DEPARTMENT OF MCA

PROGRAM STRUCTURE FOR MCA
(With effect from the academic year 2025-26)

MCA – I SEMESTER

Sl. No.	Paper	Title of the paper	Instruction Hrs per Week	No. of Credits	Duration of the Exam.	Internal Assessment	Semester End exam.	Total Marks
1	MCA101T	Computational Mathematics and Statistics	4	4	3 Hrs	30	70	100
2	MCA102T	Data Structures using Java	4	4	3 Hrs	30	70	100
3	MCA103T	Operating System Concepts and Design	4	4	3 Hrs	30	70	100
4	MCA104T	Advanced Database Management Systems	4	4	3 Hrs	30	70	100
5	MCA105T	Software Project Management	4	4	3 Hrs	30	70	100
6	MCA101E	Mobile Computing / Software Testing with Selenium	4	4	3 Hrs	30	70	100
7	MCA101P	Data Structures using Java Lab	4	2	3 Hrs	15	35	50
8	MCA102P	Database Management Systems Lab	4	2	3 Hrs	15	35	50
Total				**28**	**700**			

MCA – II SEMESTER

Sl. No.	Paper	Title of the paper	Instruction Hrs per Week	No. of Credits	Duration of the Exam.	Internal Assessment	Semester End exam.	Total Marks
1	MCA201T	Artificial Intelligence	4	4	3 Hrs	30	70	100
2	MCA202T	Advanced Algorithms	4	4	3 Hrs	30	70	100
3	MCA203T	Python Programming	4	4	3 Hrs	30	70	100
4	MCA204T	Computer Networks	4	4	3 Hrs	30	70	100
5	MCA205T	Cryptography & Information Security	4	4	3 Hrs	30	70	100
6	MCA201E	Automata Theory / Digital Image Processing	4	4	3 Hrs	30	70	100
7	MCA201P	Artificial Intelligence using Python Lab	4	2	3 Hrs	15	35	50
8	MCA202P	Advanced Algorithms using Java Lab	4	2	3 Hrs	15	35	50
Total				28	700			

ACHARYA INSTITUTE OF GRADUATE STUDIES

(NAAC Re-Accredited 'A+' Grade and Affiliated to Dr. Manmohan Singh, Bengaluru City University)

Soladevanahalli, Bengaluru-560107

DEPARTMENT OF MCA

PROGRAM STRUCTURE FOR MCA

(To be effective from the Academic Year 2018-2019)

MCA – I SEMESTER

Sl. No.	Paper Code	Title of the paper	Instruction Hrs per Week	No. of Credits	Duration of the Exam.	Internal Assessment	Semester End exam.	Total Marks
1	1MCA1	The Art of Programming	4	4	3 Hrs	30	70	100
2	1MCA2	Discrete Mathematics	4	4	3 Hrs	30	70	100
3	1MCA3	Computer Organization and Architecture	4	4	3 Hrs	30	70	100
4	1MCA4	Theory of Computation	4	4	3 Hrs	30	70	100
5	1MCA5	Object Oriented Programming	4	4	3 Hrs	30	70	100
6	1MCA6	Data Structures	4	4	3 Hrs	30	70	100
7	1MCA7	Data Structures Lab	8	2	3 Hrs	30	70	100
8	1MCA8	Object Oriented Lab	8	2	3 Hrs	30	70	100
Total				**28**	**800**			

MCA – II SEMESTER

Sl. No.	Paper Code	Title of the paper	Instruction Hrs per Week	No. of Credits	Duration of the Exam.	Internal Assessment	Semester End exam.	Total Marks
1	2MCA1	Operating Systems	4	4	3 Hrs	30	70	100
2	2MCA2	Database Management Systems	4	4	3 Hrs	30	70	100
3	2MCA3	Computer Networks	4	4	3 Hrs	30	70	100
4	2MCA4	Software Engineering	4	4	3 Hrs	30	70	100
5	2MCA5	The Design and Analysis of Algorithm	4	4	3 Hrs	30	70	100

6	2MCA6	Artificial Intelligence	4	4	3 Hrs	30	70	100
7	2MCA7	Database Management System Lab	8	2	3 Hrs	30	70	100
8	2MCA8	Unix Programming Lab	8	2	3 Hrs	30	70	100
Total				**28**	**800**			

MCA – III SEMESTER

Sl. No.	Paper	Title of the paper	Instruction Hrs per Week	No. of Credits	Duration of the Exam.	Internal Assessment	Semester End exam.	Total Marks
1	3MCA1	Open Elective	3	3	3 Hrs	30	70	100
2	3MCA2	Soft Core	3	3	3 Hrs	30	70	100
3	3MCA3	Research Methodology	4	4	3 Hrs	30	70	100
4	3MCA4	Elective I	4	4	3 Hrs	30	70	100
5	3MCA5	Elective II	4	4	3 Hrs	30	70	100
6	3MCA6	Elective III	4	4	3 Hrs	30	70	100
7	3MCA7	Mini Project	8	4	3 Hrs	30	70	100
Total				**26**	**700**			

MCA – IV SEMESTER

Sl. No.	Paper	Title of the paper	Instruction Hrs per Week	No. of Credits	Duration of the Exam.	Internal Assessment	Semester End exam.	Total Marks
1	4MCA1	Main Project	-	16	-	120	280	400
Total				**16**	**400**			

ACHARYA INSTITUTE OF GRADUATE STUDIES
(NAAC Re-Accredited 'A+' Grade and Affiliated to Dr. Manmohan Singh, Bengaluru City University)
Soladevanahalli, Bengaluru-560107

DEPARTMENT OF MCA

NAME OF THE PROGRAM: MASTER OF COMPUTER APPLICATIONS

COURSE OUTCOMES (CO'S)

MCA – I SEMESTER (2025-26)

Subject name: Computational Mathematics and Statistics - MCA101T

After the completion of the Course, the students will be able to:

- Understand propositions, logical connectives, truth tables, logical equivalence for simplification. Apply concepts of sets and their operations, explore role of functions as mathematical models in computer science
- Apply basic counting principles to solve problems, use of permutation & combination, learn binomial theorem concept and properties and apply them to computer science.
- Apply probability theorems, conditional probability and Bayes' rule, and analyze independent events.
- Analyze populations and samples using sampling distributions, frequency tables, and statistical measures such as mean, variance, and moments, and apply point/interval estimation, and maximum likelihood methods for statistical inference.

Subject name: Data Structures using Java - MCA102T

After the completion of the Course, the students will be able to:

- Demonstrate proficiency in Java programming fundamentals, including arrays, strings, control structures, and object-oriented programming constructs to solve computational problems.
- Apply advanced Java features such as inheritance, interfaces, exception handling, file handling, and Java Collections Framework to design modular and reusable programs.

- Implement and analyze linear data structures such as stacks, queues, and linked lists for solving real-world applications effectively.
- Apply advanced data structures such as trees, graphs, and efficient searching/sorting techniques to develop optimized algorithms for complex problem-solving.

Subject name: Operating System Concepts and Design - MCA103T

After the completion of the Course, the students will be able to:

- Analyze the fundamental principles and design goals of operating systems, including abstraction, modularity, and system architecture.
- Evaluate process management strategies, including scheduling algorithms, synchronization mechanisms, and deadlock handling techniques.
- Design and assess memory management systems, including paging, segmentation, virtual memory, and page replacement policies.
- Examine file system implementation, I/O management, storage management, and security mechanisms in modern operating systems.

Subject name: Advanced Database Management Systems - MCA104T

After the completion of the Course, the students will be able to:

- Understand DBMS architecture, data models (relational, ER, EER), and SQL for database design and querying.
- Apply normalization techniques, functional dependencies, and ER-to-relational mapping for efficient database design.
- Analyze transaction management, concurrency control, recovery mechanisms, and distributed database architectures.
- Explore advanced topics including NoSQL databases, data warehousing, OLAP, big data systems, and emerging database technologies.

Subject name: Software Project Management - MCA105T

After the completion of the Course, the students will be able to:

- Understand software project management fundamentals, including project lifecycle, planning, and estimation techniques.
- Apply project scheduling, resource allocation, risk management, and quality assurance practices.

- Evaluate different software development methodologies including Agile, Scrum, Waterfall, and DevOps practices.
- Demonstrate project monitoring, control, and team management skills for successful software project delivery.

MCA – II SEMESTER (2025-26)

Subject name: Artificial Intelligence - MCA201T

After the completion of the Course, the students will be able to:

- Understand fundamental concepts of AI, including intelligent agents, problem-solving, and search strategies.
- Apply knowledge representation techniques, logic, and reasoning methods for AI applications.
- Implement machine learning algorithms including supervised, unsupervised, and reinforcement learning.
- Explore advanced AI topics including neural networks, deep learning, natural language processing, and expert systems.

Subject name: Advanced Algorithms - MCA202T

After the completion of the Course, the students will be able to:

- Analyze algorithm complexity using asymptotic notation and evaluate algorithmic efficiency.
- Design and implement advanced algorithmic strategies including divide-and-conquer, dynamic programming, and greedy algorithms.
- Apply graph algorithms for solving real-world problems in networking, optimization, and data analysis.
- Evaluate advanced topics including approximation algorithms, randomized algorithms, and NP-completeness.

Subject name: Python Programming - MCA203T

After the completion of the Course, the students will be able to:

- Demonstrate proficiency in Python programming fundamentals, including data types, control structures, and functions.
- Apply object-oriented programming concepts in Python for modular and reusable code development.
- Utilize Python libraries for data manipulation, file handling, web development, and scientific computing.
- Develop applications using Python frameworks and implement data analysis and visualization techniques.

Subject name: Computer Networks - MCA204T

After the completion of the Course, the students will be able to:

- Understand network architecture, protocols, and the OSI and TCP/IP reference models.
- Analyze data link layer protocols, MAC protocols, and error detection/correction techniques.
- Evaluate network layer functions including routing algorithms, IP addressing, and internet protocols.
- Examine transport layer protocols, congestion control, and application layer services including HTTP, DNS, and email protocols.

Subject name: Cryptography & Information Security - MCA205T

After the completion of the Course, the students will be able to:

- Understand fundamental concepts of cryptography, including classical and modern encryption techniques.
- Apply symmetric and asymmetric cryptographic algorithms for secure communication.
- Analyze security protocols, digital signatures, authentication mechanisms, and key management systems.
- Evaluate network security, web security, and implement security measures for protecting information systems.

DEPARTMENT OF MCA

NAME OF THE PROGRAM: MASTER OF COMPUTER APPLICATIONS

COURSE OUTCOMES (CO'S)

MCA – I SEMESTER (2018-19)

Subject name: The Art of Programming - 1MCA1

After the completion of the Course, the students will be able to:

- Understand fundamental programming concepts, problem-solving techniques, and algorithm development.
- Apply structured programming principles using C programming language.
- Implement programs using arrays, strings, functions, pointers, and file handling.
- Develop modular and efficient programs for solving computational problems.

Subject name: Discrete Mathematics - 1MCA2

After the completion of the Course, the students will be able to:

- Apply mathematical logic, set theory, and proof techniques in computer science.
- Analyze relations, functions, and their applications in computing.
- Understand combinatorics, graph theory, and their applications in algorithm design.
- Apply discrete mathematical structures for solving computational problems.

Subject name: Computer Organization and Architecture - 1MCA3

After the completion of the Course, the students will be able to:

- Understand computer organization, instruction set architecture, and data representation.

- Analyze processor design, control unit implementation, and pipelining concepts.
- Evaluate memory hierarchy, cache organization, and virtual memory systems.
- Examine I/O organization, multiprocessors, and parallel computer architectures.

Subject name: Theory of Computation - 1MCA4

After the completion of the Course, the students will be able to:

- Understand finite automata, regular expressions, and regular languages.
- Apply context-free grammars, pushdown automata, and parsing techniques.
- Analyze Turing machines, computability, and decidability concepts.
- Evaluate computational complexity theory including P, NP, and NP-completeness.

Subject name: Object Oriented Programming - 1MCA5

After the completion of the Course, the students will be able to:

- Understand object-oriented programming concepts including encapsulation, inheritance, and polymorphism.
- Apply OOP principles using C++ programming language.
- Implement programs using classes, objects, constructors, destructors, and operator overloading.
- Design and develop applications using advanced OOP features including templates and exception handling.

Subject name: Data Structures - 1MCA6

After the completion of the Course, the students will be able to:

- Understand fundamental data structures including arrays, linked lists, stacks, and queues.
- Implement and analyze tree structures including binary trees, BST, and AVL trees.
- Apply graph data structures and algorithms for solving real-world problems.
- Evaluate searching and sorting algorithms for efficiency and performance optimization.

MCA – II SEMESTER (2018-19)

Subject name: Operating Systems - 2MCA1

After the completion of the Course, the students will be able to:

- Understand operating system concepts, structures, and process management.
- Apply CPU scheduling algorithms and synchronization mechanisms.
- Analyze memory management techniques including paging, segmentation, and virtual memory.
- Evaluate file systems, I/O management, and disk scheduling algorithms.

Subject name: Database Management Systems - 2MCA2

After the completion of the Course, the students will be able to:

- Understand DBMS architecture, data models, and relational database design.
- Apply SQL for database creation, manipulation, and querying.
- Implement normalization, transaction management, and concurrency control.
- Evaluate database security, recovery, and distributed database concepts.

Subject name: Computer Networks - 2MCA3

After the completion of the Course, the students will be able to:

- Understand network fundamentals, protocols, and OSI/TCP-IP models.
- Apply data link layer and network layer protocols for data transmission.
- Analyze routing algorithms, congestion control, and transport layer services.
- Evaluate application layer protocols and network security mechanisms.

Subject name: Software Engineering - 2MCA4

After the completion of the Course, the students will be able to:

- Understand software development life cycle and process models.
- Apply software requirement analysis and design principles.
- Implement software testing strategies and quality assurance practices.
- Evaluate software project management and maintenance techniques.

Subject name: The Design and Analysis of Algorithm - 2MCA5

After the completion of the Course, the students will be able to:

- Understand algorithm design paradigms and complexity analysis.
- Apply divide-and-conquer, dynamic programming, and greedy algorithmic strategies.
- Analyze graph algorithms and their applications in problem-solving.
- Evaluate advanced algorithmic techniques including backtracking and branch-and-bound.

Subject name: Artificial Intelligence - 2MCA6

After the completion of the Course, the students will be able to:

- Understand AI fundamentals, intelligent agents, and search strategies.
- Apply knowledge representation and reasoning techniques.
- Implement machine learning algorithms and expert systems.
- Evaluate neural networks and natural language processing applications.

MCA – III SEMESTER (2018-19)

Note: Open Elective (3MCA1) - Students can choose from any subject offered by other departments as per university guidelines. Course outcomes vary based on the selected subject.

Subject name: Quantitative, Teaching and Research Aptitude (Soft Core) - 3MCA2

After the completion of the Course, the students will be able to:

- Apply quantitative aptitude problem-solving skills in solving real-world problems and develop logical reasoning ability.
- Analyze mathematical concepts including numbers, algebra, geometry, and data interpretation.
- Demonstrate teaching and research aptitude skills for lifelong learning and competitive examinations.
- Understand higher education system governance, policies, and administration in India.

Subject name: Research Methodology - 3MCA3

After the completion of the Course, the students will be able to:

- Understand research process, problem formulation, and literature review techniques.
- Apply research design, sampling methods, and data collection techniques.
- Analyze quantitative and qualitative research methods and statistical tools.
- Develop research proposals and write research reports following academic standards.

Subject name: Mini Project - 3MCA7

After the completion of the Course, the students will be able to:

- Apply theoretical knowledge and practical skills to develop a software application.
- Demonstrate problem analysis, design, implementation, and testing capabilities.
- Document project work including requirement analysis, design, and implementation details.
- Present and defend project work effectively through oral presentation and viva-voce.

Note: Electives I, II, III, Open Elective, and Soft Core - Students select from available options as per university guidelines. Course outcomes vary based on selected electives.

Subject name: Elective I - 3MCA4

(Students select any three from the following options)

Option 1: Machine Learning

After the completion of the Course, the students will be able to:

- Understand fundamental concepts of machine learning including supervised and unsupervised learning.
- Apply various machine learning algorithms including regression, classification, and clustering.
- Implement decision trees, neural networks, and support vector machines for pattern recognition.
- Evaluate machine learning models and apply them to real-world data analysis problems.

Option 2: Big Data & Analytics

After the completion of the Course, the students will be able to:

- Understand big data concepts, characteristics, and the Hadoop ecosystem.
- Apply MapReduce programming model and HDFS for distributed data processing.
- Implement data analytics using Pig, Hive, and HBase for large-scale data analysis.
- Evaluate big data technologies and apply them to real-world business analytics problems.

Subject name: Elective II - 3MCA5

Option 3: Cryptography and Network Security

After the completion of the Course, the students will be able to:

- Understand cryptographic principles, classical ciphers, and modern encryption techniques.
- Apply symmetric and asymmetric key cryptography including DES, AES, and RSA algorithms.
- Implement digital signatures, message authentication codes, and hash functions.
- Evaluate network security protocols, firewalls, VPNs, and intrusion detection systems.

Option 4: Cloud Computing

After the completion of the Course, the students will be able to:

- Understand cloud computing concepts, service models (IaaS, PaaS, SaaS), and deployment models.
- Apply virtualization techniques and cloud infrastructure management.
- Implement cloud-based applications using platforms like AWS, Azure, or Google Cloud.
- Evaluate cloud security, scalability, and cost-effectiveness for business applications.

Subject name: Elective - 3MCA6

Option 5: Web Programming

After the completion of the Course, the students will be able to:

- Understand web technologies including HTML, CSS, JavaScript, and responsive web design.
- Apply server-side programming using PHP, Python, or Node.js for dynamic web applications.
- Implement database connectivity and session management in web applications.

- Develop complete web applications using modern frameworks and follow web development best practices.

MCA – IV SEMESTER (2018-19)

Subject name: Main Project - 4MCA1

After the completion of the Course, the students will be able to:

- Demonstrate comprehensive understanding of software development lifecycle through a substantial project.
- Apply advanced programming, database, and system design concepts to solve real-world problems.
- Implement industry-standard practices including version control, testing, and documentation.
- Evaluate project outcomes through technical documentation, presentation, and critical analysis.
- Exhibit professional skills including project management, teamwork, and effective communication.