

MAR ATHANASIUS COLLEGE OF ENGINEERING
(Government Aided and Autonomous)
Kothamangalam 686 666

Affiliated to APJ Abdul Kalam Technological University
Thiruvananthapuram



CURRICULUM - 2024

Master of Computer Applications (MCA)

PROGRAM OUTCOMES – PO

Outcomes are the attributes that are to be demonstrated by a graduate after completing the programme. Following are the Pos of the MCA programme.

1. **PO1 (Foundation Knowledge):** Apply knowledge of mathematics, programming logic and coding fundamentals for solution architecture and problem solving.
2. **PO2 (Problem Analysis):** Identify, review, formulate and analyse problems primarily focusing on customer requirements using critical thinking frameworks.
3. **PO3 (Development of Solutions):** Design, develop and investigate problems with an innovative approach for solutions incorporating ESG/SDG goals.
4. **PO4 (Modern Tool Usage):** Select, adapt and apply modern computational tools such as development of algorithms with an understanding of the limitations including human biases.
5. **PO5 (Individual and Teamwork):** Function and communicate effectively as an individual or a team leader in diverse and multidisciplinary groups. Use methodologies such as agile.
6. **PO6 (Project Management and Finance):** Use the principles of project management such as scheduling, work breakdown structure and be conversant with the principles of Finance for profitable project management.
7. **PO7 (Ethics):** Commit to professional ethics in managing software projects with financial aspects. Learn to use new technologies for cyber security and insulate customers from malware
8. **PO8 (Life-long learning):** Change management skills and the ability to learn, keep up with contemporary technologies and ways of working.

SEMESTER I

Slot	Course Code	Courses	Marks		L-T-P-J-S	Hours	Credit
			CIE	ESE			
A	M24CA1C101	Mathematical Foundations of Computing & Statistical Approaches	40	60	3-1-0-0-3	4	4
B	M24CA1C102	Digital Fundamentals and Computer Architecture	40	60	3-1-0-0-3	4	4
C	M24CA1C103	Advanced Software Engineering	40	60	3-1-0-0-3	4	4
D	M24CA1C104	Advanced Data Structures	40	60	3-1-0-0-3	4	4
G	M24CA1B105	Web Development Lab	60	40	1-0-2-2-4	5	3
H	M24CA1L106	Programming Lab	60	40	1-0-3-0-4	4	3
I	M24CA1L107	Data Structures Lab	60	40	1-0-3-0-4	4	3
J	M24CA1N108	Research Methodology and Publication Ethics	50	0	1-0-0-0-1	1	Nil
		Total	390	360		30	25

SEMESTER II

Slot	Course Code	Courses	Marks		L-T-P-J-S	Hours	Credit
			CIE	ESE			
A	M24CA1C201	Advanced Computer Networks	40	60	3-1-0-0-3	4	4
B	M24CA1C202	Advanced Database Management System	40	60	3-1-0-0-3	4	4
C	M24CA1C203	Advanced Operating Systems	40	60	3-1-0-0-3	4	4
D	M24CA1E204A	Elective I	40	60	3-1-0-0-3	4	4
G	M24CA1B205	Object Oriented Programming Lab	60	40	1-0-2-2-4	5	3
H	M24CA1L206	Advanced Database Lab	60	40	1-0-3-0-4	4	3
I	M24CA1L207	Operating Systems Lab	60	40	1-0-3-0-4	4	3
J	M24CA1N208	Personality Development through Life Enlightenment Skills	50	0	1-0-0-0-1	1	Nil
		Total	390	360		30	25

Professional Electives: Elective I

Slot	Course Code	Courses	Marks		L-T-P-J-S	Hours	Credit
			CIE	ESE			
D	M24CA1E204A	Statistical Methods in Decision Making	40	60	3-1-0-0-3	4	4
D	M24CA1E204B	Data Visualization and Predictive Analytics	40	60	3-1-0-0-3	4	4
D	M24CA1E204C	Data, Text and web Mining	40	60	3-1-0-0-3	4	4
D	M24CA1E204D	Cloud Computing	40	60	3-1-0-0-3	4	4
D	M24CA1E204E	Distributed Computing	40	60	3-1-0-0-3	4	4
D	M24CA1E204F	Cloud cost management & Optimization	40	60	3-1-0-0-3	4	4
D	M24CA1E204G	Optimization Techniques	40	60	3-1-0-0-3	4	4
D	M24CA1E204H	Object Oriented Modelling & Design	40	60	3-1-0-0-3	4	4
D	M24CA1E204I	Human Computer Interaction	40	60	3-1-0-0-3	4	4

SEMESTER III

Slot	Course Code	Courses	Marks		L-T-P-J-S	Hours	Credit
			CIE	ESE			
A	M24CA1C301	Data Science and Machine Learning	40	60	3-1-0-0-3	4	4
B	M24CA1C302	Design and Analysis of Algorithms	40	60	3-1-0-0-3	4	4
C	M24CA1E303A	Elective II	40	60	3-1-0-0-3	4	4
D	M24CA1E304A	Elective III	40	60	3-1-0-0-3	4	4
G	M24CA1B305	Mobile Applications Development Lab	60	40	1-0-2-2-4	5	3
H	M24CA1L306	Data Science Lab	60	40	1-0-3-0-4	4	3
I	M24CA1M307	Mini Project	100	0	0-0-0-4-2	4	2
J	M24CA1N308	Professional Ethics & Human Values	50	0	1-0-0-0-1	1	Nil
K	M24CA1I309	Internship	50	0			1
		Total	480	320		30	25

Professional Electives: Elective II

Slot	Course Code	Courses	Marks		L-T-P-J-S	Hours	Credit
			CIE	ESE			
C	M24CA1E303A	Artificial Intelligence	40	60	3-1-0-0-3	4	4
C	M24CA1E303B	Generative AI	40	60	3-1-0-0-3	4	4
C	M24CA1E303C	Cognitive Computing	40	60	3-1-0-0-3	4	4
C	M24CA1E303D	Big Data Management and Analytics	40	60	3-1-0-0-3	4	4
C	M24CA1E303E	CI/CD and DevOps	40	60	3-1-0-0-3	4	4
C	M24CA1E303F	Cloud Security and Migration	40	60	3-1-0-0-3	4	4
C	M24CA1E303G	Business Management	40	60	3-1-0-0-3	4	4
C	M24CA1E303H	Organizational Behavior	40	60	3-1-0-0-3	4	4
C	M24CA1E303I	IPR and Cyber Laws	40	60	3-1-0-0-3	4	4

Professional Electives: Elective III

Slot	Course Code	Courses	Marks		L-T-P-J-S	Hours	Credit
			CIE	ESE			
D	M24CA1E304A	Deep Learning	40	60	3-1-0-0-3	4	4
D	M24CA1E304B	Natural Language Processing	40	60	3-1-0-0-3	4	4
D	M24CA1E304C	Computer Vision	40	60	3-1-0-0-3	4	4
D	M24CA1E304D	Cloud Computing with AWS/ Azure/ Google Cloud Platform	40	60	3-1-0-0-3	4	4
D	M24CA1E304E	IOT and edge computing in the cloud	40	60	3-1-0-0-3	4	4
D	M24CA1E304F	Serverless Computing	40	60	3-1-0-0-3	4	4
D	M24CA1E304G	Social Network Analysis	40	60	3-1-0-0-3	4	4
D	M24CA1E304H	Cyber Security	40	60	3-1-0-0-3	4	4
D	M24CA1E304I	Blockchain Technology	40	60	3-1-0-0-3	4	4

SEMESTER IV

Slot	Course Code	Courses	Marks		L-T-P-J-S	Hours	Credit
			CIE	ESE			
M	M24CA1P401	Main Project	100	100	0-0-14-14-21	28	12
S	M24CA1S402	Seminar	50	0	0-0-2-0-2	2	2
	M24CA1O403	MOOC Course	To be completed successfully			0	2
		Total	150	100		30	16
Total credits in all four semesters							91

*One MOOC Course of minimum 8 weeks has to be successfully completed before the end of fourth semester (starting from semester 1).

Elective Courses:

Specialisation	Semester II	Semester III	
	Elective I	Elective II	Elective III
Data Science & Artificial Intelligence	M24CA1E204A - Statistical Methods in Decision Making	M24CA1E303A - Artificial Intelligence	M24CA1E304A - Deep Learning
	M24CA1E204B - Data Visualization and Predictive Analytics	M24CA1E303B - Generative AI	M24CA1E304B - Natural Language Processing
	M24CA1E204C - Data, Text and web Mining	M24CA1E303C - Cognitive Computing	M24CA1E304C - Computer Vision
Cloud Computing	M24CA1E204D - Cloud Computing	M24CA1E303D - Big Data Management and Analytics	M24CA1E304D - Cloud Computing with AWS/ Azure/ Google Cloud Platform
	M24CA1E204E - Distributed Computing	M24CA1E303E - CI/CD and DevOps	M24CA1E304E - IOT and edge computing in the cloud
	M24CA1E204F - Cloud cost management & Optimization	M24CA1E303F - Cloud Security and Migration	M24CA1E304F - Serverless Computing
Open Electives	M24CA1E204G - Optimization Techniques	M24CA1E303G - Business Management	M24CA1E304G - Social Network Analysis
	M24CA1E204H - Object	M24CA1E303H -	M24CA1E304H -

	Oriented Modelling & Design	Organizational Behavior	Cyber Security
	M24CA1E204I - Human Computer Interaction	M24CA1E303I - IPR and Cyber Laws	M24CA1E304I - Blockchain Technology

COURSE NUMBERING SCHEME

The course number consists of digits/alphabets. The pattern to be followed is **MYBBXCSNN**

It is illustrated below: Examples:

M – Masters

YY-Year of Regulation

BB-Branch & X- Specialization

S: Semester of study

1. Semesters 1
2. Semester 2
3. Semester 3
4. Semester 4

C : Course Type

- C - Programme Core Course
- B - Project Based Course
- L - Programme Lab Course
- E - Professional Elective Course
- M - Mini Project
- P - Project
- S - Seminar
- N - Non Credit Course
- I - Internship
- O - MOOC
- R - Bridge Course
- NN : Course sequence number

It is illustrated below:

Examples:

M24CA1C101 is a Programme Core Course offered in semester 1

M24CA1B205 is a Project Based Course offered in semester 2

Course Numbering Scheme - Elective Courses:

MYBBXCSNNA

Elective sequence number - A/B/C/D/E etc.

It is illustrated below:

Examples:

M24CA1E204A is a Professional Elective Course offered in semester 2

The parameter 'S' for the number of hours for self-learning can be determined using the equation $(L*1) + (T*0) + (P*1) + (J/2*1)$.

ASSESSMENT PATTERN:

Programme Core Courses/Professional Elective Courses

Continuous Internal Evaluation (Out of 40 Marks)

- Continuous Assessment Test 1 (Module 1 & Module 2) : 10 Marks
- Continuous Assessment Test 2 (Module 3 & module 4) : 10 Marks
- Assignment/Tutorials/Seminars : 12 Marks
- Attendance : 8 Marks

Continuous Assessment Test Pattern (Out of 50 Marks)

There will be two parts - Part A and Part B.

Part A contains 5 questions carrying 2 marks each.

Part B contains 5 questions carrying 8 marks each.

The duration of the examination is 2 hours

End Semester Examination (Out of 60 Marks)

The end semester examination will be conducted by the college. There will be two parts; Part A and Part B. Part A contains 10 questions (such questions shall be useful in the testing of knowledge, skills, comprehension, application, analysis, synthesis, evaluation and understanding of the students), with 2 question from each module, having 2 marks for each question. Students shall answer all questions. Part B contains 7 questions (such questions shall be useful in the testing of overall achievement and maturity of the students in a course, through long answer questions relating to theoretical/practical knowledge, derivations, problem solving and quantitative evaluation) with minimum one question and maximum two questions from each module of which student shall answer any five. Each question can carry 8 marks. Total duration of the examination will be 180 minutes.

Project Based Course with theory examination

Courses:

PBC2 – Object Oriented Programming Lab

Continuous Internal Evaluation (Out of 60 Marks)

- Attendance : 10 Marks
- Test 1 (Theory) : 15 Marks
- Test 2 (Lab) : 15 Marks
- Continuous Evaluation : 20 Marks

End Semester Examination (Out Of 40 Marks)

- Problem Solving : 15marks
- Viva : 5 Marks
- Git Repository : 5 Marks
- Micro Project : 15 Marks

Project Based Course without theory examination

Courses:

PBC1 – Web Development Lab

PBC3 – Mobile Application Development Lab

Continuous Internal Evaluation (Out of 60 Marks)

- Attendance : 10 Marks
- Test 1 (Lab) : 15 Marks
- Test 2 (Lab) : 15 Marks
- Continuous Evaluation : 20 Marks

End Semester Examination (Out of 40 Marks)

- Problem solving : 15Marks
- viva : 5 Marks
- Git repository : 5 Marks
- Micro Project : 15 Marks

The project for Project Based Course shall be done individually.

Programme Lab Course with theory examination

Courses:

PLC1: Programming Lab

Continuous Internal Evaluation (Out of 60 Marks)

- Attendance : 10 Marks
- Test 1 (Theory) : 15 Marks
- Test 2 (Lab) : 15 Marks
- Continuous Evaluation : 20 Marks

End Semester Examination (Out Of 40 Marks)

- Problem Solving : 30Marks
- Viva : 5 Marks
- Git Repository : 5 Marks

Programme Lab Course without theory examination

Courses:

PLC2	:	Data Structures Lab
PLC3	:	Data Science Lab
PLC4	:	Advanced Database Lab
PLC5	:	Operating Systems Lab

Continuous Internal Evaluation (Out of 60 Marks)

- Attendance : 10 Marks
- Test 1 (Lab) : 15 Marks
- Test 2 (Lab) : 15 Marks
- Continuous Evaluation : 20 Marks

End Semester Examination (Out Of 40 Marks)

- Problem Solving : 30marks
- Viva : 5 Marks
- Git Repository : 5marks

For Programme Lab courses and Project based courses final evaluation shall be done by two examiners; one examiner will be a senior faculty from the same department.

MINI PROJECT

Mini project can help to strengthen the understanding of student's fundamentals through application of theoretical concepts and to boost their skills and widen the horizon of their thinking. The ultimate aim of an MCA student is to resolve a problem by applying theoretical knowledge. Doing more projects increases problem-solving skills. The introduction of mini projects ensures preparedness of students to undertake dissertation. Students should identify a topic of interest in consultation with Project Coordinator, Project Guide. Demonstrate the novelty of the project through the results and outputs. The progress of the mini project is evaluated based on two reviews, one interim review and a final review. A report is required at the end of the semester.

Continuous Internal Evaluation (Out of 100 Marks)

Interim Evaluation by Project Assessment Board	–	20 Marks
Final Evaluation by Project Assessment Board	–	30 Marks
Continuous internal evaluation	–	30 Marks
Attendance	–	10 Marks
Report	–	10 Marks

MAIN PROJECT

The main project in the MCA (Master of Computer Applications) program is highly relevant as it builds upon the foundation established by the mini project. After completing their mini projects, students are better equipped with practical skills, enhanced problem-solving abilities,

and a deeper understanding of theoretical concepts. The main project serves as a culminating experience, allowing students to tackle more complex and comprehensive problems, integrating advanced knowledge and skills acquired throughout the MCA curriculum. It fosters independent research, critical thinking, and innovative solutions, preparing students for real-world challenges in the IT industry. Additionally, the main project provides an opportunity for students to demonstrate their expertise and readiness for professional roles, significantly enhancing their employability and career prospects. Through this extensive project, students can showcase their ability to manage, design, and implement significant IT solutions, reinforcing the overall objectives of the MCA program. Students shall identify Real-Life Projects which are relevant and useful to the society or industry. The project shall be an individual project and must be done in-house.

External Evaluation : 100 Marks

Continuous Internal Evaluation (Out of 100 Marks)

Interim Evaluation by Project Assessment Board	–	20 Marks
Final Evaluation by Project Assessment Board	–	30 Marks
Continuous Internal Evaluation	–	30 Marks
Attendance	–	10 Marks
Report	–	10 Marks

SEMINAR

The seminar component of the MCA (Master of Computer Applications) program, focusing on current technology, holds significant relevance in today's rapidly evolving technological landscape. It provides students with an opportunity to stay updated with the latest advancements, trends, and innovations in the field of computer applications. Engaging in seminars encourages active learning and critical thinking, allowing students to explore cutting-edge technologies and their practical applications. This exposure not only broadens their knowledge base but also enhances their ability to analyze and evaluate emerging technologies. By participating in discussions, presentations, and collaborative learning activities, students develop essential communication and presentation skills, which are crucial for professional success. Moreover, seminars foster a culture of continuous learning and adaptability, preparing students to thrive in the dynamic IT industry. Overall, the seminar based on current technology enriches the MCA curriculum by bridging the gap between academic learning and real-world technological advancements.

Continuous Internal Evaluation (Out of 50 Marks)

Evaluation by the Supervisor/ Guide	–	10 Marks
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Evaluation by the Seminar Assessment board :

Scope, Relevance and Knowledge in the Topic	–	10 Marks
Presentation Skill and Quality of Slides	–	20 Marks
Report	–	10 Marks

INTERNSHIP

Internships are educational and career development opportunities, providing practical experience in a field or discipline. They are structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. An internship may be compensated or non-compensated by the organization providing the internship. The internship has to be meaningful and mutually beneficial to the intern and the organization. It is important that the objectives and the activities of the internship program are clearly defined and understood. The internship offers the students an opportunity to gain hands-on industrial or organizational exposure; to integrate the knowledge and skills acquired through the coursework; interact with professionals and other interns; and to improve their presentation, writing, and communication skills. Internship often acts as a gateway for final placement for many students.

A student shall opt for carrying out the Internship at an Industry/Research Organization or at another institute of higher learning and repute (Academia). The organization for Internship shall be selected/decided by the students on their own with prior approval from the faculty advisor/Guide/Supervisor/Head of the Department. Every student shall be assigned an internship Supervisor/Guide at the beginning of the Internship.

Continuous Internal Evaluation (Out of 50 Marks)

Student's diary	–	20 Marks
Presentation	–	10 Marks
Viva Voce	–	10 Marks
Internship Report	–	10 Marks

Student's Diary/ Daily Log: The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day to day account of the observations, impressions, information gathered and suggestions given, if any. The daily training diary should be signed after every day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor visiting the industry from time to time and got ratified on the day of his visit.

Internship Report: After completion of the internship, the student should prepare a comprehensive report to indicate what he has observed and learnt in the training period and

should be submitted to the faculty Supervisor. The student may contact Industrial Supervisor/ Faculty Mentor for assigning special topics and problems and should prepare the final report on the assigned topics. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The training report should be signed by the Internship Supervisor and Head of the Department.

NON-CREDIT COURSE

Non-credit courses are integral to the MCA curriculum, ensuring that students develop technical expertise, essential soft skills, and ethical values. By completing these courses, students will be better prepared to face the challenges of the professional world with confidence, integrity, and a well-rounded personality.

Continuous Internal Evaluation (Out of 50 Marks)

Course based task/Seminars/Quiz	:	15 marks
Test	:	15 marks
Case Study Report	:	10 marks
Attendance	:	10 marks

Duration of the Examination is 2 hours

BRIDGE COURSE

A bridge course serves as a crucial academic pathway designed to ease the transition into the demanding and dynamic field of computer science. Tailored to address foundational knowledge gaps and ensure a comprehensive understanding of core concepts, the bridge course acts as a bridge between the students' prior educational background and the advanced requirements of the MCA program. It typically covers essential topics such as programming languages, algorithms, data structures, and mathematics, providing a solid base for students to navigate the complexities of computer science. This preparatory program not only empowers students with the prerequisite skills but also cultivates the confidence necessary to excel in their MCA studies, fostering a smooth and successful academic journey. An evaluation of the bridge course may be conducted and the Faculty Advisor/ Head of the Department may give feedback to the students about their performance. Some indicative resources are given as references.

Mathematics & Statistics

Digital Fundamentals & Computer Architecture

Operating Systems

C Programming

Data Structures

Examination Pattern

A final examination that covers the entire content of the bridge course may be conducted to assess overall understanding and retention. The examination is a 3-hour duration worth 60 marks and is conducted at the beginning of first semester. A lab assessment of two hours duration and a total of 50 marks that covers a moderate question on C programming, an advanced question on Data Structures, and a comprehensive viva is conducted as part of the bridge course. Regular attendance might be a factor in the evaluation process.

MOOC COURSES

List of MOOC courses shall be published by the department from time to time. The MOOC course shall be considered only if it is conducted by the agencies namely AICTE/NPTEL/SWAYAM or NITTTR. The MOOC course should have a minimum duration of 8 weeks and the content of the syllabus shall be enough for at least 40 hours of teaching. The course should have a proctored/offline end semester examination. The students can do the MOOC according to their convenience, but shall complete it by third semester. The list of MOOC courses will be provided by the concerned BoS if at least 70% of the course content matches with the area/stream of study. The course shall not be considered if its content has more than 50% of overlap with a core/elective course in the concerned discipline or with an open elective.

MOOC Course to be successfully completed before the commencement of fourth semester (starting from semester 1). A credit of 2 will be awarded to all students who ever successfully completes the MOOC course as per the evaluation pattern of the respective agency conducting the MOOC.

Major highlights of the Curriculum

- * Specialization based on Elective Courses
- * Project based courses
- * Mandatory Bridge Course
- * Mandatory MOOC course and Internship
- * Non-Credit Course focused on Ethics and Life skills
- * Research driven courses
- * Self-learning Assessment system