns using UML and Java.

MCA2109 Employability Skills

S. No.	CO No.	Course Outcome
1	MCA2109.1	Demonstrate self-awareness, positive mindset, time management, grooming, and adaptability.
2	MCA2109.2	Apply ethical decision-making, conflict resolution, stress management, and workplace leadership.
3	MCA2109.3	Deliver professional presentations, participate in group discussions, and excel in interview dynamics.

R20 III SEMESTER

MCA3101 Machine Learning with Python

S. No.	CO No.	Course Outcome
1	MCA3101.1	Understand machine learning terminology, pipelines, and basic Python libraries (NumPy, SciPy, Matplotlib, Scikit-learn).
2	MCA3101.2	Implement supervised learning algorithms including regression models, Naive Bayes, decision trees, and SVMs.
3	MCA3101.3	Apply dataset preparation, missing data handling, feature scaling, and dimensionality reduction via PCA and LDA.
4	MCA3101.4	Evaluate model performance using cross-validation, hyperparameter tuning with grid search, and ensemble learning methods.
5	MCA3101.5	Analyze text data using bag-of-words models, TF-IDF transformations, and sentiment classification workflows.



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MCA3102 Internet of Things

S. No.	CO No.	Course Outcome
1	MCA3102.1	Understand IoT architectures, connected device fundamentals, and application protocols (HTTP, HTTPS, FTP, Telnet).
2	MCA3102.2	Analyze IoT/M2M system standardizations, modified OSI stacks, ETSI domains, and gateway management.
3	MCA3102.3	Apply web connectivity and message communication protocols designed for smart connected devices.
4	MCA3102.4	Analyze IoT/M2M data acquisition, storage pipelines, stream analytics, and enterprise system integrations.
5	MCA3102.5	Evaluate cloud platforms (Xively, Nimbits), sensor networks, RFID implementations, and smart actuation systems.

MCA3103 Web Technologies

S. No.	CO No.	Course Outcome
1	MCA3103.1	Design structured, responsive web pages using HTML5 markup, multimedia elements, tables, forms, and CSS.
2	MCA3103.2	Implement client-side scripting, event handling, DOM manipulation, and input form validations using JavaScript.
3	MCA3103.3	Parse and manipulate semi-structured data using XML schemas, DTD specifications, and DOM/SAX Java parsers.
4	MCA3103.4	Develop enterprise web components using Java Servlets, JSP pages, session tracking, and database connectivity via JDBC.
5	MCA3103.5	Build dynamic server-side applications using PHP scripting, form handling, cookies/sessions, file I/O, and MySQL queries.

MCA3104 Cryptography and Network Security

S. No.	CO No.	Course Outcome
1	MCA3104.1	Understand cryptographic mathematical foundations, security services, threats, and symmetric ciphers (DES, AES).
2	MCA3104.2	Apply asymmetric algorithms including RSA, ElGamal, Rabin, and Elliptic Curve cryptosystems based on number theory.
3	MCA3104.3	Design cryptographic hash functions (SHA-256, SHA-3) and digital signature schemes (ElGamal, Schnorr, DSA).
4	MCA3104.4	Evaluate key distribution architectures, X.509 public-key certificates, and remote authentication protocols (Kerberos).
5	MCA3104.5	Assess network security standards including S/MIME, IPsec encapsulations (ESP/AH), and Internet Key Exchange (IKE).

MCA3105 Elective-II: Soft Computing

S. No.	CO No.	Course Outcome
1	MCA3105.1	Understand fuzzy sets, membership functions, fuzzy relations, and fuzzy inference systems (Mamdani, Sugeno).



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2	MCA3105.2	Apply derivative-based descent methods and derivative-free heuristics (Genetic Algorithms, Simulated Annealing).
3	MCA3105.3	Implement artificial neural networks, single-layer perceptrons, and backpropagation feedforward architectures.
4	MCA3105.4	Analyze adaptive neuro-fuzzy inference systems (ANFIS), coactive modeling, and hybrid learning algorithms.
5	MCA3105.5	Apply computational intelligence models to solve pattern recognition, inverse kinematics, and engineering predictions.

MCA3105 Elective-II: Software Project Management

S. No.	CO No.	Course Outcome
1	MCA3105.1	Understand conventional management drawbacks, software economics, and modern iterative engineering principles.
2	MCA3105.2	Analyze project life-cycle phases (Inception, Elaboration, Construction, Transition) and management artifacts.
3	MCA3105.3	Formulate iterative workflows, work breakdown structures (WBS), effort/cost estimates, and milestone checkpoints.
4	MCA3105.4	Apply software process instrumentation, the seven core metrics, quality indicators, and metric automation tools.
5	MCA3105.5	Evaluate Agile Scrum adaptation patterns, DevOps delivery pipelines, tool stacks, and orchestration strategies.

MCA3105 Elective-II: Cloud Computing

S. No.	CO No.	Course Outcome
1	MCA3105.1	Understand system models for distributed/cloud computing, performance dimensions, and cloud delivery models.
2	MCA3105.2	Analyze hardware virtualization structures, CPU/memory/IO virtualization, and data-center automation mechanisms.
3	MCA3105.3	Evaluate compute/storage cloud architectures, inter-cloud resource management, SOA, and message-oriented middleware.
4	MCA3105.4	Implement parallel distributed programming (MapReduce), GAE, AWS/Azure platforms, and distributed storage (HDFS, S3).
5	MCA3105.5	Assess autonomic resource management policies, feedback-based task scheduling, dynamic thresholds, and SLA guarantees.

MCA3105 Elective-II: Optimization Techniques

S. No.	CO No.	Course Outcome
1	MCA3105.1	Formulate linear programming models and solve constrained optimization problems using graphical and simplex techniques.
2	MCA3105.2	Solve transportation, assignment, job sequencing, and traveling salesman routing optimization problems.
3	MCA3105.3	Analyze equipment replacement strategies and queuing system behaviors using Poisson arrival-departure processes.
4	MCA3105.4	Formulate deterministic and stochastic inventory control models with shortage allowances and price breakpoints.
5	MCA3105.5	Evaluate rectangular game theory saddle points, dynamic programming optimality, and project networks using



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PERT/CPM.

MCA3105 Elective-II: Cyber Security

S. No.	CO No.	Course Outcome
1	MCA3105.1	Understand cyber security concepts, CIA triad, threat taxonomies, attack types, and comprehensive security policies.
2	MCA3105.2	Examine Indian Cyberspace regulations, National Cyber Security Policy, digital forensics lifecycles, and evidence audits.
3	MCA3105.3	Analyze mobile and wireless computing threats, registry security settings, and organizational mobility control measures.
4	MCA3105.4	Assess organizational risks, social computing perils, IPR concerns, cyber terrorism, and hacker psychological motivations.
5	MCA3105.5	Formulate data privacy models, privacy specification languages, and defense strategies against data linking and profiling.

MCA3106 Machine Learning with Python Lab

S. No.	CO No.	Course Outcome
1	MCA3106.1	Implement structured data extraction, exploratory data analysis, transformation pipelines, and plotting using Pandas and Matplotlib.
2	MCA3106.2	Construct and validate supervised regression models, logistic regression, decision trees, k-NN, and Naive Bayes classifiers.
3	MCA3106.3	Design Bayesian networks, evaluate diagnostic datasets, and execute image dimensionality reduction via Principal Component Analysis.

MCA3107 IoT Lab

S. No.	CO No.	Course Outcome
1	MCA3107.1	Interface sensors (DHT11, LDR, IR) and actuators (LED, buzzer, relay, motors) with Arduino and Raspberry Pi boards.
2	MCA3107.2	Establish peripheral wireless communication using Bluetooth, OLED modules, and local MySQL logging on Raspberry Pi.
3	MCA3107.3	Implement MQTT publish/subscribe messaging, ThingSpeak cloud telemetry, and responsive TCP/UDP socket servers.

MCA3108 Web Technologies Lab

S. No.	CO No.	Course Outcome
1	MCA3108.1	Develop responsive website templates using HTML5/CSS and create client-side JavaScript form verification scripts.



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2	MCA3108.2	Build XML schemas for user data representation and implement server-side PHP data filtering, file I/O, and string operations.
3	MCA3108.3	Deploy full-stack MVC applications on Tomcat using Servlets, JSP, JavaBeans, session tracking, and database connectivity.

MCA3109 Internship / Industry Oriented Mini Project

S. No.	CO No.	Course Outcome
1	MCA3109.1	Identify engineering/societal problem statements, conduct industrial requirement analysis, and formulate specifications.
2	MCA3109.2	Design, build, and test software/hardware-software solutions using contemporary frameworks and engineering practices.
3	MCA3109.3	Validate project outputs, prepare standardized technical documentation, and defend project findings before an expert committee.

R20 IV SEMESTER

MCA4101

S. No.	CO No.	Course Outcome
1	MCA4101.1	Understand digital marketing fundamentals, SMART goals, HTML5 elements, and dynamic DOM manipulation.
2	MCA4101.2	Apply dynamic Cascading Style Sheets, XML parsing, and client-side JavaScript for marketing platforms.
3	MCA4101.3	Implement Search Engine Optimization (SEO) strategies, campaign planning, and paid search payment models.
4	MCA4101.4	Formulate Social Media Marketing (SMM) strategies, paid-owned-earned frameworks, and mobile marketing plans.
5	MCA4101.5	Evaluate email marketing campaigns, internet marketing conversion metrics, and content marketing reach.

MCA4101 Elective-III: Digital Marketing

S. No.	CO No.	Course Outcome
1	MCA4101.1	Understand principles of HRM, ethical aspects, HR policies, and strategic organizational alignment.
2	MCA4101.2	Apply HR planning forecasting techniques, job analysis, recruitment, selection, and training evaluation models.
3	MCA4101.3	Examine wage and salary administration, job evaluation techniques, and employee welfare mechanisms.
4	MCA4101.4	Evaluate modern performance appraisal systems, career development pathways, and global compensation models.
5	MCA4101.5	Analyze industrial relations, trade union structures, collective bargaining, and workplace safety protocols.

MCA4101 Elective-III: Human Resource Management



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S. No.	CO No.	Course Outcome
1	MCA4101.1	Understand linear algebra, numerical computation, gradient-based optimization, and deep network fundamentals.
2	MCA4101.2	Implement deep feedforward neural architectures, activation functions, and backpropagation learning.
3	MCA4101.3	Apply deep learning regularization techniques (dropout, norm penalties) and adaptive optimization algorithms.
4	MCA4101.4	Design Convolutional Neural Networks (CNNs) for structured feature extraction and image processing tasks.
5	MCA4101.5	Construct Recurrent Neural Networks (RNN), LSTMs, and sequence-to-sequence models for temporal data analysis.

MCA4101 Elective-III: Deep Learning

S. No.	CO No.	Course Outcome
1	MCA4101.1	Understand wireless communication fundamentals, radio propagation, MANETs, and WSN design challenges.
2	MCA4101.2	Analyze MAC layer protocols for ad-hoc wireless networks including contention and reservation schemes.
3	MCA4101.3	Evaluate proactive, reactive, and hybrid routing protocols along with transport layer issues over wireless links.
4	MCA4101.4	Examine sensor node architectures, data relaying, aggregation strategies, and IEEE 802.15.4 MAC standard.
5	MCA4101.5	Assess WSN localization, quality of service (QoS), energy-efficient routing, and ad-hoc security mechanisms.

MCA4102 Elective-IV: Network Programming

S. No.	CO No.	Course Outcome
1	MCA4102.1	Understand Unix networking standards, socket address structures, protocol usage, and standard internet services.
2	MCA4102.2	Implement elementary TCP socket client-server architectures, connection setups, and process termination handling.
3	MCA4102.3	Apply I/O multiplexing techniques using select and poll functions, socket state control, and socket options.
4	MCA4102.4	Develop UDP client-server applications and implement DNS name-to-address conversions with IPv6 support.
5	MCA4102.5	Evaluate Inter-Process Communication (IPC) mechanisms including pipes, FIFOs, message queues, and RPC.

MCA4102 Elective-IV: Block Chain Technologies

S. No.	CO No.	Course Outcome
1	MCA4102.1	Understand distributed consensus protocols, Byzantine agreement, Proof of Work (PoW), and Proof of Stake (PoS).
2	MCA4102.2	Apply cryptographic primitives including SHA hashing algorithms, digital signatures, and elliptic curve cryptography.
3	MCA4102.3	Analyze Bitcoin architecture, block validation rules, mining difficulty, transaction verify, and double-spending.
4	MCA4102.4	Develop smart contracts on Ethereum Virtual Machine (EVM) using Solidity, identifying common security flaws.
5	MCA4102.5	Evaluate Zero-Knowledge proofs (SNARKs), cryptocurrency economics, legal regulations, and emerging trends.



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MCA4102 Elective-IV: Software Testing Methodologies

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1	MCA4102.1	Understand software testing goals, STLC lifecycle, and verification versus validation quality processes.
2	MCA4102.2	Apply dynamic Black-Box testing (BVA, Equivalence Class) and White-Box logic path coverage techniques.
3	MCA4102.3	Conduct static testing inspections, technical walkthroughs, technical reviews, and regression testing cycles.
4	MCA4102.4	Analyze test suite minimization, prioritization methods, SQA metrics, and defect debugging processes.
5	MCA4102.5	Design automated test scripts using testing tools (Selenium, JUnit) for web, OO, and mobile software applications.

MCA4102 Elective-IV: Big Data Analytics

S. No.	CO No.	Course Outcome
1	MCA4102.1	Understand Big Data evolution, characteristics, HDFS distributed storage architecture, and MapReduce processing.
2	MCA4102.2	Formulate data analysis and transformation workflows using Hadoop ecosystem tools including Apache Pig and Hive.
3	MCA4102.3	Apply advanced analytical clustering (K-Means) and classification algorithms (Decision Trees, Naive Bayes) using R.
4	MCA4102.4	Implement real-time streaming data models and in-memory analytics using Apache Spark RDD operations.
5	MCA4102.5	Evaluate NoSQL database management systems and big data visualization techniques for enterprise solutions.

MCA4103 Project Work / Dissertation

S. No.	CO No.	Course Outcome
1	MCA4103.1	Formulate an engineering problem, conduct systematic literature review, and derive clear software requirements.
2	MCA4103.2	Design software architecture, implement functional code modules, and perform rigorous verification testing.
3	MCA4103.3	Author a comprehensive project thesis adhering to academic standards and defend findings before an expert panel.